US Army Corps of Engineers®

Draft Integrated Feasibility Report and Environmental Assessment

Agat Emergency Shoreline Protection Agat, Guam

September 2024

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Agat, Guam

Prepared By:
U.S. Army Corps of Engineers
Honolulu District

September 2024

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 Agat Emergency Shoreline Protection Feasibility Study. The study area is located in the village of Agat in the U.S. Territory of Guam, for which the Government of Guam (GovGuam), represented by the Guam Department of Public Works (GDPW), is the non-Federal sponsor (NFS). This IFR/EA, evaluates and discloses potential impacts that would result from the implementation of potential emergency shoreline protection measures in the study area. In accordance with applicable Federal law, regulation, and USACE policy, this 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.

The study is authorized under Section 14 of the Flood Control Act of 1946, as amended (33 United States Code [USC] 701r), for Emergency Shoreline Protection under the USACE 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 allow additional design and construction to proceed following approval of this report.

Generally, plan formulation and evaluation for CAP Section 14 studies will focus on the least cost alternative that provides emergency shoreline protection to public infrastructure. The least cost alternative plan is justified if the cost of the proposed alternative is less than the costs necessary to relocate the threatened facilities (Engineer Pamphlet [EP] 1105-2-58).

The Agat Mayor’s Complex serves as the municipal government headquarters of Agat, and also provides public services open to all on equal terms. The complex is located directly on the coastline and is under threat of coastal erosion. The facility serves the general public and is open to all on equal terms. The furthest oceanward building in the complex is just a few feet (ft) from a concrete rock masonry (CRM) seawall that protects it from the eroding shoreline. Adjacent to the mayor’s office is another community facility, Agat Sagan Bisita, with pavilions along the shoreline and an adjoining section of CRM seawall. The mayor’s office, Sagan Bisita, and associated public utilities are collectively referred to as the Agat Mayor’s Complex in this report. The proximity of these buildings and facilities to the seawall make them vulnerable to wave overtopping during high wave events. The seawall itself is vulnerable to undermining due to continued erosion of the beach fronting the seawall.

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 seven 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 alternatives: Alternative 1 - No Action, Alternative 2 - Concrete Armor Unit Revetment, Alternative 3 - Open Cell Piling Seawall, Alternative 4 - Secant Pile Seawall.

Based on formulation and evaluation of potential alternatives, the TSP is Alternative 3: Open Cell Piling Seawall (Figure ES 1). This alternative consists of replacing the existing CRM seawall with a 320 ft long vinyl open cell sheet piling seawall anchored 4 ft into bedrock with 2 ft pin piles. The cells of the vinyl sheet piles will be backfilled with reinforced concrete and the wall anchored with tieback rods every 8 ft for the length of the seawall. The finished seawall will have a top elevation of 6 ft above Mean Sea Level (MSL), depth elevation of -6 ft MSL, and width of 2 ft. The top crest elevation needed for the design to meet the USACE 50-year design requirement for sea level change (SLC) and be adaptable to 100-year SLC under the intermediate scenario is 6 ft above MSL, approximately the same height as the existing seawall. The Open Cell Piling Seawall will be approximately 2 ft wide, constructed parallel to the shoreline and extending seaward.

The TSP is the least cost, environmentally acceptable alternative that is less than the cost of facility relocation ($19.65 million). At the Fiscal Year (FY) 2024 discount rate of 2.75% the project first cost estimate for the TSP is approximately $6.7 million.

Due to the limited nature of construction disturbance associated with replacement of the existing seawall, the activities of the TSP, i.e., Proposed Action, are not expected to cause any long-term adverse environmental effects in the immediate study area. Environmental commitments (ECs) and best management practices (BMPs) would be implemented, where appropriate, to ensure that potential construction-related impacts are avoided and minimized to a less than significant level (see Section 6.9). The TSP results in no loss of waters of the U.S. therefore, no compensatory mitigation is required. Further examination of impacts from the proposed design will be part of the Design and Implementation (D&I) phase.

The NFS expressed support for Alternative 3 as the TSP at the July 30, 2024 TSP milestone meeting. GovGuam's support for the TSP was coordinated with the Governor of Guam. To solicit stakeholder input on this study, this draft IFR/EA will be released to the public and Federal, territory and local agencies for a 30-day public review period beginning in September 2024. A live public meeting at the Agat mayor's office, with an option for virtual attendance, is planned for October 2024 to present the TSP and allow the public to respond and ask questions during the review period. The meeting will be recorded, and the public will be further notified of the draft report through various outlets and the Honolulu District's website. Public and agency comments on the draft report will be incorporated into the final report. The final IFR/EA is scheduled to be complete and made publicly available in the summer of 2025.

TENTATIVELY SELECTED PLAN:

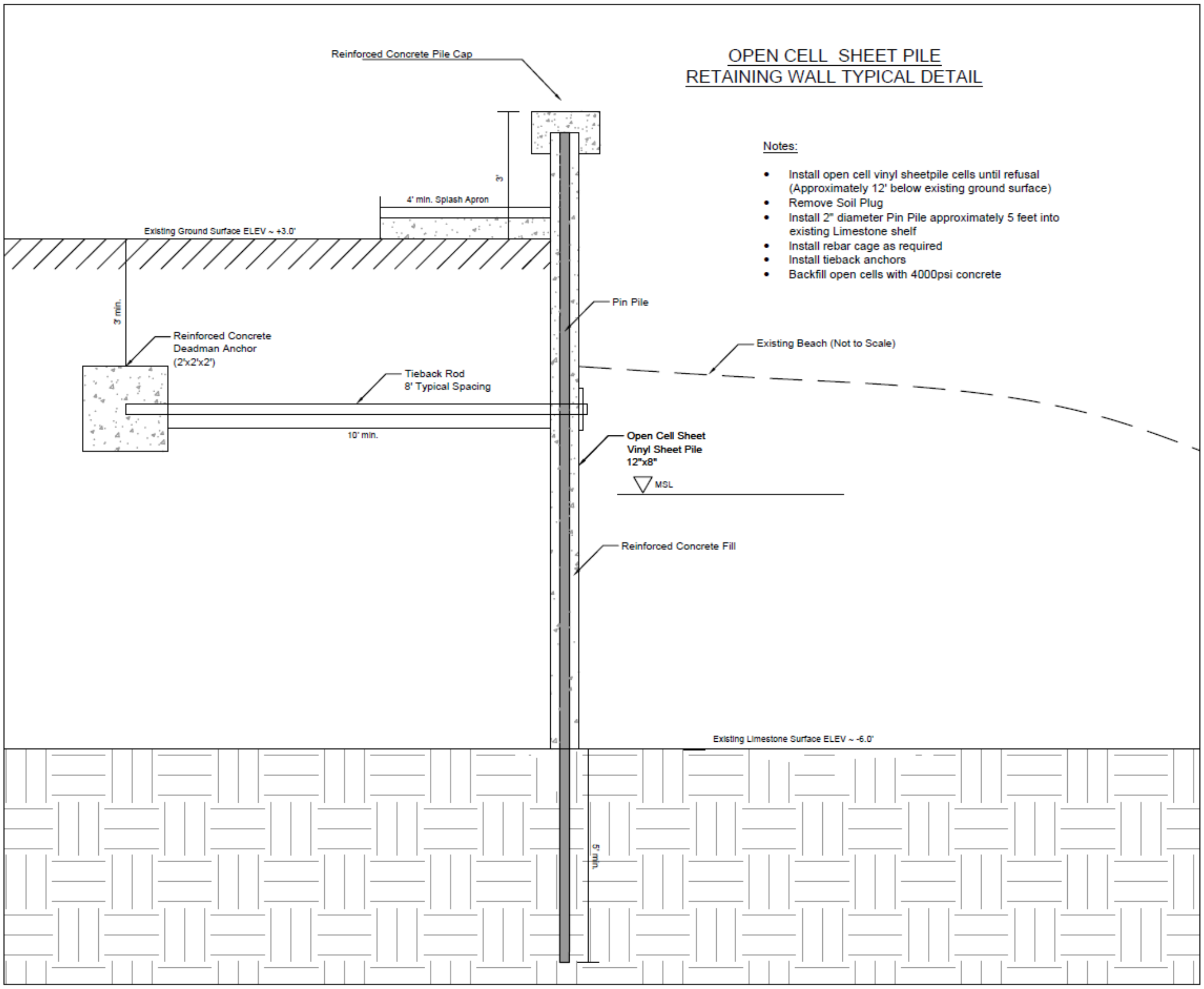

Figure ES 1: Cross section of the Open Cell Piling Seawall

TABLE OF CONTENTS

List of Tables

List of Figures

APPENDICES

List of Acronyms and Abbreviations

AEP	Annual Exceedance Probability
APE	Area of Potential Effects
BEA	Bureau of Economic Analysis
BMP(s)	Best Management Practices
CAP	Continuing Authorities Program
CDP	Census-designated place
CE	Common Era
CEJST	Climate and Economic Justice Screening Tool
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CES	Current Employment Survey
CFR	Code of Federal Regulations
COR	Condition of Readiness
COVID	Corona Virus Disease
CSRM	Cost and Schedule Risk Analysis
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
D&I	Design and Implementation phase
EA	Environmental Assessment
EC	Environmental Commitment
EFH	Essential Fish Habitat
EFHA	EFH Areas Protected from Fishing
EJ	Environmental Justice
EJSCREEN	Environmental Justice Screening and Mapping Tool
EO	Executive Order
EOP	Environmental Operating Principles
EP	Engineer Pamphlet
EQ	Environmental Quality
ER	Engineer Regulation
ESA	Endangered Species Act
ESI	Environmental Sensitivity Index
FCD	Federal Consistency Determination
FCSA	Federal Cost Sharing Agreement
FEMA	Federal Emergency Management Agency
FID	Federal Interest Determination
FONSI	Finding of No Significant Impact
FT	Foot or feet
FWCA	Fish and Wildlife Coordination Act
FWOP	Future Without Project
FY	Fiscal year
GBSP	Guam Bureau of Statistics and Plans

GCMP	Guam Coastal Management Program
GDAWR	Guam Division of Aquatic and Wildlife Resources
GDP	Gross Domestic Product
GDPW	Guam Department of Public Works
GEPA	Guam Environmental Protection Agency
GovGuam	Government of Guam
H:V	Horizontal to vertical (slope)
HAPC	Habitat Areas of Particular Concern
HTRW	Hazardous, Toxic, and Radioactive Wastes
IFR/EA	Integrated Feasibility Report and Environmental Assessment
IUCN	International Union for Conservation of Nature
Lbs	Pounds
LERRD	Lands, easements, rights-of-way, relocations, and disposals
MHHW	Mean higher high water
MLLW	Mean lower low water
MMPA	Marine Mammal Protection Act
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MSL	Mean Sea Level
MUS	Management unit species
NED	National economic development
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
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
OMRR&R	Operations, maintenance, repair, replacement, and rehabilitation
OSE	Other social effects
P&G	Principles and Guidelines
PDT	Project Delivery Team
PED	Preconstruction, engineering, and design
PL	Public Law
PPA	Project partnership agreement
RED	Regional economic development
RSLC	Relative sea level change
SHPO	State Historic Preservation Officer
SLC	Sea level change
SLR	Sea level rise
SWPPP	Stormwater Pollution Prevention Plan

TSP	Tentatively Selected Plan
U.S.	United States
USACE	United States Army Corps of Engineers
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UXO	Unexploded Ordnance
WOTUS	Waters of the United States
WPRFMC	Western Pacific Regional Fishery Management Council
WQC	Water quality certification
WRDA	Water Resources Development Act
WWII	World War II

1.0 INTRODUCTION

This section provides information on the United States Army Corps of Engineers (USACE) planning process, study purpose, need and scope, study authority, study area, and previous studies that contributed to this feasibility study. It also provides a summary of problems, opportunities, objectives, and constraints considered in formulating study alternatives.

1.1 USACE Planning Process

The USACE uses an iterative six-step planning process, as outlined in Engineer Regulation (ER) 1105-2-103, *"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 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 Tentatively Selected Plan (TSP). This IFR/EA discusses and discloses environmental effects, beneficial or adverse, that may result from proposed project in compliance with the National Environmental Policy Act (NEPA) of 1969 (42 United States Code [USC] § 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.

Engineering Pamphlet (EP) 1105-2-58, which supersedes Appendix F of 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 IFR/EA.

1.2 Study Purpose, Need, and Scope

The purpose of this feasibility study is to identify and evaluate solutions to protect critical structures and infrastructure at the Agat Mayor's Complex in Agat[1], Guam, from the imminent threat of failure due to coastal erosion. The shoreline in this area is threatened by wave action eroding the beach and existing seawall, which currently serve to protect landside infrastructure in this Complex. Without an implementable solution in place, the existing seawall will collapse and eventually structures within the Complex will also succumb to coastal erosion. This puts the Agat Mayor's Complex at high risk of shutdown and failure should no action be taken.

The study scope includes the development and evaluation of a series of potential alternative plans with a focus on emergency shoreline protection. Alternatives were developed in consideration of study area problems and opportunities as well as objectives and constraints and evaluated against the CEQ Principles and Guidelines (P&G) four evaluation criteria: completeness, effectiveness, efficiency, and acceptability (CEQ 2013). Analysis of alternative plans focuses on the least-cost, environmentally acceptable plan, which is identified as the TSP. The results of this analysis are documented in this decision document, which will serve as the basis for project design and implementation (D&I) authorization.

1.3 Study Authority

This feasibility study 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 USC 701r). Under the CAP, Section 14 authorizes USACE to partner with a non-Federal sponsor (NFS) 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*

[1] In August 2021, Governor Lou Leon Guerrero signed a bill officially changing the name of the village from Agat to Hågat. Project documentation prior to this date refers to the village by the prior name, Agat. Both names (Hågat and Agat) may be used interchangeably within this document.

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."

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 Agat Mayor's Complex is an essential public facility, open to all on equal terms, has been properly maintained, and is in imminent threat of damage by natural shoreline erosion. Therefore, the complex is eligible for consideration of protection under Section 14.

The NFS for this project is the Government of Guam (GovGuam), represented by the Guam Department of Public Works (GDPW). Although the project is represented by GDPW, the Guam Bureau of Statistics and Plans (GBSP) is the planning coordinating agency authorized by GovGuam to solicit support from Federal agencies to address coastal management concerns. Based on data collected from the Agat Mayor's Office and preliminary assessments conducted by GDPW and GBSP, GovGuam sought expert guidance and support from USACE. A letter from GBSP, dated August 15, 2019, requested for USACE assistance in reducing the risk from coastal storm damage in the municipality of Agat. In 2020, under the Planning Assistance to the States program, USACE prepared an Agat Bay Regional Shoreline Assessment Report (USACE, 2020b), highlighting the necessity for shoreline protection measures at certain areas along the Agat shoreline. Recognizing the critical nature of this issue, GBSP submitted a letter, dated April 12, 2022, requesting USACE assistance for shoreline protection at the Agat Mayor's Complex under the CAP Section 14 authority.

In February 2023 a Feasibility Cost Sharing Agreement (FCSA) was executed between USACE and GovGuam to initiate a feasibility study under the CAP Section 14 authority. Section 14 projects 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 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 USC 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 Guam. At the time of FCSA execution, the Section 1156 waiver was $665,000. In Federal Fiscal year (FY) 2024, the Section 1156 waiver is valued at $648,000 and will continue adjusting annually based on current inflation rates. The cost share waiver deducts from the non-Federal share and adds to the Federal share. Additional information on projected cost share requirements can be found in Section 6.7 Cost Sharing.

1.4 Location and Description of the Study Area

Guam is located in the North Pacific Ocean between the Commonwealth of the Northern Mariana Islands (to the north) and the Federated States of Micronesia (to the south). It is the westernmost point in the U.S., located approximately 3,950 miles west of Hawaii. The inset map zooms in on the Territory of Guam, with a star to indicate the location of the study area (Figure 1).

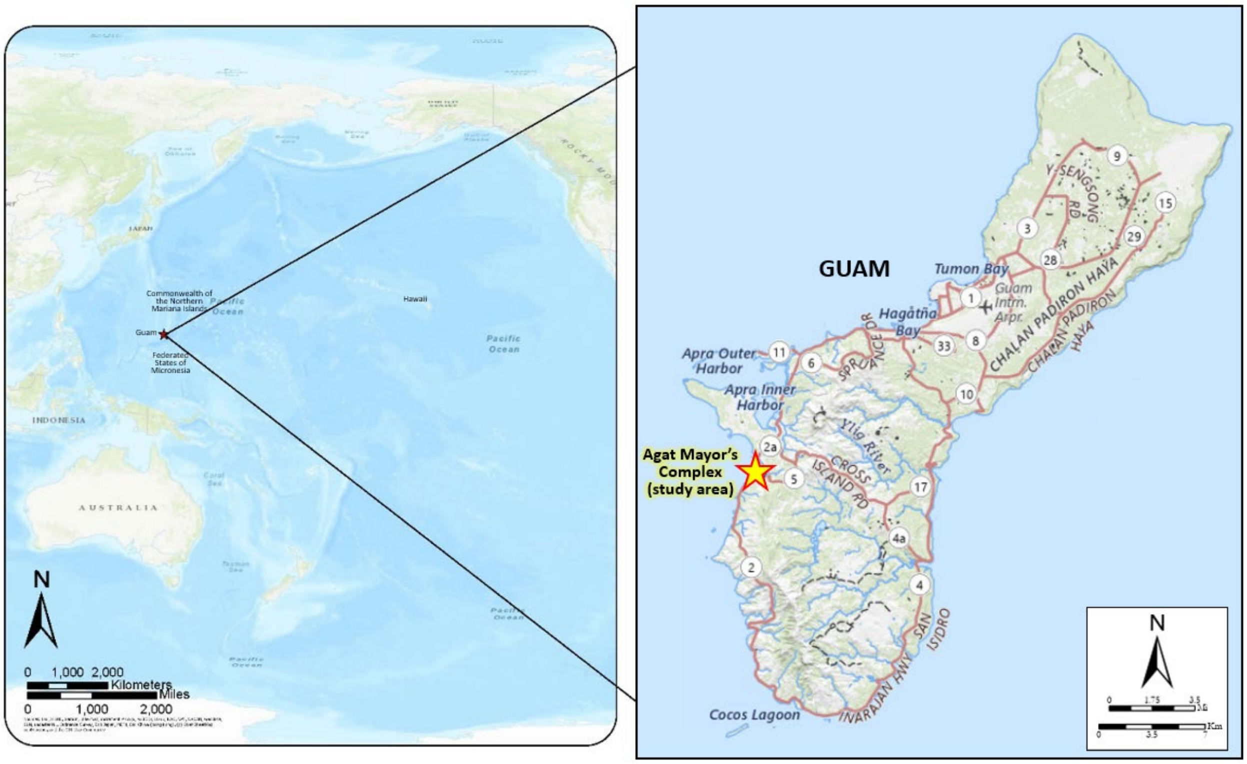

Figure 1: Location Map of Territory of Guam

Guam is a U.S. territory and is represented by a delegate in the U.S. Congress, whom at the time of this report writing is Mr. James Moylan (Republican).

The study area (Figure 2, yellow dotted box) is located on the west central coast of Guam in the village of Agat. Agat is one of 19 municipalities on the Island of Guam. Located along Guam's western shore, Agat is home to an existing Corps of Engineers small boat harbor and exhibits development typical of moderately urbanized coastal communities on islands with narrow, steep watersheds where both flash flooding from riverine sources can occur concurrently with coastal flooding due to coastal storms, to include typhoons.

The Agat Mayor's Complex is located along Route 2 just north of the Agat Beach Unit of the War in the Pacific National Historical Park. A stream (Figure 2, blue box) runs southwest of the study area from the national park, draining into Agat Bay.

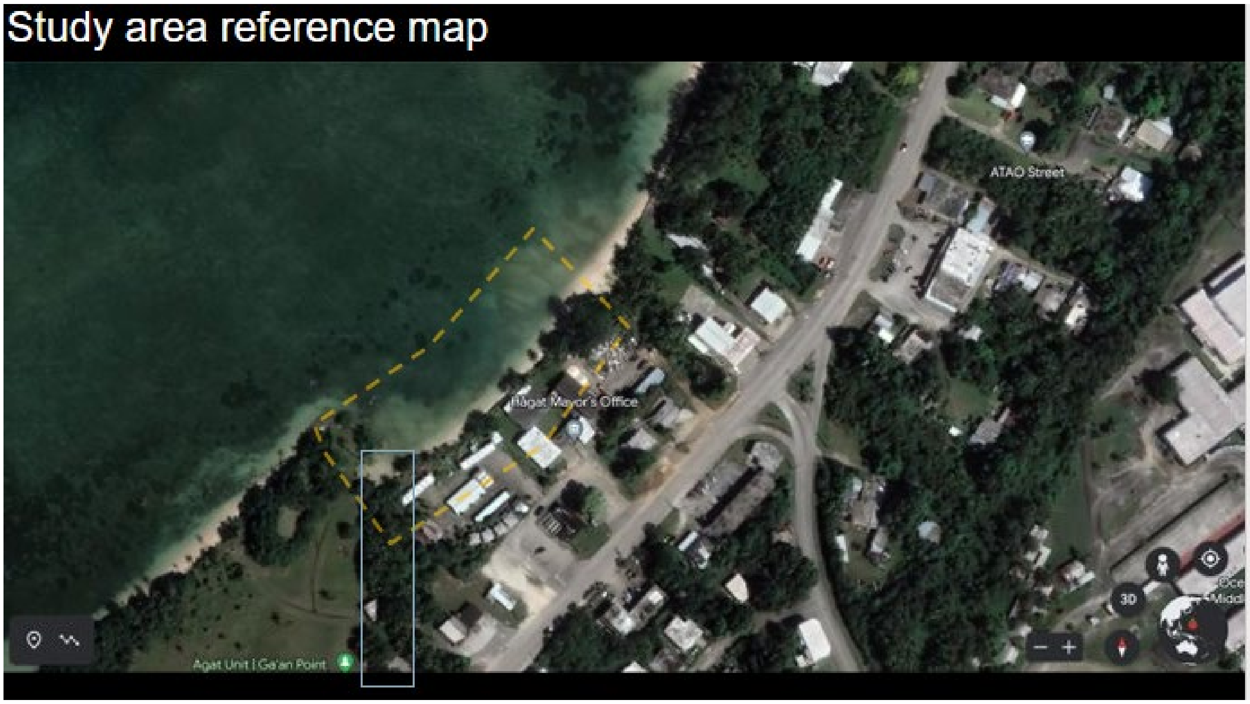

Figure 2: Aerial view of the Agat Mayor’s Complex

The study area, in this report referred to as the Agat Mayor’s Complex, includes the Agat mayor’s office as well as the nearby Sagan Bisita, a community gathering place. The Mayor’s Complex is a collection of buildings that include the mayor’s office, community center, learning center, computer lab, emergency shelter, evacuation facility, post office, and community gathering space (Figure 3 and Figure 4). The Complex spans approximately 450 feet (ft) along the shoreline. Route 2 runs parallel to the shoreline on the landward side of the public structures (approximately 500 ft from the coastline) and is the only road along the western shore from the administrative capital of Guam (Hagåtña) to Agat and other municipalities. A main power line also runs along Route 2.

Figure 3: Map of structures within the Agat Mayor’s Complex

Figure 4: Aerial image of the Agat Mayor's Complex. *Image source: GBSP, July 2023*

The Complex provides multiple services for the village of Agat and the surrounding region. In addition to year-round local municipality services, the collection of buildings provides numerous emergency response functions during storm, typhoon, or tsunami events. The Complex serves as an emergency shelter during storm events and buses use it as a primary stop for transferring people to other shelters serving three adjacent municipalities. In addition, the Complex serves multiple purposes during different Condition of Readiness (COR) levels, including dispatch, staging, and deployment of personnel and equipment during emergency events. The community center also provided COVID-19 clinics during the recent pandemic.

Recent investments have expanded the Mayor's Complex to include a community kitchen, computer lab, and support after-school and summer programs. Additionally, the location serves as a food distribution center for all three municipalities in the south.

The Agat mayor's office, community center, and learning center are highlighted in Figure 5 and Figure 6. The structures were constructed sometime prior to 1973, and the area serves as a community center, Emergency Operations Center, and Evacuation center.

Figure 5: Aerial view of Agat mayor's office, community center, and learning center.
Image source: GBSP, July 2023

Figure 6: Ground view of Agat mayor's office, community center, and learning center. *Image source: USACE, January 2022*

The Mayor's Complex also includes the Sagan Bisita, a multi-purpose community gathering space. The Sagan Bisita serves as a venue for weekly night markets (e.g., farmers market) as well as year-round events such as weddings, graduations, religious services, funerals, movie nights, a 5k run, and holiday events. The Sagan Bisita is an open-air facility with a raised stage, permanent weather shelters, picnic tables, and cooking areas. It is the only location within the municipality with adequate size to host community events, such as the largest festival in Agat – the annual Mango Festival, which draws in thousands of tourists each year. Figure 7 below provides a ground view of the Sagan Bisita and Figure 8 is an aerial view of the Agat Mayor's Complex, with Sagan Bisita in the forefront (white and blue structures with white roofs) and mayor's office to the left in the background (orange structures with grey roofs).

Figure 7: Ground view of the Sagan Bisita community gathering space. *Image source: USACE, January 2022*

Figure 8: Aerial view of the Agat Mayor's Complex from the coastline. *Image source: GBSP, July 2023*

Based on information from the NFS, the existing seawall along the shoreline of the study area was constructed in the early 2000s. The wall fronting the mayor's office is about 3 ft high and 80 ft long. The beach in front of it is about 15-20 ft wide with mean sea level (MSL) tides (Figure 5). The south end of the wall makes a 90 degree turn landward at the junction of the two properties between the mayor's office and the Sagan Bisita (Figure 9).

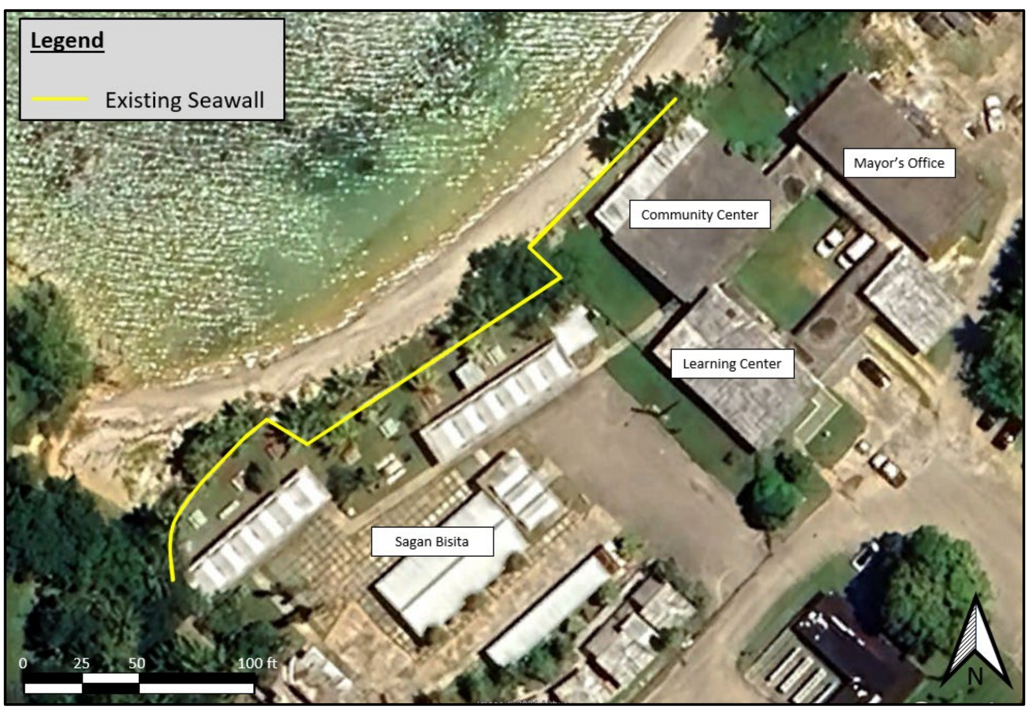

Figure 9: Location of the existing CRM seawall. *Image source: Google Earth, April 2023*

The building furthest oceanward, the community center, is just a few feet landward of the existing concrete rubble masonry (CRM) seawall (Figure 10). At high tide, the NFS has observed the water line rising to the base of the eroding seawall fronting and placing the community center just feet away from the ocean. The existing seawall extending to the southwest and fronting the Sagan Bisita is constructed entirely in uplands, beyond the influence of the tide.

Figure 10: Undermining of the existing seawall fronting the Community Center. *Image source: USACE, January 2022*

The wall in front of Agat Sagan Bisita is approximately 4 ft high and setback 20 ft from the wall fronting the mayor's office (Figure 9). The wall turns seaward fronting the southern set of pavilions at the Sagan Bisita property. Then the wall turns inland, separating the Sagan Bisita from the national park land and nearby stream.

The images above and below were captured by USACE Project Delivery Team (PDT) members on a site visit in January 2022, highlighting the deteriorating condition of the existing seawall and need for immediate protection. Figure 10 shows the undermining of the seawall fronting the community center, while the left image in Figure 11 displays erosion flanking around the existing seawall. Figure 11 also displays ad hoc protection measures placed by the community with large rocks and concrete utility poles used to protect the community center (left image) and Sagan Bisita (right image).

Figure 11: Large rocks and utility poles for temporary protection to the community center and Sagan Bisita. *Image source: USACE, January 2022*

1.5 Previous Studies

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

- ***Guam Comprehensive Study, USACE, Pacific Ocean Division, 1980***. This study described the physical characteristics of the Guam shoreline with an emphasis on shoreline erosion problems and shore protection needs (USACE 1980).
- ***Flood Insurance Study, Territory of Guam, USACE, Pacific Ocean Division, September 1983.*** The study was completed by the U.S. Corps of Engineers for the Federal Emergency Management Agency (FEMA) under the authorities of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. The flood insurance study investigated the existence and severity of flood hazards on the island of Guam. The study also developed flood risk data for various areas of the community that have been used to establish actuarial flood insurance rates and assist the community in their efforts to promote sound flood plain management. A section of the report covered the problems of coastal flooding and documented several accounts of damages by wind generated waves. (USACE 1983)
- ***Agat (Hågat) Bay Regional Shoreline Assessment***, ***July 2020***. The Planning Assistance to States Program report identified areas of significant shoreline erosion, determined the causes of erosion, and developed conceptual plans for shoreline stabilization. Erosion at the Agat mayor's office is due in part to a trend of offshore transport during typical and extreme wave events, caused by wave-generated currents. This may also have been exacerbated in recent years by higher-than-normal water levels in the western Pacific. The analysis shows that overall, there is a deficit of sediment in the region. (USACE 2020)

- ***Guam Watershed Plan, July 2022.*** The study, funded by WRDA of 1986 (PL 99-662), as amended, identified water resources problems for the island of Guam by focusing on natural hazards, past disaster events, local community needs, and local government interests. One of the near-term options to address riverine flooding recommended in the study would be a comprehensive flood study focusing first on the Agat-Santa Rita area (USACE 2022).

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 Challenges

Guam is in close proximity to a breeding ground for tropical storms and typhoons, and the low-lying coastline of Agat is subject to frequent storm wave attacks. The much higher than usual wave heights that reach the shoreline during severe storm periods have caused erosion to the beach and have resulted in undermining of the existing seawall. This damage to the existing seawall has put the Agat Mayor’s Complex and public utilities in the immediate vicinity of the study area at imminent risk. Future sea level rise will continue to exacerbate this condition and cause erosion and the resulting damage to accelerate.

To supplement the existing seawall, makeshift erosion mitigation features such as large boulders and utility poles have been placed on the shoreline as temporary protection. However, the erosion threat is imminent, and these temporary measures are insufficient to manage the coastal wave energy in the study area. According to the NFS, approximately 10 to 15 ft of beach have eroded since the early 1990s, resulting in the loss of beach facilities such as a full shower building and benches. The buildings and structures within the Complex are in close proximity to the shoreline with little to no space for retreat. The existing seawall provides limited protection as it is not continuous, and the intact portions of the wall are crumbling and on the brink of failure. The structures within the Agat Mayor’s Complex are at high risk of continued erosion and wave impacts, placing the Complex at risk of imminent closure.

Agat, located between Naval Base Guam and Agat Small Boat Harbor, is both the western gateway to the south half of Guam and the commercial center of south Guam (Guampedia 2023). Agat also contains some of Guam’s most popular beaches and is home to the Agat Beach Unit of the National Park Service’s War in the Pacific National Historical Park. The Mayor’s Complex provides municipal, community, and emergency services to the 4,917 residents (as of the 2010 US Census) of Agat. Damage to these buildings and the public utilities beneath them would delay the southern villages’ accessibility to essential services such as emergency shelters, thereby resulting in health and safety risks.

Coastline erosion in the study area was accelerated during Typhoon Yutu that devastated the islands in 2018 and later Typhoon Mawar in 2023. Wave runup from these high storm events deposited sand, rocks, and debris upland to the Sagan Bisita pavilions and community center walkways. The area was affected by heavy winds and rain that caused fallen trees, downed power lines, and other debris. The Mayor's staff worked quickly to clear debris from the area in order to restore operations for emergency disaster relief.

1.6.2 Problems

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

- Offshore transport during typical and extreme wave events, caused by wave-generated currents, is eroding the shoreline along the Agat Mayor's Complex and will damage the buildings and utilities beneath without emergency shoreline protection.
- The existing seawall is vulnerable to undermining due to erosion of the beach, leaving structures and infrastructure within the Agat Mayor's Complex at risk of damage from erosion and wave attack.
- Critical damage to the Agat Mayor's Complex threatens the provision of municipality services in Agat as well as community activity, impacting social connectedness, especially during emergency situations. The residents of Agat consistently lose electricity during natural disasters and some also experience water loss. In 2023, Typhoon Mawar caused thousands of residents to lose cellphone service when it disrupted the island's communication capabilities. Thus, the emergency services provided by the mayor's office connecting community members to resources of electricity, water, communication, and shelters is critical.

1.6.3 Opportunities

Opportunities to attain desirable future outcomes incidental to implementing a solution to the identified problems include:

- Increase community resiliency to coastal erosion
- Maintain the provision of public and emergency services at the Agat Mayor's Complex
- Proactively plan for future sea level change (SLC) along Guam's shorelines
- Minimize disruption of public access to the Agat Bay for recreation, tourism, and cultural practices (e.g., subsistence fishing)

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 ER 1105-2-103, is to: (1) protect the Nation's environment by maximizing sustainable economic development, avoiding unwise use of floodplains and flood-prone areas, and protecting, restoring, and mitigating for unavoidable damage to natural systems; (2) reasonably maximize all benefits with appropriate consideration of costs, with public benefits including environmental, economic, and social goals; and (3) provide the partner, Tribes, state and federal agencies, stakeholders, and decision makers with an opportunity to compare and examine alternatives and trade-offs to water resource problems.

1.7.2 Planning Objective

The planning objective for the study is to identify a solution that reduces the risk of failure due to erosion at the Agat Mayor's Complex over the 50-year period of analysis.

Under CAP Section 14, the least cost alternative plan is justified if the total cost of the proposed alternative is less than the cost to relocate the buildings and utilities of the Agat Mayor's Complex.

1.7.3 Planning Constraints

The following factors were identified as planning constraints:

- Ga'an Point is a national historic site protected as part of the War in the Pacific National Historical Park. The National Park Service (NPS) boundary transects a portion of the Sagan Bisita (Figure 12), constraining the footprint of implementable measures in the study area.

Figure 12: NPS boundary at Ga'an Point. *Image source: NPS, November 2023*

- The high cost of implementation in remote territories such as Guam was identified as a study constraint. There are two main contributing factors to this constraint:
    - Section 1156 of WRDA 1986 provides a territorial waiver under the Feasibility and D&I phases of CAP studies. In 2023 when this feasibility study was initiated, the Section 1156 waiver was $665,000. While the intent of the territorial waiver is beneficial in most cases, under a Section 14 authority with a limited Federal expenditure of $10 million, the territorial waiver hinders the study's ability to qualify under a CAP Section 14 authority. 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 Guam.
    - Given the recent period of high inflation and the high costs associated with mobilizing equipment and personnel to remote territories such as Guam, there may be a limited number of alternatives that qualify within the range of coastal erosion management measures and alternatives that may be considered and selected under this authority.

1.7.4 Planning Considerations

In consideration of existing local planning statutes, the study must demonstrate consistency with the Conservation of Natural Resource element in the Guam Comprehensive Development Plan (GBSP 1979) and the Guam Territorial Seashore Protection Act of 1974 (PL 12-108, Chapter V-A), including the following provisions from Executive Order 78-23:

Shore Area Development: Only those uses shall be located within the Seashore Reserve which: (1) enhance, are compatible with or do not generally detract from the surrounding coastal area's aesthetic and environmental quality and beach accessibility; or (2) can demonstrate dependence on such a location and the lack of feasible alternative sites.

Visual Quality: Preservation and enhancement of, and respect for the island's scenic resources shall be encouraged through increased enforcement of and compliance with sign, litter, zoning, subdivision, building and related land-use laws; visually objectionable uses shall be located to the maximum extent practicable, so as not to degrade significantly views from scenic overlooks, highways, and trails.

The Government Code Section 13450 of the Territory Beach Areas Act also applies:

The indiscriminate building of structures on the ocean shores of Guam should be discouraged.

2.0 EXISTING CONDITIONS

Section 2 documents the second step in the six-step planning process: *Inventory, forecast, and analysis of water and related land resource conditions within the planning area relevant to the identified problems and opportunities*. For the purposes of this integrated report, the Existing Conditions section constitutes the Affected Environment section for NEPA purposes. Resources in the Affected Environment are described below and are analyzed for effects in Section 4.0. The list includes climate; air quality/greenhouse gas; geomorphology, hydrology & hydraulics; water resources & quality; special aquatic sites; hazardous, toxic & radioactive wastes; noise; terrestrial habitat; marine habitat; threatened, endangered species & critical habitat; essential fish habitat; invasive species; navigation; land use, public infrastructure & utilities; socio-economics; environmental justice; historic & archaeological resources; cultural & subsistence activities; and aesthetics.

The temporal scope of analysis for this study is a period of 50 years beginning in 2028 and ending in 2078. The spatial scope of analysis for this study focuses on the proposed action area, which includes the immediate and surrounding environment within which USACE considered potential effects of the proposed action. The proposed action area is inclusive of the study area and extends beyond the construction footprints of each alternative to where indirect impacts to resources may be reasonably expected to occur. It is the largest geographic scope of analysis within which all impacts to resources described in this section are later evaluated in Section 4. Within the proposed action area, the construction footprint encompasses 320 ft from the neighboring national park’s boundary to the end of the existing wall just in front of an empty lot next to the Complex.

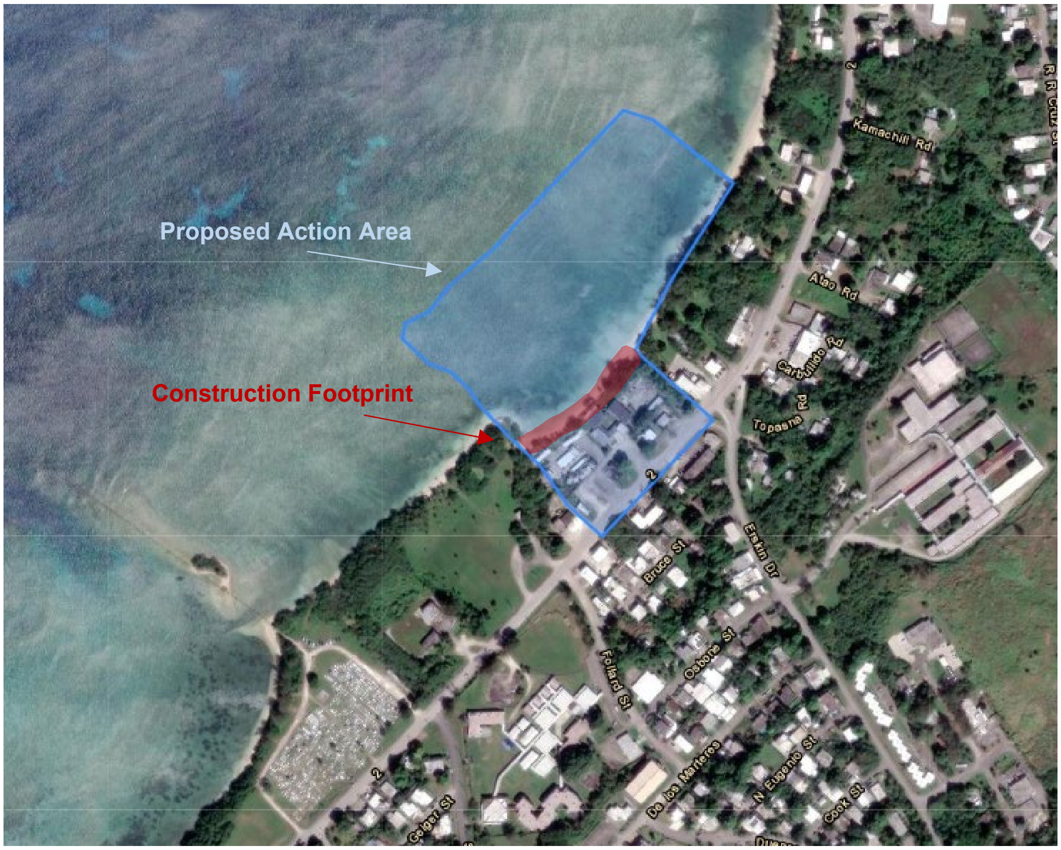

Figure 13: Location of Proposed Action Area and Construction Footprint. *Image source: USFWS IPaC, May 2024*

For each resource, the existing conditions within the proposed action 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. 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 resources that would be potentially affected by the alternatives and have the most material bearing on the decision-making process. Resources that do not occur along the shoreline of the Agat Mayor's Complex are not considered further in this section.

2.1 FWOP 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 identification of FWOP conditions, plan formulation, and evaluation and performance of alternative plans under the future with project (FWP) conditions.

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 can be found in Appendix A-1.1 Coastal Engineering. Climate change will impact the shoreline of Agat Mayor's Complex into the foreseeable future. The effects of sea level rise and intensifying storms will continue eroding the beach, which will eventually undermine the existing wall entirely and cause the property to collapse into the ocean. Shoreline protection measures, such as seawalls, are known to interfere with sediment transport and may cause erosion and/or accretion of sediments elsewhere along the shoreline. However, a shoreline protection alternative at the Complex would result in less erosion compared to the FWOP scenario and provide resiliency against climate change impacts.

2.2 Physical Environment

This section summarizes the physical environment within the proposed action area. Additional details are provided in Appendix 1 Engineering, and Appendix A-3 Environmental.

2.2.1 Climate

The Guam climate is tropical, with warm and humid conditions throughout the year. The surrounding ocean has a year-round temperature of 81 degrees and is largely responsible for the island's climate. There are two distinct seasons, defined by variations in wind and rainfall. A dry season extends from January through May, and a wet season from July through November. December and June are transitional months. Annual rainfall averages are typically above 80 inches. Easterly trade winds occur throughout the year but are dominant during the dry season. From July to October the winds become variable, and the occurrence of typhoons increases.

Guam lies near a known breeding ground for tropical depressions, tropical storms, and typhoons. Typhoons (or hurricanes as they are called east of the International Date Line) are defined as tropical cyclonic storms with winds exceeding 65 knots (74 mph). During the period of 1946 to 1991, Guam was directly affected by 20 typhoons. On an annual average, two to three of these storms pass within 200 miles of Guam.

Extratropical storms are generated far from the island of Guam. These types of events can be generated by an extratropical storm in the northern or southern Pacific Ocean or a large event in the Southern Ocean. They are characterized by waves generated far away from the proposed action area that propagate across the open ocean, interact with each other, and finally impact the project site with large waves. Distant typhoons are also capable of generating a wave-only event if the storm is large enough and traveling in specified direction in relation to the island. The difference between a typhoon condition and the extratropical swell condition is the longer period of the swell conditions along with a minimal increase to the nearshore water levels.

Additional information on wind and El Niño Southern Oscillation Cycles is discussed in Appendix A-1.1 Coastal Engineering.

2.2.2 Air Quality and Greenhouse Gas Emissions

The United States Environmental Protection Agency (USEPA) has established National Ambient Air Quality Standards for criteria pollutants including carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter, ozone, and lead. Guam's air quality is generally considered good. Piti, Piti-Cabras, and Tanguisson in Guam are non-attainment areas for sulfur dioxide (USEPA 2023). The rest of Guam, including the proposed action area, is in attainment of air quality standards. The proposed action area is located well outside the buffer zones of these non-attainment areas.

Existing GHG emissions are incurred in the construction footprint for recurring wall repairs requiring use of heavy machinery, equipment and motor vehicles.

2.2.3 Geomorphology, Hydrology and Hydraulics

The footprint of the existing CRM seawall is on land and is separated from the water by a strip of beach outside of high tide and high wave events. Shoreline changes in the area in front of the Agat Mayor's Complex are shown in Figure 14.

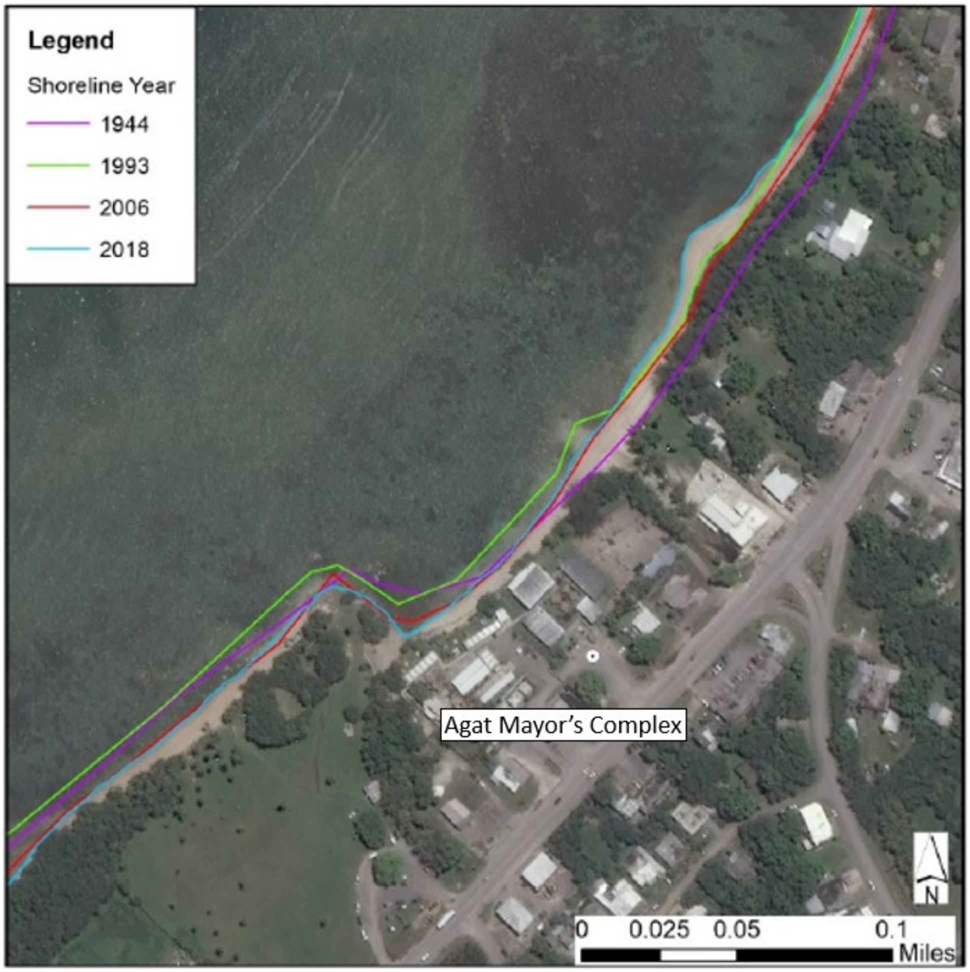

Figure 14: Shoreline changes in the area in front of the Agat Mayor's Complex

Shorter-term trends indicate that in the period between 1993 to 2006, most of the region was losing sediment, without an obvious location of accretion to balance the loss. This may be due to one or more of many causes such as increased tropical storm activity, upland construction reducing sediment supply, or the documented increased water levels due to intensification of Pacific trade winds since the early 1990s through about 2010. Investigation of these causes of potential accelerated erosion are outside the scope of this study. However, it does appear that in the more recent years from 2006 to 2018, areas between Inn on the Bay to the Agat Mayor's Complex may be recovering (Figure 15). Overall, the variability in erosion and accretion along the shoreline shows that sediment movement within the region is complex, and not strongly dominant in one direction or the other alongshore, but rather influenced by small circulation cells controlled by bathymetry and coastal morphology.

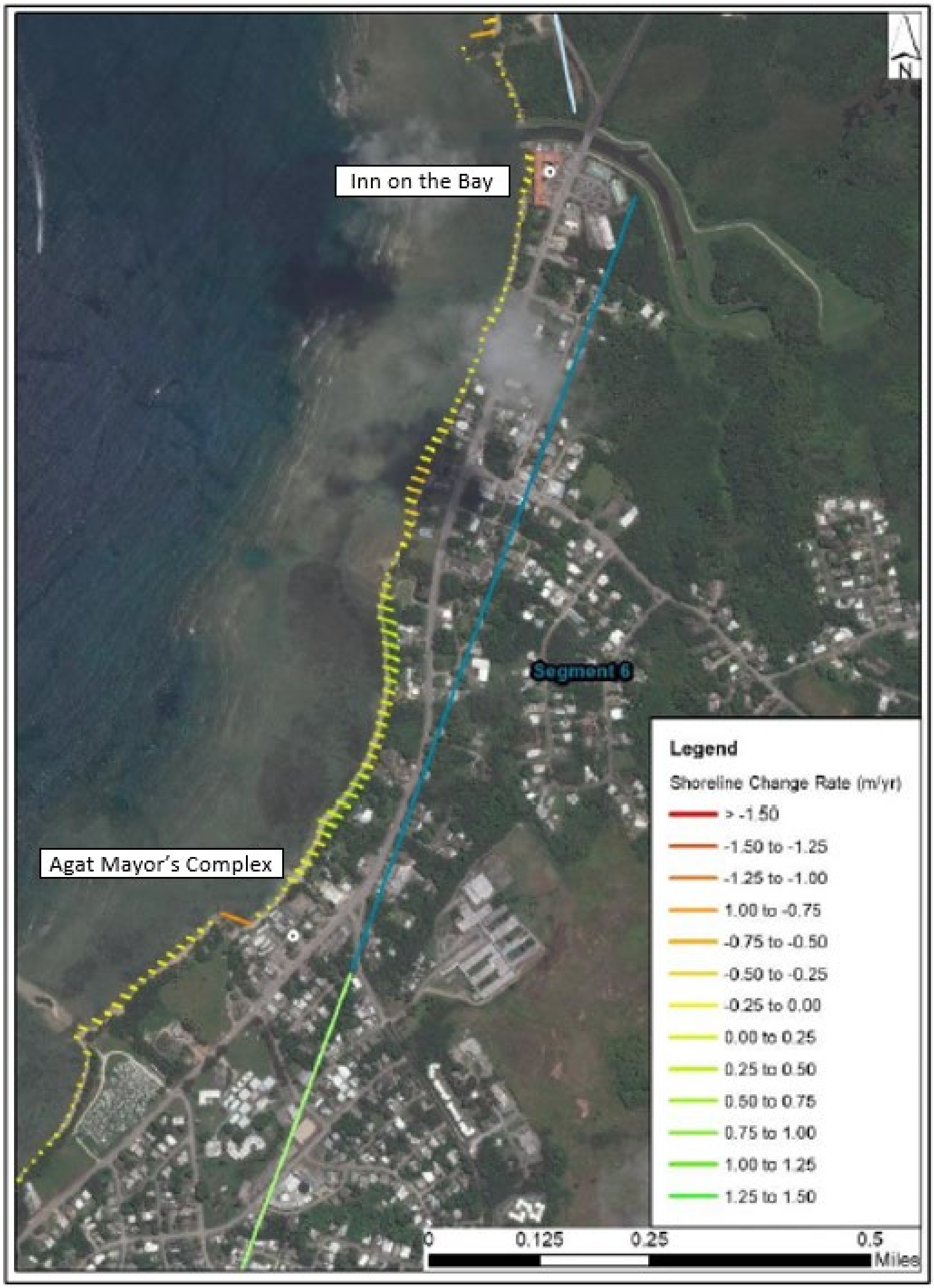

Figure 15: Shoreline change rates between Inn on the Bay to Agat Mayor's Complex

Based on the shoreline change rate, erosion rate at the Agat Mayor’s Complex is stable to slightly erosive with a 0 to -0.25 meter per year of erosion change. With continued chronic erosion coupled with SLC, it is anticipated that no beach will remain following the 50-year period of analysis.

Existing geology is described in detail in the Geotechnical Feasibility Appendix. Existing erosion and shoreline dynamics are described in detail in the Agat Bay Regional Shoreline Assessment (USACE 2020b).

Existing hydrology (tides, waves, and SLC) is described in Appendix A-1.1 Coastal Engineering.

2.2.4 Water Resources and Quality

33 CFR 328.3(a) defines “waters of the United States” (WOTUS), as it applies to the USACE regulatory jurisdiction pursuant to Section 404 of the Clean Water Act (CWA), 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 WOTUS. Agat is located on the shore of Agat Bay, which extends from Apra Harbor to Facpi Point on the southwest coast of Guam.

Agat Bay is a reach of the Pacific Ocean subject to the ebb and flow of the tide, and part of the territorial seas of Guam; and accordingly, meets the definition of a WOTUS, i.e., navigable water The landward limit of CWA jurisdiction extends to the High Tide Line at and fronting the existing seawall (see 33 CFR 328.3(c)(4) and the blue line on Figures 22, 24, and 26). A stream is located in the adjacent national park with the stream mouth ending in Agat Bay at the southwest limits of the proposed action area (blue box on Figure 2) it is not named by USEPA (How’s My Waterway), USGS (National Water Dashboard), or NPS (https://www.nps.gov/wapa/planyourvisit/maps.htm) that meets the definition of a WOTUS, i.e., tributary to a navigable water. There are no wetlands or other jurisdictional WOTUS within the proposed action area.

Agat Bay, is classified as M2: good marine water quality, supporting whole body contact, recreation, aquatic life, and consumption uses. Water quality adjacent to the Mayor’s Complex was reported as good for 2020, the most recent data available (Agat Bay 2; Category 2). Category 2 waters support some but not all designated uses. The northern portion of Agat Bay is impaired for chlordane, dioxin, and PCBs in fish tissues (Agat Bay 1; Category 5). Category 5 waters have at least one designated use that is not supported and a Total Maximum Daily Load is needed (GEPA 2020; USEPA 2023a).

Regulations for conducting CWA Section 404(b)(1) analysis (40 CFR 230.40-230.45) describe the following six special aquatic sites that should be considered in any proposed action area:

2.2.4.1 Sanctuaries and Refuges

Ga’an Point is a national historic site protected as part of the Agat Unit of the War in the Pacific National Historical Park (WAPA; Figure 16). WAPA was established to commemorate the bravery and sacrifice of those participating in the campaigns of the Pacific Theater of World War II and to conserve and interpret outstanding natural, scenic, and historic values and objects of the island of Guam, including coral reefs and other marine life (NPS 2024a). The NPS boundary includes parts of the Sagan Bisita (Figure 12). The project may occur within the Public Lands portion of the National Park (orange areas on Figure 2) and would require an NPS Right-of-Way permit. Areas shaded in green are protected Federal lands where construction and site access would not be allowed.

Figure 16: Construction Footprint (red rectangle) with reference to the Agat Unit of the War in the Pacific National Historical Park. Source: https://www.nps.gov/wapa/planyourvisit/maps.htm, accessed June 14, 2024.

2.2.4.2 Wetlands

There are no wetlands in the proposed action area and no wetlands would be affected by any project activities (PDT 2023). EO 11990 Protection of Wetlands is not applicable.

2.2.4.3 Mud Flats

There are no mudflats in the proposed action area (USFWS 2024a).

2.2.4.4 Vegetated Shallows

There are vegetated shallows in the proposed action area .

Within the Pacific Islands, the U.S. Fish and Wildlife Service (USFWS) considers *Halimeda* meadows and seagrass communities to be vegetated shallows, possessing special ecological characteristics and contributing to the overall benefit of the ecosystem (USFWS 2024). Section 2.3.2.1 describes in more detail seagrass and algae in the proposed action area.

2.2.4.5 Coral Reefs

There are coral reefs in the proposed action area.

Coral colonies are generally rare within 164 ft (50 m) of the proposed construction area and uncommon within 460 ft (140 m). Coral species in the genera *Porites* and *Pocillopora* were the most commonly observed (USFWS 2024a).

2.2.4.6 Riffle and Pool Complexes

The proposed action area does not include riffle and pool complexes. The proposed action area is located along the coastline and is absent of any streams or riparian areas that may feature riffle and pool complexes. There is a stream located southwest of the proposed action area in the national park that has not been assessed for the presence of riffle and pool complexes and that also will not be affected by the proposed action. The project as currently designed does not include the unnamed stream or its floodplain.

2.2.5 Hazardous, Toxic and Radioactive Waste

Per ER 1165-2-132 (USACE 1992), Hazardous, Toxic and Radioactive Waste (HTRW) includes any material listed as a "hazardous substance" under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9601 et seq, including Unexploded Ordinance (UXO).

> “Construction of Civil Works projects in HTRW-contaminated areas should be avoided where practicable. This can be accomplished by early identification of potential problems in reconnaissance, feasibility, and PED phases before any land acquisition begins. Costs of environmental investigations to identify any existence of HTRW and studies required for formulation of the NED plan, recognizing the existence and extent of any HTRW, and studies required to evaluate alternatives to avoid HTRW will be cost shared the same as cost sharing for the phase the project is in (i.e., feasibility, PED, or construction). Where HTRW contaminated areas or impacts cannot be avoided, response actions must be acceptable to EPA and applicable state regulatory agencies.”

Presence of subsurface UXO are a risk for any ground disturbance beneath or outside the current wall base given the World War II combat history of the island of Guam

(DeFant et al. 2011). Based on a review of USEPA's EnviroAtlas, and How's My Watershed, USACE understands that there are no known sources that would have contributed HTRW in the proposed action area (USEPA 2024a, 2024b). Additionally, USACE is not proposing an activity that would introduce or otherwise become a source of HTRW in the proposed action area.

2.2.6 Noise

Much of the village of Agat is a developed urban community. Commercial, institutional and government operations are centralized to within its limits. Vehicular traffic associated with Route 2 results in significant daytime ambient noise levels.

2.3 Natural Environment

The natural environment of the proposed action area encompasses 0.13 acres of intertidal habitat (<1%), 320 ft of shoreline, 1.22 acres of beach and 2 acres of terrestrial habitat in the Mayor's Complex. Baseline natural environment condition is based on observations made by USFWS during marine surveys in January 2024, information provided during the July 2023 Charette and Resource Agencies Workshop, observations made by the PDT during site visits in January and March 2022 (USACE 2022a), and National Oceanic and Atmospheric Administration's (NOAA) Environmental Sensitivity Index (ESI) (NOAA 2005), as well as resource specific literature as detailed below. Figure 17 illustrates NOAA's 2005 ESI of natural and cultural resources in Agat Bay. Within Figure 17, the area labelled 75 in the white square is the War in the Pacific National Historical Park, NPS; the 3 in the yellow triangle is the Vessel GU1287CP (Unknown), Incident ID 1151; Spinner Dolphins (*Stenella longirostris*) are present throughout Guam coastal waters; and the red rectangle is the construction footprint.

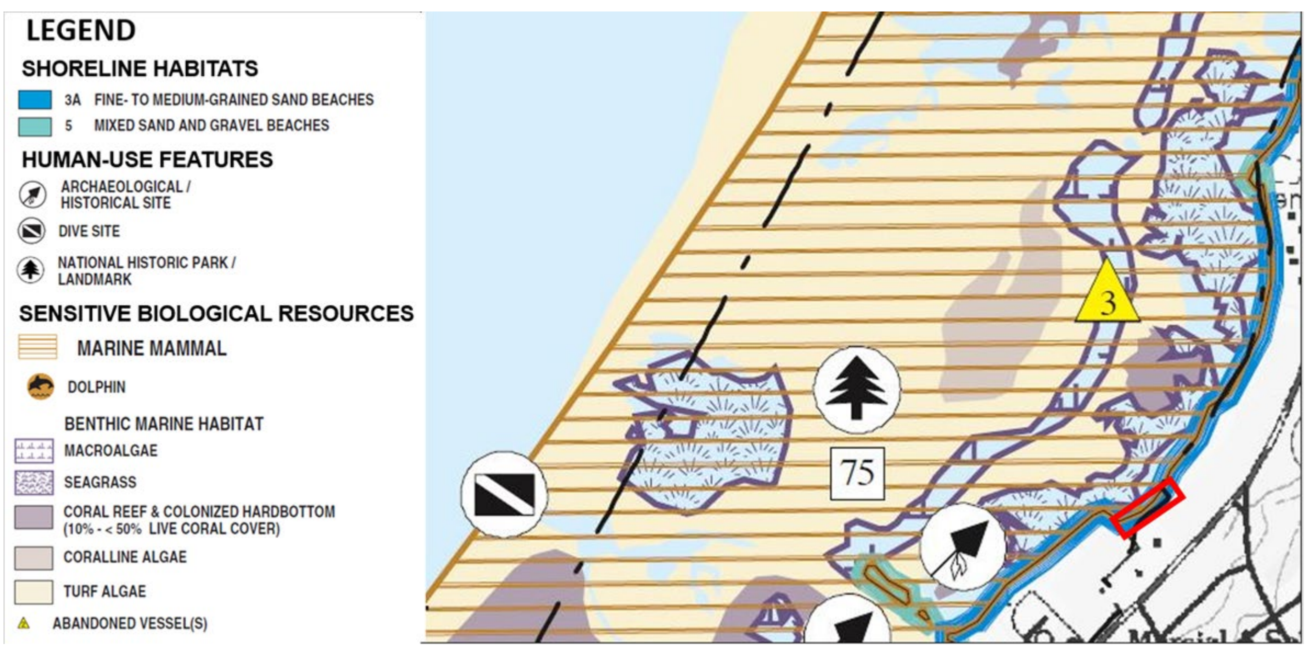

Figure 17: NOAA's 2005 ESI map 2

2.3.1 Terrestrial Habitat

The terrestrial or land habitat that makes up 99% of the project construction footprint is highly modified and limited to a strip of vegetation between the Mayor's Complex and Sagan Bisita structures and the CRM wall. This area includes limited land varying from 12 to 63 ft (3.66 to 19.20 m) wide between the seawall and the buildings. Land habitat is described in more detail in Attachments 2f and 3b of Appendix A-3. It is also indicated on the habitat zone map of Attachment 1c in Appendix A-3 and shown here as Figure 18. The black polygon represents the land habitat, the light green polygon highlights the shoreline intertidal habitat, and the light blue polygon marks the surveyed reef flat habitat.

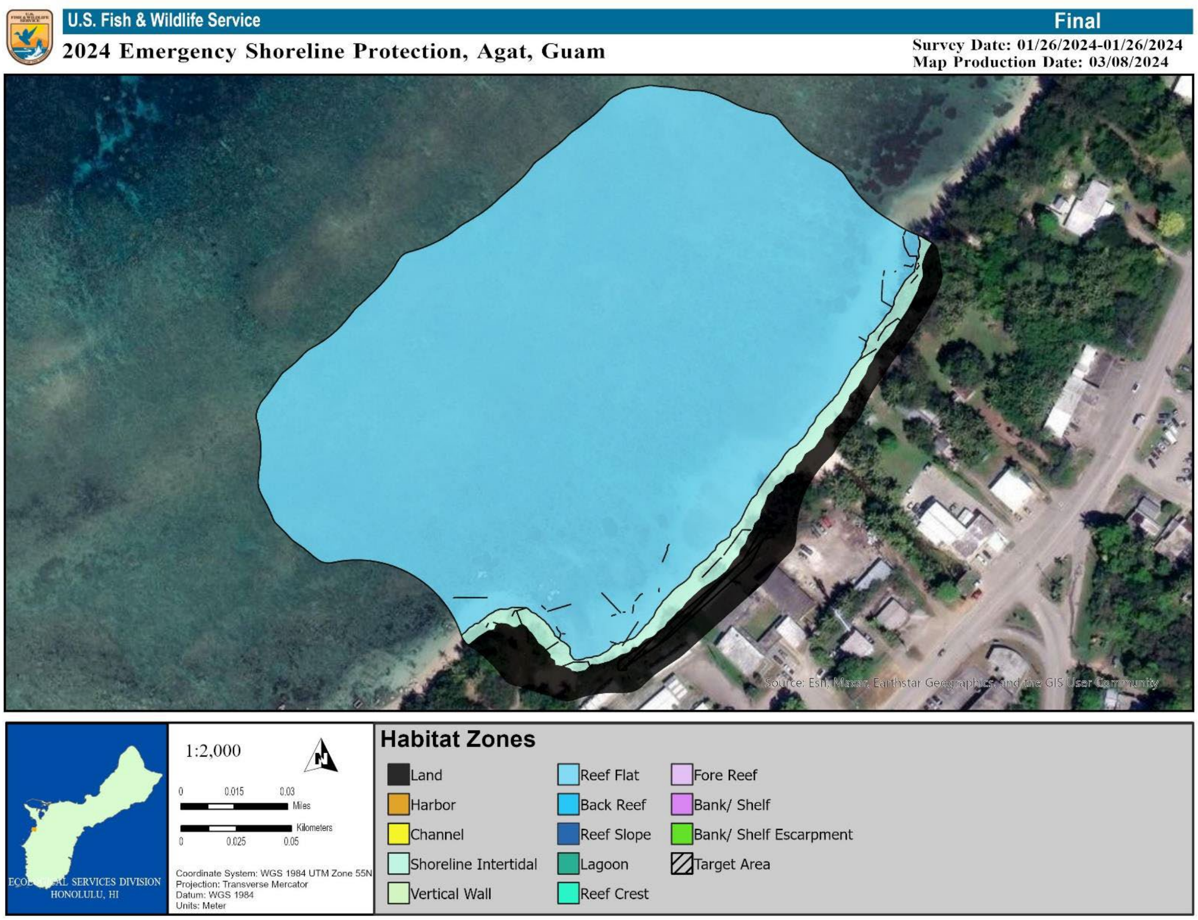

Figure 18: Habitat Zones of and near the proposed project area. *Image source: USFWS, April 2024*

2.3.1.1 Terrestrial Vegetation

The vegetation within the proposed action area consists of coconut palm (*Cocos nucifera*), ironwood (*Casuarina equisetifolia*), sea hibiscus (*Hibiscus tiliaceus*), and beach morning glory (*Ipomoea pes-caprae*) (Figure 19). Mowed herbaceous vegetation of unknown species was observed in the open areas surrounding the buildings in the proposed action area. Twelve trees (coconut palm and sea hibiscus) are in the construction area and will require removal and replacement per Guam law (5 GCA Government Operations Guam Code Annotated CH. 63 Fish, Game, Forestry & Conservation § 63302: Unlicensed Tree-Cutting on Public Lands; Prohibited). Tree removal also requires a license (5 GCA § 63302).

Figure 19: Current terrestrial habitat. *Image source: USACE, January 2022*

2.3.1.2 Terrestrial Birds

The PDT did not note any birds in the proposed action area during their visit (USACE 2022a). However, pacific golden plover (*Pluvialis fulva*) and black drongo (*Dicrurus macrocercus*) have been previously observed in the vicinity.

2.3.1.3 Terrestrial Mammals

The PDT did not observe any mammals during their visit in January (USACE 2022a).

2.3.2 Marine Habitat: Intertidal Habitat and Reef Flat Habitat

USFWS biologists conducted field surveys in January 2024 to determine the baseline condition of the nearshore environment fronting the Mayor’s Complex. Marine habitats immediately adjacent to the construction footprint include intertidal sandy beach habitat (light green polygon on Figure 18) and reef flat (light blue polygon on Figure 18), described in detail in Appendix A-3, Attachment 1c Final Fish & Wildlife Coordination Act Report.

The reef flat is primarily Hard Bottom Pavement with smaller areas of Unconsolidated Sediment (Mud, Sand, and Rubble) and Mixed Habitat Structure consisting of Scattered

Coral Rock in Unconsolidated Sediment. Habitat complexity at the reef flat was low. The closest coral observed was 150 ft (46 m) away from the existing wall (USFWS 2024a).

Figure 20: Intertidal and Reef Flat Habitat. *Image source: USFWS, January 2024*

2.3.2.1 Marine Vegetation

Seagrass was common and not dominant in the proposed action area with three observed species: *Enhalus acoroides, Halodule uninervis,* and *Halophila minor* (Figure 20). The nearest recorded seagrass was approximately 114 ft from the proposed construction area and the most abundant seagrass was more than 330 ft away.

Crustose coralline algae, frondose algae, and turf algae were common and not dominant throughout the proposed action area. Frondose algae included species from the genera *Caulerpa, Neomeris, Halimeda, Jania, Padina, Asparagopsis, Galaxaura, Sargassum, Laurencia, Dictyota*, and *Acanthophora*. Filamentous algae and cyanobacteria were uncommon (USFWS 2024a, Appendix A-3 Attachment 1c).

2.3.2.2 Marine Habitat Fish

USFWS biologists observed two large stingrays swimming in the proposed action area during their field survey (USFWS 2024a). Other fish species can be found in Guam's coastal waters, and may occur throughout Agat Bay: *Canthigaster bennetti, Caranx spp., Chaenopsidae spp., Chromis viridis, Corythoichthys intestinalis, Dascyllus aruanus, Echidna nebulosa, Gerres oyena, Lethrinus harak, Mulloidichthys flavolineatus, Rhinecanthus aculeatus, Scolopsis lineata, Siganus spinus*, *Chlorurus sordidus, Labroides dimidiatus, Myripristis adusta, Myripristis kuntee,* and *Sargocentron spiniferum*.

2.3.2.3 Shore Birds

The USFWS biologists did not observe any birds within the proposed action area in January (USFWS 2024a). Members of the Marianas Audubon Society have witnessed a higher presence of migratory birds in Guam from August to April, peak sightings in August and April. Migratory bird species that may occur throughout Agat Bay include white tern (*Gygis alba*), pacific reef heron (*Egretta sacra*), yellow bittern (*Ixobrychus sinensis*), common sandpiper (*Actitis hypoleucos*), ruddy turnstone (*Arenaria interpres*), whimbrel (*Numenius phaeopus*), and pacific golden plover (*Pluvialis fulva*) (Toves 2023).

2.3.2.4 Marine Habitat Mammals

USFWS biologists did not observe marine mammals during their field survey (USFWS 2024a). Spinner dolphins (*Stenella longirostris)* were reported present throughout Guam's coastal waters (NOAA 2005; Figure 17).

2.3.2.5 Marine Habitat Invertebrates and Associated Habitat

The reef flat is a relatively low-productivity coral reef. Corals were absent to rare within approximately 164 ft (50 m) of the proposed construction area. Coral cover, diversity, and colony size increased slightly beyond 164 ft (50 m) from shore. Coral cover was low to moderate, up to a maximum of 10 percent, only beyond approximately 459 ft (140 m) from the proposed construction area, where species diversity and colony size also increased slightly. Coral species in the genera *Porites* and *Pocillopora* were most common (Figure 20). No ESA-listed coral species were observed (USFWS 2024a).

Sea cucumbers and sea stars were observed. Additional invertebrates, such as crabs and nudibranchs, were not observed in populations considered significant to define the overall ecosystem characteristics. There were no sponges observed within the proposed action area.

Maps and more details are in Appendix A of Attachment 1c Final Fish & Wildlife Coordination Act Report in Appendix A-3.

2.3.3 Threatened and Endangered Species and Critical Habitat

USACE requested technical assistance from USFWS and NMFS in December 2023 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, as well as information on designated or proposed Federally designated critical habitat occurring within the immediate vicinity of the proposed action area (Attachment 2). The USACE will continue to coordinate with the USFWS, NMFS, and the DAWR as part of the public review of this Draft IFR/NEPA document and throughout the feasibility phase.

Species listed or proposed for listing as threatened and endangered under the Endangered Species Act (ESA), including designated critical habitat, which may occur within the ESA action area (all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR §402.02)), are listed in both Table 1 and Appendix A-3 Attachment 2a. In this report, the ESA action area and the project's proposed action area share the same boundaries as they both consider direct and indirect effects by the Federal action. There are no state threatened and endangered species that occur within the proposed action area. Currently, there is proposed critical habitat for green sea turtle nesting located less than 1,312 ft (400 m) to the southwest of the construction area, and USFWS biologists observed green sea turtles in the proposed action area during their field survey. There is also proposed critical habitat for coral *Acropora globiceps* at depths between 0-39 ft (0-12 m), however no ESA listed corals were observed in the Action Area during the 2024 surveys. The anticipated coral spawning period during 2027 is from July to August. Four (4) species of giant clams are proposed for listing in Guam under ESA, however no ESA candidate species of giant clams were observed in the Action Area during the 2024 surveys (USFWS 2024a).

The NPS Pacific Island Inventory and Monitoring Program (PACN) has inventoried amphibians, birds, fish, mammals, reptiles, and vascular plants in the Agat Unit (Figure 12) of War in the Pacific National Park (WAPA; NPS 2024a). The only species in Table 1 listed in any unit of WAPA is the Fadang (*Cycas micronesica*), which was identified in the Bangi Point subunit in Finile (over a mile from the Mayor's Complex) during initial vascular plant inventories (Yoshioka 2008) and has not been recorded since (NPS 2024b). PACN continues to monitor benthic marine communities, marine fish communities, and terrestrial plant communities at WAPA (NPS 2024c). None of the species in Table 1 are reported in WAPA in available monitoring data from 2006-2022.

While tree snails can be cryptic and USFWS estimates any survey misses 80% of a population, it is highly unlikely that ESA listed tree snails would be found in or adjacent to the Action Area due to a lack of appropriate habitat (Fiedler, personal communication, June 18, 2024).

Table 1: ESA-Listed Species Potentially Affected by the Proposed Action

Common Name	Scientific Name	Status	Critical Habitat in Action Area	Jurisdiction	Observed in Action Area
Marine Invertebrates					
Coral	*Acropora globiceps*	Threatened	Proposed	NMFS	No
Giant Clam	*Tridacna derasa* *Tridacna squamosa* *Tridacna gigas* *Hippopus hippopus*	Candidate, expected listing 2024	No	NMFS	No
Fish					
Scalloped Hammerhead Shark Indo-West Pacific Distinct Population Segment (DPS)	*Sphyrna lewini*	Threatened	No	NMFS	No
Sea Turtles					
Green Sea Turtle, Central South Pacific DPS	*Chelonia mydas*	Endangered	No	NMFS in ocean/USFWS on land	Yes
Hawksbill Sea Turtle	*Eretmochelys imbricata*	Endangered	No	NMFS in ocean/USFWS on land	No
Terrestrial Invertebrates					
Humped Tree Snail, akaleha’	*Partula gibba*	Endangered	No	USFWS	No
Guam Tree Snail, akaleha’	*Partula radiolata*	Endangered	No	USFWS	No
Fragile Tree Snail, akaleha’	*Samoana fragilis*	Endangered	No	USFWS	No
Terrestrial Mammals					
Mariana Fruit Bat (=mariana Flying Fox)	*Pteropus mariannus mariannus*	Threatened	No	USFWS	No
Birds					
Guam Kingfisher	*Todiramphus cinnamominus*	Endangered	No	USFWS	No
Guam Rail	*Gallirallus owstoni*	Endangered	No	USFWS	No
Mariana Swiftlet	*Aerodramus bartschi*	Endangered	No	USFWS	No

Short-tailed Albatross	*Phoebastria (=Diomedea) albatrus*	Endangered	No	USFWS	No
Reptiles					
Slevin's Skink	*Emoia slevini*	Endangered	No	USFWS	No
Conifers and Cycads					
Fadang	*Cycas micronesica*	Threatened	No	USFWS	No
Flowering Plants					
Cebello Halumtano	*Bulbophyllum guamense*	Threatened	No	USFWS	No
	Dendrobium guamense	Threatened	No	USFWS	No
	Tuberolabium guamense	Threatened	No	USFWS	No
Ufa-halomtano	*Heritiera longipetiolata*	Endangered	No	USFWS	No

2.3.4 Essential Fish Habitat

The proposed action area consists of Essential Fish Habitat (EFH) designated for the federally managed fisheries/species of the Mariana Archipelago and Pelagic Fisheries. EFH is defined in the Magnuson-Stevens Act as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. Textual descriptions of the fisheries, managed species and their designated EFH occurring within the proposed action area are published in the Fishery Ecosystem Plan (FEP) for the Mariana Archipelago and the Fishery Ecosystem Plan for Pacific Pelagic Fisheries of the Western Pacific Region, respectively (WPRFMC 2009 a & b). These place-based FEPs replaced the former Fishery Management Plans.

The Marianas Archipelago Fishery includes the following Management Unit Species (MUS): Mariana Bottomfish MUS listed in Table 2. FEP Amendment 5 (WPFMC 2018) reclassified the Crustacean and Coral Reef MUS to Ecosystem Component Species (ECS).

Table 2: Mariana Bottomfish MUS (50 CFR 665.401)

Local name	**Common name**	**Scientific name**
lehi/maroobw	red snapper, silvermouth	*Aphareus rutilans*
tarakitu/etam	giant trevally, jack	*Caranx ignobilis*
tarakiton attelong, orong	black trevally, jack	*Caranx lugubris*
bueli, bwele	lunartail grouper	*Variola louti*
buninas agaga', falaghal moroobw	red snapper	*Etelis carbunculus*
abuninas, taighulupegh	red snapper	*Etelis coruscans*
mafuti, atigh	redgill emperor	*Lethrinus rubrioperculatus*
funai, saas	blueline snapper	*Lutjanus kasmira*
buninas, falaghal-maroobw	yellowtail snapper	*Pristipomoides auricilla*
buninas, pakapaka, falaghal-maroobw,	pink snapper	*Pristipomoides filamentosus*
buninas, falaghal-maroobw	yelloweye snapper	*Pristipomoides flavipinnis*
buninas, falaghal-maroobwmaroobw	pink snapper	*Pristipomoides seiboldii*
buninas rayao amariyu, falaghal-maroobw	flower snapper	*Pristipomoides zonatus*

The marine portion of the proposed action area is inclusive of the EFH action area and encompasses EFH designated for both Mariana Bottomfish and Pelagic MUS. The EFH action area is absent of any Habitat Areas of Particular Concern (HAPC). EFH is designated for each of the above species, however, collectively, the combined EFH for Mariana Bottomfish MUS is the water column from the shoreline to the Exclusive Economic Zone (EEZ, 200 nautical miles from shore), and from the surface to 1,000 meters in depth; and all bottom habitat from the shoreline to a depth of 400 meters. The combined EFH for the Pelagics MUS is the water column down to a depth of 200 meters from the shoreline to the outer limit of the EEZ for egg and larval life stage and the water column down to a depth of 1,000 meters for juvenile and adult pelagic fishery species.

Specific bottom habitats and ecosystems comprising EFH in the Mariana Archipelago are listed in Table 3. There are intertidal habitats, seagrass beds, coral and patch reefs and hard, artificial and soft substrates within the EFH action area. There are no mangrove forests, lagoon, estuarine, surge zone, deep reef slopes, banks and seamounts, deep ocean, or pelagic ecosystems within the EFH action area. These EFH habitats are not discussed or considered further in this analysis.

Table 3: Bottom Habitat and ecosystems comprising EFH designations for the Marianas Bottomfish and Pelagic MUS within the EFH Action Area (WPRFMC 2005 a & b).

Bottom Habitat/Ecosystem	Present in EFH Action Area
Intertidal	Yes
Mangrove forest	No
Seagrass bed	Yes
Coral and Patch Reefs	Yes
Hard, Artificial, and Soft Substrates	Yes
Lagoon	No
Estuarine	No
Surge Zone	No
Deep reef slopes, banks, and seamounts	No
Deep ocean and pelagic ecosystems	No

The intertidal habitat is directly seaward of the existing CRM seawall, and the sediment present in the intertidal habitat is generally sand and rubble. USFWS (2024a) reported that this zone is likely periodically saturated by high tides, especially during high surf and extreme weather events. USFWS also reported that the proposed construction area was located completely above the low water mark. Live corals, other macroinvertebrates, seagrasses and fishes were not observed in the intertidal habitat.

The reef flat habitat zone is directly seaward of the intertidal habitat. It is primarily hard bottom pavement with smaller areas of unconsolidated sediment (mud, sand, and rubble) and mixed habitat structure consisting of scattered coral rock in unconsolidated sediment. USFWS (2024a) biologists reported that the habitat complexity for the reef flat was low, and also stated that the physical environment on the reef flat included enough wave energy to suspend fine sediments and create a turbid environment from the beach out to approximately 328 ft (100 m) from shore. Corals were absent to rare until approximately 164 ft (50 m) from the shore where observed coral cover, diversity, and colony size increased slightly. Coral cover was low to moderate, up to a maximum of 10%, only beyond approximately 460 ft (140 m) from the project footprint, where coral species diversity and colony size also increased slightly. Seagrass was common but not dominant in the proposed action area as described in Section 2.3.2.1.

2.3.5 Invasive Species

As per Executive Order 13112 (Section 1. Definitions) an "invasive species" is a species that is non-native (or alien) to the ecosystem under consideration and, whose introduction causes or is likely to cause economic or environmental harm or harm to human health. Invasive species of concern identified for Guam include African tulip tree (*Spathodea campanulate*), Coral Vine (*Antigonon leptopus*), Mile-a-minute Vine (Mikania micrantha), Cycad Aulacaspis Scale (*Aulacaspis yasumatsui*), Tångantångan (*Leucaena leucocephala*), Angel Hair Alga (*Chaetomorpha vieillardii*), cycad blue butterfly (*Chilades pandava*), cycad moth (*Erechthias sp.*), Little fire ant (*Wasmannia auropunctata*), Greater Banded Hornet (*Vespa tropica*), Giant African Land Snail (*Achatina fulica*), New Guinea flatworm (*Platydemus manokwari*), Coconut rhinoceros beetle (*Oryctes rhinoceros*), and Banana Bunchy Top Virus (*Babuvirus*) (University of Guam 2019). None of these species were observed in the proposed action area during the PDT site visit in January 2022 (USACE 2022a).

2.4 Built Environment

2.4.1 Navigation

Due to its shallow depth of 0.3 to 5 ft (0.1 to 1.5 m; USFWS) and lack of developed entrance channel, navigation in Agat Bay along the Mayor's Complex is limited to shallow draft personal watercraft such as canoes.

2.4.2 Land Use, Public Infrastructure and Utilities

The Mayor's Complex includes the mayor's office, community center, learning center, computer lab, emergency shelter, evacuation facility, post office, and community gathering space (Figure 3). The Mayor's Complex is also used by the Guam Department of Land Management for their statutory location of public hearings. Section 1.4 provides more detail of the current land and structural use.

In addition to the current land and structural use described in section 1.4, Route 2 runs parallel to the shoreline on the landward side of the public structures (approximately 500 ft from the coastline) and is the only road along the western shore from the administrative capital of Guam (Hagåtña) to Agat and other municipalities. A main power line also runs along Route 2.

Land use at the beach in front of the Mayor's Complex include *talaya* throwing, rod and reel fishing, and free diving at night to catch fish.

2.5 Economic Environment

2.5.1 Socio-Economic Conditions

2.5.1.1 Population and Demographics

The 2020 Census estimates the population of Guam at approximately 154,000. The 2010 Census showed an increase of 2.9% in population from 2000. However, the 2020 estimates show a decrease of 3.5% from the previous decennial census estimates. The Northern portion of Guam, where the terrain lends itself more easily to development, sees population distributed generally across the landscape, whereas the more mountainous southern half of Guam sees population and development more concentrated near the coastlines. The 2020 Census estimates the population of the census-designated place (CDP) Hågat municipality at 4515, an 8.2% decrease from the 2010 estimate of 4,917.

Census data from the Guam Bureau of Statistics and Plans (GBSP) and the U.S. Census Bureau indicate that the most prominent race or ethnicity in Guam is Native Hawaiian or Other Pacific Islander (49%), 75% of which are CHamoru. This group is followed by Asian (32%), multi-racial groups (9%), White (7%), Black (1%), and Hispanic or Latino (1%).

2.5.1.2 Employment and Income

The top two sectors comprising most of the economic activity of Guam are the Federal government, including the military, and tourism. The Bureau of Economic Analysis (BEA, 2019), released the GDP for Guam for 2019, showing an annual increase of 2% since 2018. The sources of the increase to the GDP included increases in exports, private fixed investment, Federal government spending, and consumer spending. Spending by tourists increased by 15.6% in 2019 because of the increased number of Korean and Japanese tourists. The COVID-19 lock-downs from 2020 to 2022 drastically reduced the tourist numbers and associated benefit to the economy. Tourism, primarily tourists from Japan and Korea, is expected to increase in the future, particularly through increased cruise ship activity associated with the new Hotel Wharf rehabilitation project.

As of March 2019, there were 65,220 individuals that were employed on Guam according to the Current Employment Survey (CES) conducted by the Guam Department of Labor-Bureau of Labor Statistics (University of Guam, 2019). There was also an increase in total employment from 2018 to 2019 of +.52% and an unemployment rate of 4.3%. The GovGuam receives most of their revenue from taxes such as Income Tax, Gross Receipts or Business Privilege Tax, Federal Income Taxes, and other taxes. In 2019, there was a decrease in income tax revenue because of the Tax Cut and Jobs Act (University of Guam, 2019). This policy reduced tax rates dramatically and therefore decreased the amount of revenue that the GovGuam received.

The military presence in Guam is already substantial and would increase if plans for the relocation of Marines to Guam from the U.S. Marine Corps Futenma Air Station on Okinawa are realized. While the relocation of the Marines to Guam may create new jobs, new small businesses, new tax revenues, and an increase in spending, there are concerns about possible social impacts typically associated with large population shifts, such the impact to the housing market to facilitate the incoming population of approximately 35,000 people (PCR Environmental Inc., 2009). As of 2023, the relocation of the Marines is delayed due to higher than expected relocation costs.

2.5.2 Environmental Justice

While it is currently not included in either USEPA's EJSCREEN nor CEQ's Climate and Economic Justice Screening Tool (CEJST), the entirety of Guam is considered an economically disadvantaged community (CEQ 2022, USEPA 2022). Additionally, all US territories, including Guam, are considered economically disadvantaged by USACE in accordance with the Implementation Guidance for Section 160 of WRDA 2020, Definition of Economically Disadvantaged Community (USACE 2023).

2.6 Cultural Resources

The island of Guam was first occupied more than 3,500 years ago by seafaring peoples from Southeast Asia, ancestors of the CHamoru people. The history of Guam is broadly divided into six periods: Pre-Latte, Latte, Spanish, First American, Japanese Occupation, and Second American (Guam Historic Resources Division [GHRD] 2024) (see Table 4).

The dominant archaeological site type associated with the Pre-Latte Period consists of subsurface cultural layers at coastal lowlands and elevated coastal terraces. The principal artifact type associated with these sites is a thin-walled, red-slipped ceramic referred to as Marianas Redware.

The Latte Period is characterized by latte architecture; a configuration of two parallel rows of stone shafts (haligi) supporting bowl-shaped capstones (tasa). The foundation of these latte sets supported raised residential structures. Archaeological sites dating to this period are found in both coastal areas and further inland. In addition to latte architecture, the principal artifact type associated with these sites is a thicker style of ceramic known as Marianas Plainware (Watanabe 1994; Hunter-Anderson et al. 2006; Amesbury et al. 2015).

Table 4: General chronological historic context of Guam

Date Range	Guam Historic Property Inventory Cultural Periods	Broad Periods
1500 – 1000 BCE	Early Pre-Latte Period	Pre-Latte Period
1000 – 500 BCE	Middle Pre-Latte Period	
500 BCE – 500 CE	Late Pre-Latte Period	
500 – 800 CE	Transitional Period	
800 – 1100 CE	Early Latte Period	Latte Period

1100 – 1350 CE	Middle Latte Period	
1350 – 1521 CE	Late Latte Period	
1521 – 1668 CE	Pre-Colonial European Trade Period	Spanish Period
1668 – 1700 CE	Spanish Missionization Period	
1700 – 1898 CE	Spanish Colonial Period	
1898 – 1941 CE	First American Territorial Period	First American Period
1941 – 1944 CE	WWII Japanese Military Occupation	Japanese Occupation Period
1944 – 1950 CE	Second American Territorial Period	Second American Period
1950 CE – Present	Organic Act / Home Rule Period	

Source: GHRD, 2024

The Spanish Period began with the arrival and departure of Ferdinand Magellan at Guam in 1521 Common Era (CE), although Spain did not formally take possession of Guam until 1565 and did not establish a military or religious presence on the island until the late 1660s. During the Spanish Period, between 1680–1684, the Spanish Governor Don Jose Quiroga constructed multiple centralized settlements. The Spanish proceeded to destroy smaller scattered villages and moved the inhabitants to the new settlements. In 1684, the Spanish completed the construction of Agat. Many of the new inhabitants at Agat came from the village of Fena (USACE 1981).

The First American Period began when the U.S. acquired Guam from Spain through the terms of the Treaty of Paris in 1898 and ended with the surrender of the American Governor to invading Imperial Japanese armed forces on December 10, 1941.

The Japanese Occupation Period spans most of World War II (WWII), beginning with Japanese forces invading Guam on December 10, 1941, and terminating with the cessation of organized Imperial Japanese armed forces resistance on August 15, 1944. Approximately 33 months after Japan invaded Guam, U.S. forces began pre-invasion bombardments along the western coast of Guam (Dixon et al. 2013). The village of Agat received the most intense focus of the bombardments, leveling the community prior to the joint amphibious landing of U.S. Marines and U.S. Army units. Agat Beach was one of two American invasion points. Ga'an Point, located in modern day Agat, was a heavily fortified Japanese defensive point that also received U.S. naval bombardments. After U.S. forces recaptured Guam on July 21, 1944 (known now as "W-Day" or "Liberation Day"), the U.S. military rebuilt the village of Agat (now known as "Hågat") about 1 to 2 miles south of the original Spanish settlement (Thompson 1985).

The Second American Period began with the reoccupation of Guam by American armed forces and continues to present day. Guam residents were declared citizens of the United States of America in the Organic Act of 1950, and a civilian government was established. In the 1970s, Federal historic preservation laws were found to be applicable to Guam (Watanabe 1994; Hunter-Anderson et al. 2006; Amesbury et al. 2015).

2.6.1 Recent History

Most archaeological investigations in the Agat area have been undertaken in association with cultural resource management of various construction projects. These previous projects include road work and utilities installations (Moore et al. 1994; Moore et al. 1995; DeFant et al. 2011; DeFant et al. 2018) and harbor construction (Price & Craib 1978; USACE 1981). USACE has previously conducted limited archaeological investigations in association with feasibility studies in the general area (e.g., Price & Craib 1978). Additional archaeological investigations have been conducted by the NPS during their Cultural Landscapes surveys (NPS 2003, 2013; Thompson 1985). More recent archaeological investigations, for which reports have not yet been finalized, include sewer line installations and cell phone tower installations; burials were identified at two locations (J. M. Joseph, pers. comm. 2022).

2.6.2 Known Cultural Resources

In January 2022, USACE conducted a non-invasive pedestrian survey of the proposed undertaking's area of potential effect (APE) that is within the proposed action area. Shovel testing was not conducted out of concern that digging holes along the seaward side of the existing seawall would further destabilize and damage the structure. Shovel testing along the landward side was not possible due to existing buildings and structures. No surficial cultural resources were identified. A review of the published literature, as well as grey literature and other documentation provided to USACE by the Guam Historic Resources Division in response to Requests for Assistance, identified 11 known cultural resources in the general vicinity of the APE (Table 5). Nine are considered historic properties in accordance with 36 CFR § 800.16(l).

Table 5. Known cultural resources in the vicinity of the APE

Guam Historic Properties Inventory Number	Site Name	Cultural Period	National Register of Historic Places Status	In APE
66-02-1054	Agat Invasion Beach	Second American	Listed	Yes
66-02-1313	Fena Massacre Site	Latte, Spanish	Unknown	No
66-02-1048	Hill 40	Second American	Listed	No
66-02-1049	Mt. Ailfan Battle Site	Second American	Unknown	No
66-02-1072	Taelayaq Spanish Bridge	Spanish	Listed	No

66-02-1071	Taleyfac Spanish Bridge	Spanish	Listed	No
66-02-1868	Umang Dam	Spanish	Listed	No
N/A	Agat World War II Amtrac	Second American	Listed	No
66-03-1043	Cable Station Ruins	First American Japanese Occupation Second American	Listed	No
66-03-1066	Orote Field	First American, Japanese Occupation Second American	Listed	No
66-03-1041	Sumay Cemetery	First American Japanese Occupation Second American	Listed	No

Sources: GHRD 2024; NPS 2024b

2.7 Cultural and Subsistence Activities

As described in Section 1.4, the Agat Mayor's Complex serves a multitude of functions for the community, which directly support cultural activities and traditions.

The beach in front of the Mayor's Complex is also important for subsistence use. Residents come to the Complex for *talaya* throwing, rod and reel fishing, and free diving at night to catch fish. Subsistence activities are advocated for by the mayor's office, especially in lieu of more destructive pig and deer hunting that requires clearing forested land with fire.

2.8 Aesthetics

The view of the bay and ocean beyond the fringing reef from the pavilions in Sagan Bisita (Figure 8) is partially blocked by 3 ft (1.2 m) of wall. The property along the beach is landscaped with coconut palms and other ornamental coastal trees. Much of the area is grassed or covered with beach morning glory. The overall effect is a very pleasing visually aesthetic view. The existing wall crest elevation ranges from 3 ft (1.2 m) to 6 ft (1.8 m) MSL. The ground height landward of the existing seawall ranges from 3 ft (1.2 m) and 5 ft (1.5 m) MSL. The effect of these elevations is if you were standing on the oceanside and facing the wall, the existing wall would appear to be between 3 ft (1.2 m) to 6 ft (1.8 m) tall along the length of the structure, and if you were standing on the landward side and facing the ocean, looking over the wall, the wall would appear to be at the ground elevation to approximately 3 ft (1.2 m) tall along the length of the structure.

3.0 PLAN FORMULATION

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 alternative is not available in Guam. The cost estimate includes for the assumption that stone will need to be sourced from another location and transported to Guam.
- The Community Center abuts the existing seawall, limiting available real estate for construction. Traditional seawall alternatives require width and minimum real estate space for excavation of the seawall foundation. The cost estimate includes for the assumption that it would be more cost effective to construct a seawall design that has a narrower foundation as opposed to relocating or rebuilding the adjacent structure.

3.3 Management Measures and Screening

3.3.1 Management Measures

As part of the planning process, the PDT, in coordination with the NFS 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 coastal erosion to the threatened facility (Agat Mayor’s Complex) rather than trying to reduce the probability that facilities are threatened by coastal erosion. Traditional non-structural measures that address shoreline erosion and coastal storm risk at coastal beach fronts include piles, 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 structural, non-structural, and NNBF measures that were most likely to meet the study objectives (Table 6).

3.3.2 Screening 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 **efficient**, i.e., will not require special equipment, material, or expertise that is not available in Guam?
- Is the measure likely to be environmentally **acceptable** based on available information?

Parametric cost estimates and initial agency feedback were used to assist with the screening process. Table 6 summarizes the initial screening of management measures.

Table 6: Screening of Management Measures

Management Measure	Carried Forward (Y/N)	Reason Not Carried Forward
Structural Measures		
Revetment (rock or concrete armor unit) - consists of a graded slope protected by an underlayer of medium-sized stones and a top layer of heavier armor stones. A tribar revetment is constructed similarly to the rock revetment, but comprised of engineered, interlocking concrete armor units	Y	N/A
Offshore Breakwater – a revetment constructed in the ocean offshore of the project location	N	Not efficient Not least cost
Concrete (or CRM) Seawall - involves constructing a concrete or CRM wall that is keyed into hard substrate using a precast concrete base	Y	N/A*
Repair Existing CRM Wall – to conduct various necessary repairs, e.g., spalling repair, replacing damaged sections of wall	N	Not least cost
Natural and Nature-Based Measures		
Beach Nourishment - 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.	N	Not effective Not least cost
Coral habitat creation – to place substrate on which corals can colonize in the marine environment in the appropriate depth and potentially attaching living corals, e.g., nursery-grown corals	N	Not efficient Not least cost

Vegetation - consists of select vegetative plantings to add stability to the shoreline	N	Not effective
Nonstructural Measures		
Relocation of Agat Mayor’s Complex - involves the relocation of mayor’s office, learning center, community center, and Sagan Bisita inland to avoid continued damage from coastal erosion.	N	Cost – not lowest cost

Measures for construction of a revetment and a seawall were carried forward to the initial array of alternatives. For those measures not carried forward, a summary of the measure’s performance under the screening criteria is included below:

- Offshore breakwater: Offshore work tends to be more expensive than onshore work. Additionally, an offshore breakwater would require more rock than a revetment because the structure would need to be both larger and taller due to being located in deeper water (i.e., geometry and depth). The additional rock would increase project cost. Furthermore, the in-water construction would likely require equipment that can operate in the marine environment, which would also be more expensive than land-based equipment. An offshore breakwater would also require a marine survey resulting in more cost increases. A breakwater would provide some protection through breaking the waves and reducing storm height, but since a breakwater would not block long-shore sand transport, this measure would provide more ambient protection and may not meet the needs of study alone.
- Repair existing CRM wall: Due to undercutting, normal repairs would not allow the existing wall to last the necessary 50 years. Given the current condition of the wall, the extent of repairs required would be the cost and effort equivalent of constructing a new wall. To address the undercutting, the repair would need to extend the structure deeper which is a complex (and therefore expensive) process. Additionally, the existing CRM wall is not continuous with gaps in protection. These areas would still require new construction of a seawall. For these reasons, this measure is unlikely to be the least cost alternative.
- Beach nourishment: High expense of borrow material and a temporary measure not likely to meet the 50-year period of analysis. While a source of sand is known (i.e., Agat Small Boat Harbor) the need for sand for beneficial re-use is ubiquitous throughout the island of Guam and may not be available for this project. Renourishment is not authorized by Section 14 authority, so this project would consist of one-time nourishment and subsequent re-nourishment of the beach would be conducted by the NFS for this measure to be effective. Additionally, this measure would likely not provide sufficient protection alone and would need to be paired with another measure to provide sufficient protection. Therefore, the level of renourishment needed for measure performance not feasible under CAP Section 14.
- Coral habitat creation: According to resource agencies, the offshore environment is not favorable for coral, which would make this measure expensive. The initial maintenance to allow the coral to become established would be extensive and the associated work and monitoring for coral establishment would be more

expensive than other measures that require less monitoring and maintenance. While the coral reef would break waves, even given RSLC from climate change, the rock piled up to create the coral reef would effectively provide the same protection to the study area as the offshore breakwater measure. This measure is unlikely to be effective alone and would require pairing with a structure. For this reason, and the reasons discussed for the offshore breakwater measure above, this measure is unlikely to be the least cost alternative.

- 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 the Agat Mayor's Complex over the 50-year period of analysis. This measure was not carried forward as a standalone alternative but can be considered in combination with other hardened shoreline protection measures during the design phase.
- Relocation of the Agat Mayor's Complex - Costs to construct new buildings and infrastructure combined with the cost to demolish and decommission existing buildings is estimated at $19.7M[2] (FY24) which is much higher than other structural alternatives. The shoreline would remain exposed to erosion and continue to threaten remaining public infrastructure such as Route 2. Furthermore, the community is committed to the current location as an important component in emergency response, e.g., an initial stop in evacuation.

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. An initial array of alternative plans was formulated by combining retained management measures. The initial array of alternatives includes the following:

- No Action
- Rock Revetment
- Concrete Armor Unit Revetment
- Precast Concrete Seawall
- CRM Seawall
- Open Cell Piling Seawall
- Secant Pile Seawall

The initial array of alternatives was screened using the following criteria:

- Is the alternative likely to be cost effective in providing shoreline protection?

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[2] Construction costs of a multi-purpose recreation and emergency center in Chalan Pago-Ordot was $9.4 million in FY22. As the Chalan location is similar in size and nature to the Agat Mayor's Complex, the construction cost was used for comparison purposes. Adding in costs for decommission & demolition of the existing structures, for design of a new complex, contingency, and inflation results in a rough estimate of $19.7M in FY24 price level to relocate the Agat Mayor's Complex.

- Does the alternative require special equipment, material, or expertise that is not available in Guam?
- Does the alternative meet USACE design life requirements, including the consideration of 100 years of sea level change?
- Is the alternative likely to be environmentally acceptable?

Table 7 summarizes the screening of the initial array of alternative plans. Parametric cost estimates and concept designs were used to screen the initial array of alternatives.

Table 7: Screening of Initial Array of Alternatives

Alternative	Likely to be Cost Effective?	Special Equipment Required?	Meets USACE Design Requirements?	Likely to be Environmentally Acceptable?	Carried Forward
No Action	N/A	N/A	N/A	N/A	Yes
Rock Revetment	No	No	Yes	Yes	No
Concrete Armor Unit	Yes	Yes	Yes	Yes	Yes
Precast Concrete Seawall	No	Yes	Yes	Yes	No
CRM Seawall	No	No	Yes	Yes	No
Open Cell Piling Seawall	Yes	Yes	Yes	Yes	Yes
Secant Pile Seawall	Yes	Yes	Yes	Yes	Yes

Rock Revetment: The required size stone necessary for the rock revetment is unavailable on Guam or Saipan. High shipping costs to import rock from elsewhere renders the rock revetment alternative more expensive than other alternatives with similar functionality and effectiveness. For this reason, the rock revetment was screened out from further consideration.

Precast Concrete Seawall and CRM Seawall: Traditional seawall alternatives require additional width and minimum real estate space for excavation of the seawall foundation. For a 12 ft high seawall (-6 ft to +6 ft elevation), the precast concrete seawall and CRM seawall require an excavation width of 40 ft, of which 26 ft is required for excavation landward of the existing seawall (8 ft for the cantilever footing and 18 ft for excavation at a slope of 1.5H:1V) and 14 ft seaward. Similarly, excavation for the CRM seawall requires an excavation width of 36 ft, of which approximately 22 ft is landward of the existing seawall (4 ft for CRM base and 18 ft for excavation) and 14 ft seaward. The excavation space necessary for these two seawall options would require demolition and reconstruction of the Community Center which is located 8 to 9 ft landward from the existing seawall. The cost to demolition and reconstruct the community center, as well as extensive excavation requirements make the precast and CRM seawalls not likely to be our least cost alternative. Other seawall types such as the open cell piling seawall and secant pile seawall provide similar functionality and effectiveness, with a much reduced excavation extent and footprint, and do not require demolition and reconstruction of the Community Center. For this reason, the precast concrete and CRM seawalls were screened out from further consideration.

3.5 Final Array of Alternatives

Based on the rationale and findings noted in Section 3.4, the Final Array of Alternatives were developed. The final array of alternatives include:

- Alternative 1: No Action Alternative
- Alternative 2: Concrete Armor Unit Revetment
- Alternative 3: Open Cell Piling Seawall
- Alternative 4: Secant Pile Seawall

The length of all the structural alternatives is approximately 320 ft from the boundary of the national park land to the end of existing wall in front of empty lot next to the mayor's office.

3.5.1 Alternative 1: No Action Alternative

Under Alternative 1, 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. More frequent and severe tropical storms in combination with relative sea level rise would exacerbate shoreline erosion and leave the Mayor's Complex exposed to severe damage. The GovGuam would need to take on protections for the Mayor's Complex.

3.5.2 Alternative 2: Concrete Armor Unit Revetment

Engineered revetments reduce the erosive power of the waves by dissipating wave energy through the interstices of the armor units. A 320 ft long concrete armor unit revetment would be constructed parallel to the shoreline and replace the existing wall. For this alternative, the tribar was selected as the design for its compact interlocking and turning radius, and the higher likelihood of available and experienced contractors with the design.

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 with the toe of the structure dug into the underlying limestone shelf. The stone sizing of the underlayer was determined to be 100-300 pounds (lbs) stone. At the specified 1.5H:1V slope, the revetment is expected to be 30 ft wide, extending towards the ocean, with a crest elevation of +6 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. OMRR&R

activities associated with Alternative 2 may include the replacement of damaged armor units, replacement of underlayer material, crest repair due to erosion of backfill, tieback repair due to erosion, and/or vegetation removal. OMRR&R costs are estimated at 20% of the initial construction cost at year 25 for replacement of damaged armor units and an annual cost of $15,000 for vegetation removal and regular maintenance.

Figure 21 displays the conceptual design for Alternative 2: Concrete Armor Unit Revetment.

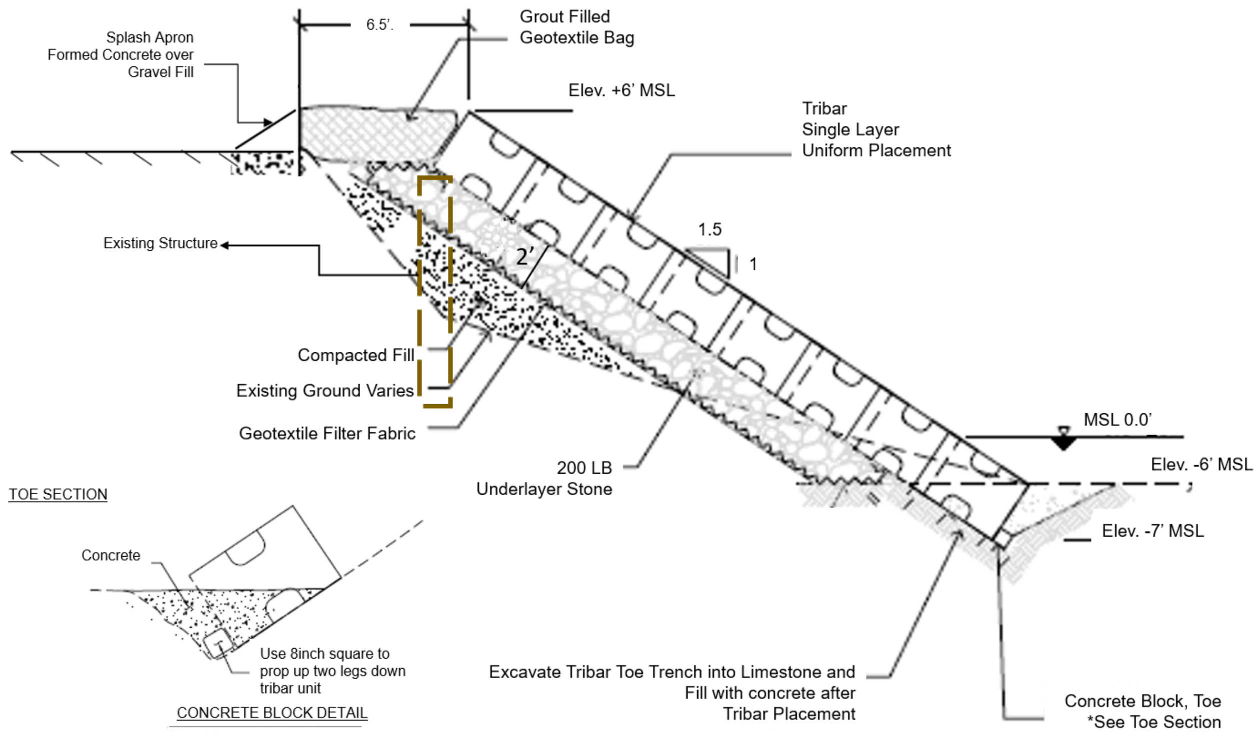

Figure 21: Concrete Armor Unit Revetment Cross Section

Figure 22 includes the general footprint and staging areas for Alternative 2. The area shaded in beige is the finished revetment footprint, in orange is the construction extent, and in turquoise is the construction staging areas. The lines on the oceanside represent the various water level lines: Mean Lower Low Water (MLLW) in red, MSL in green, and Mean Higher High Water (MHHW) in blue.

Construction of the revetment would begin in 2027 and take 12 months. Construction would not occur during peak coral spawning seasons (e.g., 12 July-9 August in 2027 and 30 June-20 July in 2028) to avoid impacts to coral during in-water activities.

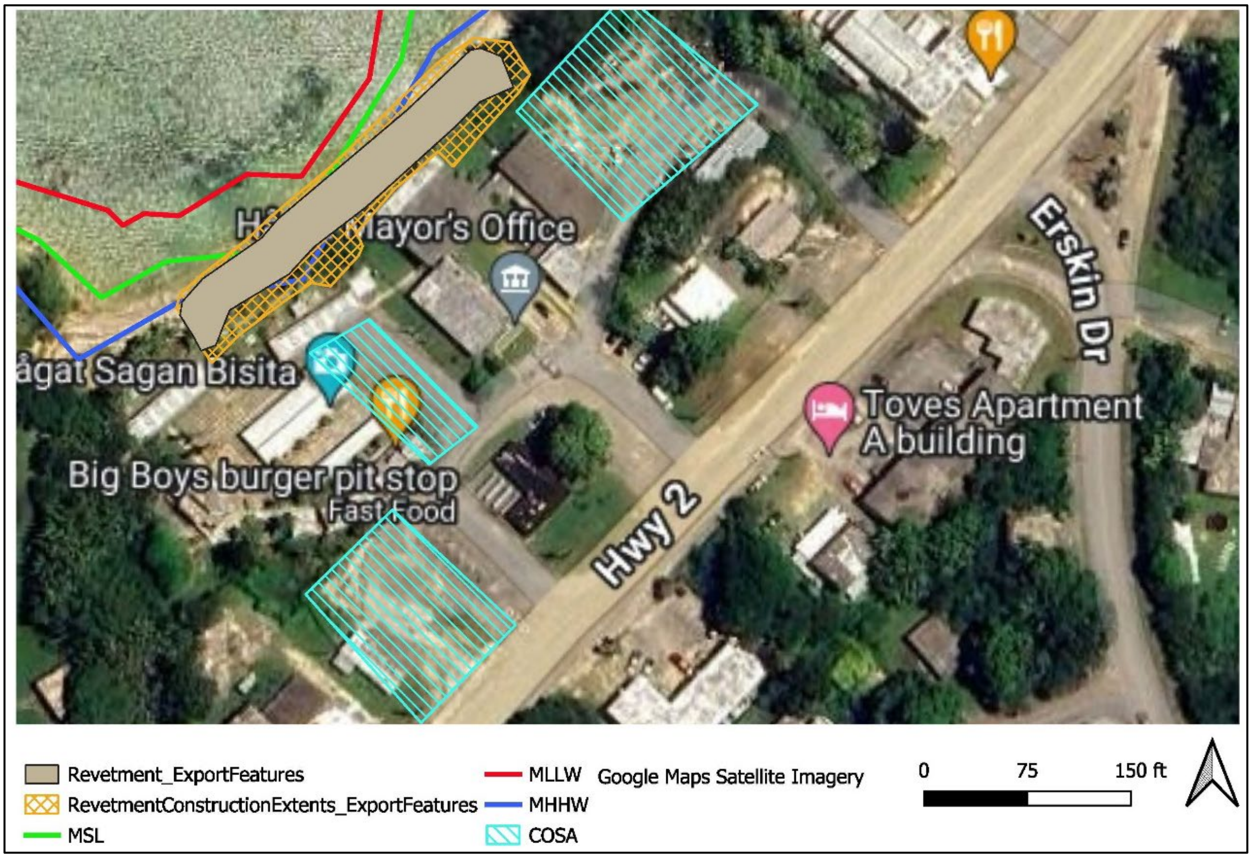

Figure 22: Concrete Armor Unit Revetment Footprint and Staging Areas

3.5.3 Alternative 3: Open Cell Piling Seawall

Alternative 3 consists of removal of the existing seawall and the construction of an open cell piling seawall. The open cell piling seawall will be 320 ft long and consist of 1 ft wide vinyl cells filled with reinforced concrete installed to the consolidated limestone shelf. The individual wall panels will be anchored with a 2-inch diameter pin pile installed into the limestone. The seawall will have a 2 ft wide pile cap and a 4 ft wide splash apron. Approximately 12 trees within the construction footprint will be removed. The seawall will be constructed by driving vinyl open cell sheet piling using a vibratory mandrel hammer to the limestone shelf. Holes will be drilled at the top of the wall to facilitate a water jet method to remove sand from the annular space, The sand will be trapped, dewatered, and placed appropriately on the beach. A 2-inch diameter pin pile will be installed approximately 5 ft into the limestone shelf and the annuls will be back filled with reinforced concrete. Weep holes would be installed to aid in proper drainage. The seawall will be attached to reinforced concrete deadman anchors using 10 ft long tieback rods at a minimum of 6 inch wide by 3 ft deep in the backfill. The deadman anchors will be placed every 8 ft for the length of the seawall for an estimated total of 40 anchors and tiebacks. At the location of the Mayor's office building, the 2 x 2 x 2 ft square space required to place the deadman anchors will be hollowed and then re-laid in the concrete porch. The excavation required to place the tiebacks could be completed with a shovel, demonstrating the minimal excavation effort required. The individual panels will be tied together at the top with a cap. Concrete stairs will be installed for beach access. Approximately 12 trees will be planted, and excavated beach sand will be added to the beach profile. The finished seawall will have a top elevation of approximately 6 ft MSL and will extend down to -6 ft MSL. The top of the seawall will be approximately 3 ft above the existing grade of the mayor’s complex. Figure 23 displays the conceptual design for the open cell piling seawall.

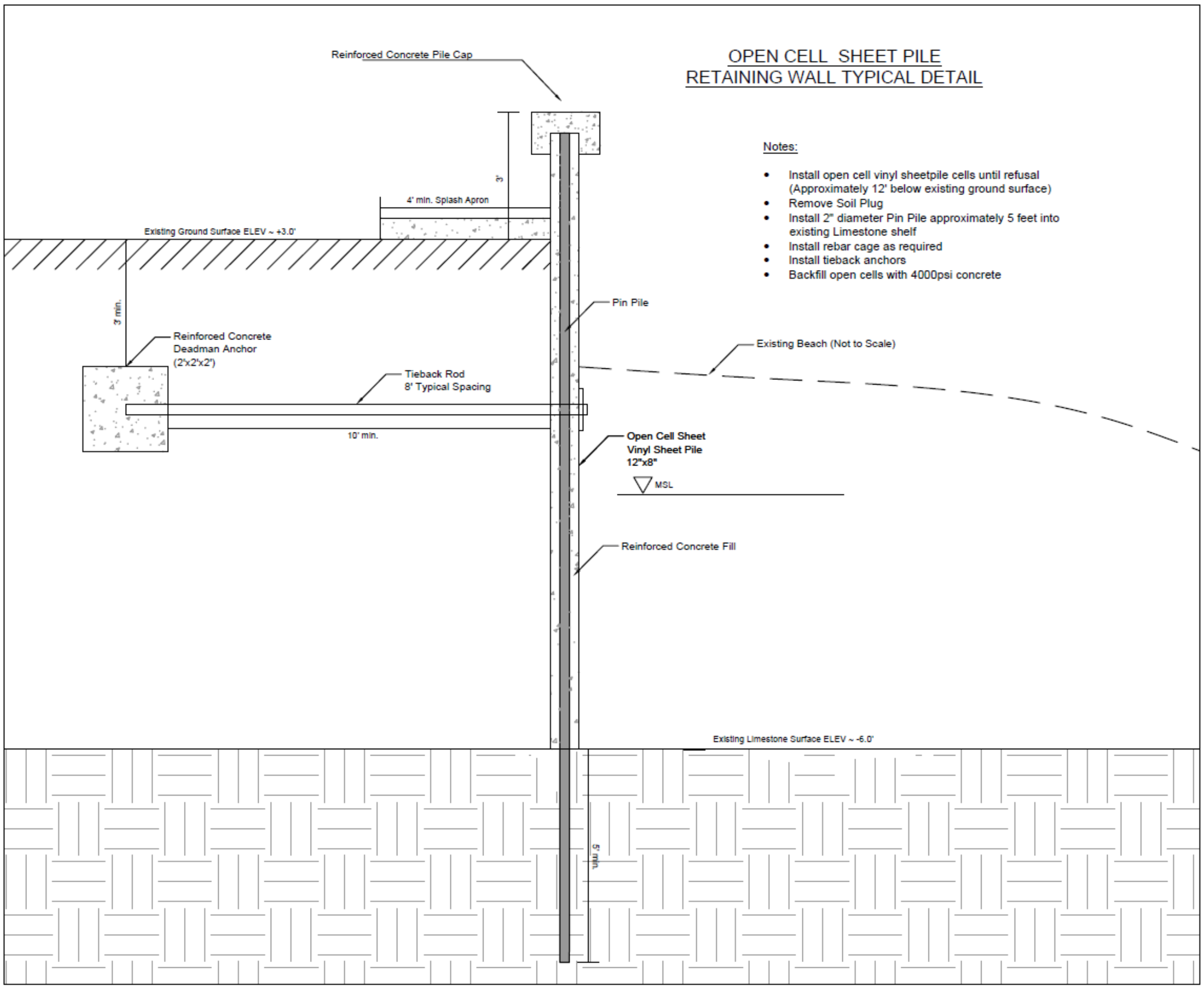

Figure 23: Open Cell Piling Seawall Cross Section

Figure 24 includes the general footprint and staging areas for Alternative 3. The area in red and yellow represent the footprint of the finished open cell seawall and in turquoise is the construction staging areas. The lines on the oceanside represent the various water level lines: MLLW in red, MSL in green, and MHHW in blue.

Construction of the open cell piling seawall would begin in 2027 and take 6 months. Construction would not occur during peak coral spawning seasons (e.g., 12 July-9

August in 2027 and 30 June-28 July in 2028) to avoid impacts to coral during in-water activities.

OMRR&R activities associated with Alternative 3 may include crack sealing, weep hole maintenance, filling depressions behind the wall, vegetation removal, and replacement of single cells as needed. OMRR&R costs are estimated at an annual cost of $15,000 for vegetation removal and crack sealing.

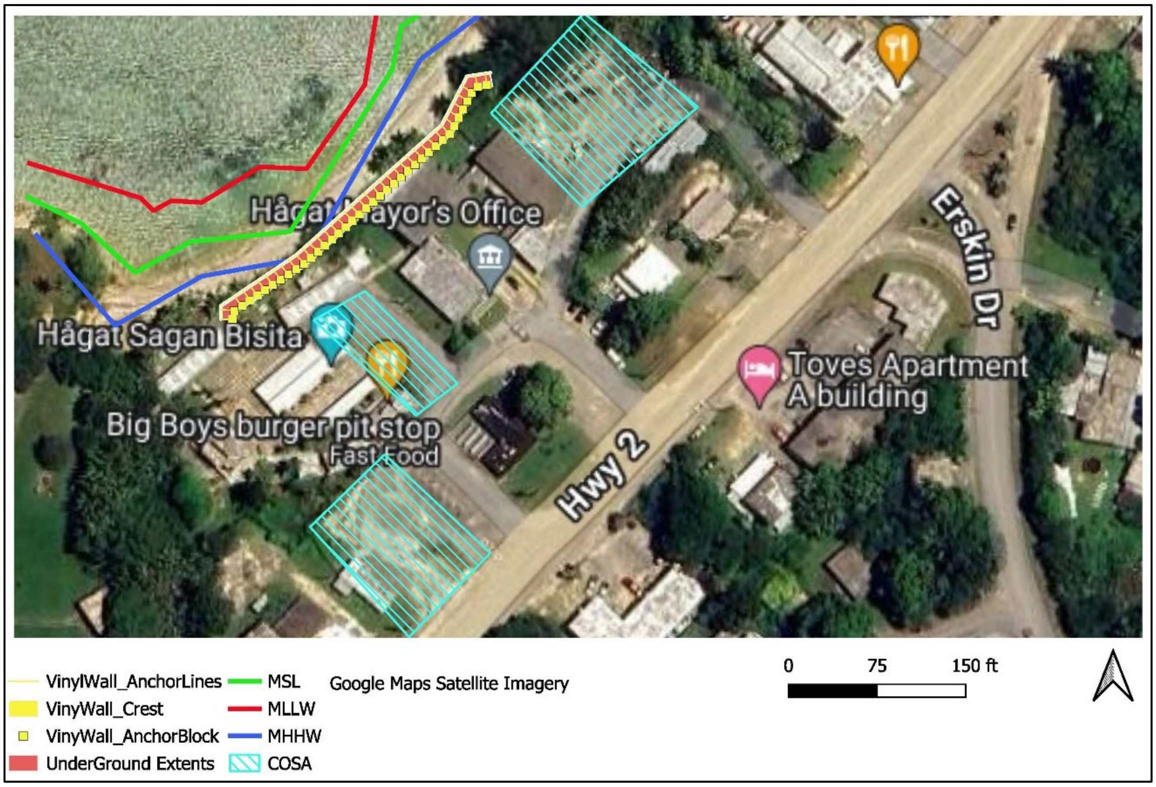

Figure 24: Construction and Staging Areas for the Open Cell Piling Seawall

3.5.4 Alternative 4: Secant Pile Seawall

The construction of a secant pile seawall involves drilling overlapping concrete columns to form a barrier. The secant pile seawall will be 320 ft long and consist of 2 ft wide concrete columns installed into the consolidated limestone shelf. The seawall will have a 3 ft wide pile cap and a 4 ft wide splash apron. The seawall will be constructed by drilling and installing alternating and overlapping primary and secondary elements approximately 5 ft into the limestone shelf. The secondary piles will be installed with an 8-inch overlap of the primary piles. The finished seawall will have a top elevation of approximately 6 ft MSL and will extend down to -6 ft MSL. The top of the seawall will be approximately 3 ft above the existing grade of the mayor's complex. Figure 25 displays the conceptual design for the secant pile seawall.

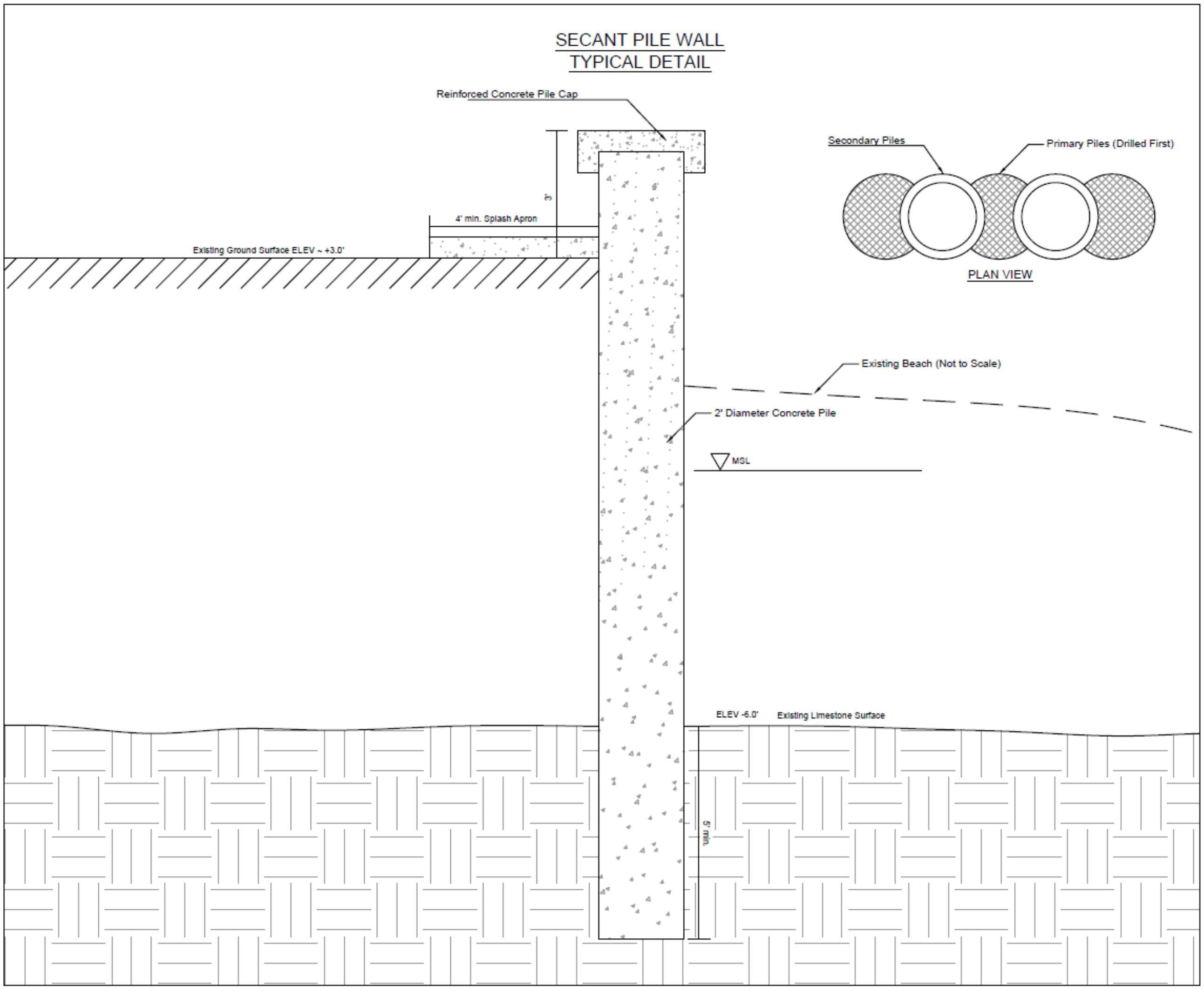

Figure 25: Secant Pile Seawall Cross Section

Figure 26 includes the general footprint and staging areas for Alternative 4. The yellow line represents the finished secant pile seawall footprint, the orange areas the construction extent, and in turquoise is the construction staging areas. The lines on the oceanside represent the various water level lines: MLLW in red, MSL in green, and MHHW in blue.

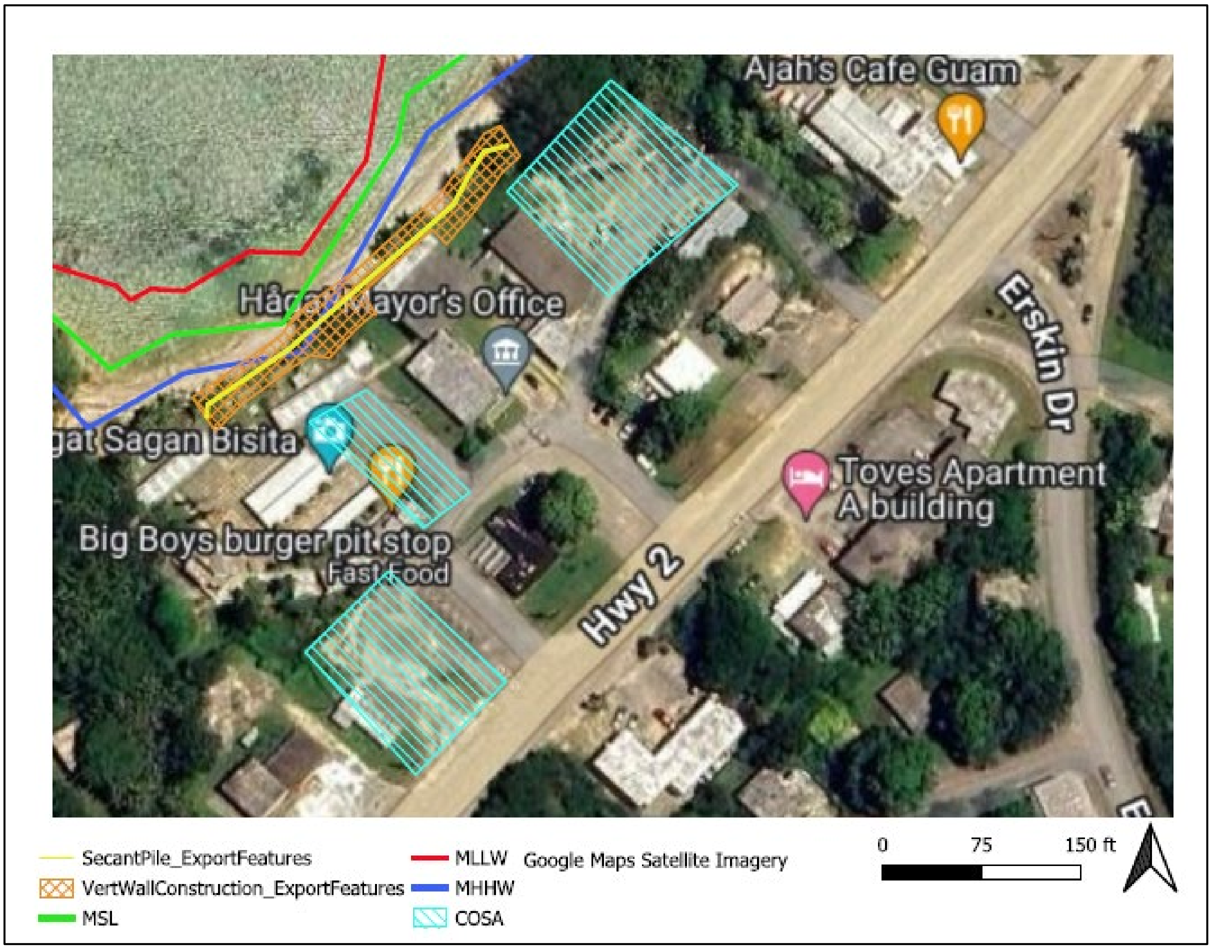

Figure 26: Construction and Staging areas for the Secant Pile Seawall

Construction of the secant pile seawall would begin in 2027 and take approximately 8 months. Construction would not occur during peak coral spawning seasons (e.g., 12 July-9 August in 2027 and 30 June-28 July in 2028) to avoid impacts to coral during in-water activities.

OMRR&R activities associated with Alternative 4 may include crack sealing, weep hole maintenance, and vegetation removal. OMRR&R costs are estimated at an annual cost of $15,000 for vegetation removal and crack sealing.

4.0 AFFECTED ENVIRONMENT (40 CFR 1502.15) AND ENVIRONMENTAL CONSEQUENCES (40 CFR 1502.16)

NEPA 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 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.

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.

There is no previous NEPA documentation that exists for the project site and the proposed activity is not covered by a USACE categorical exclusion (see ER 200-2-2). Based on knowledge of the area, discussions with the local sponsor, and the scope and scale of the proposed action, significant adverse environmental impacts are not anticipated. An Environmental Assessment (EA) is expected to meet NEPA requirements. If evaluation of impacts indicates further documentation in an Environmental Impact Statement is necessary, Federal interest under this authority will be evaluated. All necessary consultation, coordination, permits, and approvals will be conducted and documented in the EA to comply with all applicable Federal laws and regulations. Such environmental requirements include but are not limited to the following: Section 307 of the Coastal Zone Management Act (CZMA), Sections 301, 401, 402, and 404 of the CWA, Section 106 of the National Historic Preservation Act (NHPA), Section 7 of ESA, the Fish & Wildlife Coordination Act (FWCA), and the Magnuson-Stevens Fishery Conservation and Management Act (MSA). In further evaluating the proposed action, full consideration will be given to any and all reasonable and practicable design modifications and measures intended to avoid and/or minimize adverse impacts to the environment.

This section provides an analysis of effects and consequences (40 CFR 1502.16) of each alternative plan on the resources present in the proposed action area (Section 2) in comparison to the No Action or (FWOP) conditions i.e., Alternative 1: No Action. For the most part, the USACE anticipates that Alternatives 2 through 4 would cause similar effects to resources listed below and accordingly discusses the impacts of all alternatives together. For resources where the effect differs between alternatives, the effects are discussed independently, per resource. 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 4. Table 8 compares the predicted dimensions of the alternatives below.

Table 8: Dimensions of the Alternatives

Alternative	Alternative 1: No Action Alternative: Existing CRM Seawall	Alternative 2: Concrete Armor Unit Revetment	Alternative 3: Open Cell Piling Seawall	Alternative 4: Secant Pile Seawall
Structure Length (ft)	450	320	320	320
Crest Width (ft)	1-1.5	6.5	2	3
Crest Elevation (ft) above MSL	3-6	6	6	6
Crest Elevation (ft) above ground surface	0-1	0	3	3
Bottom Elevation (ft) below MSL	Unknown	-7	-11	-11
Depth into Hard Substrate (ft)	Unknown	2	5	5
Structure Slope (H:V)	Vertical	1:1.5	Vertical	Vertical
Structure Footprint Width (ft)	1-1.5	30	6	7
Excavation Width Footprint (ft)	N/A	40	11*	2
Staging Areas (sq. feet)	N/A	98,009	98,009	98,009

**Excavation extent for Open Cell Piling Seawall includes 1 ft width for seawall itself, 8 ft for tie backs, and 2 ft for deadman anchors. Tie backs and deadman anchors are spaced every 8 ft along the wall at a depth of 3 ft on the landward side of the seawall.*

Note: All alternatives will require 3 to 4 ft of excavation seaward to remove the existing seawall.

The environmental consequences of a given alternative would depend on its extent, but it is unlikely that any of the initial alternatives described above would cause significant adverse effects to the environment. The FWOP condition poses its own risk of environmental damage, especially to the offshore environment. Gradual or catastrophic erosion inland of the existing shore protection would release fine sediment and possibly contaminants into the marine environment, and damage the sea grass, algal, and coral benthic habitats just offshore.

Temporary and permanent impacts to habitat areas vary across the alternatives. The permanently impacted habitat area is the area that would be disturbed by the placement of each of the alternative plans in the final array. Construction is expected to start in 2027 and take 6-12 months and is anticipated to occur from land at low tide as much as practicable in order to avoid in-water work. It is not feasible to calculate the extent of erosion under the No Action Alternative within the constraints of this Feasibility Study.

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 compares the potential effects of the alternatives on the resources below.

Table 9: Summary of Potential Effects for Alternatives

Resource	Alternative 1 No Action	Alternative 2 Concrete Armor Unit Revetment	Alternative 3 Open Cell Piling Seawall	Alternative 4 Secant Pile Seawall
Climate	N	N	N	N
Air Quality/Greenhouse Gas	N	B	B	B
Geomorphology, Hydrology & Hydraulics	S	S	L	L
Water Resources and Quality	S	L*	L*	L
Special Aquatic Sites	S	L*	L*	L
Hazardous, Toxic & Radioactive Wastes	N	N	N	N
Noise	N	L*	L*	L*
Terrestrial Habitat	S	L*	L*	L*
Marine Habitat	S	N*	L*	L*
Threatened, Endangered Species & Critical Habitat	S	L*	L*	L*
Essential Fish Habitat	L	L*	L*	L*
Invasive Species	N	L*	L*	L*
Navigation	N	N	N	N
Land Use, Public Infrastructure & Utilities	S	B	B	B
Socio-economics	S	B	B	B
Environmental Justice	S	B	B	B
Cultural Resources	N	L	N	L
Cultural and Subsistence Activities	S	S	L	L
Aesthetics	S	S	L	L
*Effect would cause 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.				
B = Beneficial, N = No Effect, L = Less than Significant, S = Significant Criteria based on the definitions of significance at 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. 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).				

4.1 Physical Environment

4.1.1 Climate

Effects on climate were considered significant if implementation of an alternative plan would result in:

- a change in natural or existing climate, measured as temperature, humidity, precipitation, and / or water level,
- to a degree that renders the current environment less desirable or suitable for existing biota, and
- lasting beyond the period of construction or occurring in the future.

Additionally, effects on climate change were evaluated and considered significant if implementation of an alternative plan could be reasonably expected to cause exacerbation or acceleration of climate change projections for the region.

4.1.1.1 Alternative 1: No Action

Under the no action alternative, no federal dollars would be spent to mitigate failure of the existing seawall and exposure of the landside public infrastructure to natural erosive forces. For example, there would be no construction activity using heavy machinery or equipment, import of foreign materials, generation of construction waste or manipulation of the physical and natural resources such as sand and vegetation. Accordingly, the Corps anticipates the no action alternative, under the future without project condition, would have no effect on the existing climate, i.e., temperature, humidity, precipitation, and/or water level. Likewise, the no action alternative would neither exacerbate nor accelerate climate change.

4.1.1.2 Alternatives 2-4: Revetment and Seawalls

The use of heavy machinery, generation of construction waste and increased human presence in the proposed action area relative to impacts to climate and climate change are similar across alternatives.

The revetment has a larger footprint and the concrete used in the revetment absorbs heat and releases it more slowly over time, potentially increasing local temperatures. The seawall's smaller footprints would absorb less heat with less effect on local temperature. The existing sandy beach also absorbs heat and releases it slowly similarly to concrete, therefore USACE anticipates no long-term increase in temperature from any of the alternatives.

While concrete is traditionally considered to be an impermeable surface, the revetment is designed to allow flow through of water, therefore there would be no loss in permeability of the beach.

While 12 to 20 trees will be removed for the demolition and construction of the revetement or walls, any removed trees will be replaced with similar non-invasive species. Therefore, any local climate change due to loss of vegetation would be short term and limited to the time it would take for the trees to grow.

For these reasons, USACE has determined the alternatives would have no effect on the climate.

4.1.2 Air Quality and Greenhouse Gas Emissions

Under the Clean Air Act of 1972 (42 USC §7401 et seq.) Agat is not designated as a nonattainment or maintenance area for any criteria pollutant; therefore, USEPA's General Conformity Rule to implement Section 176(c) of the CAA [42 USC §7506(c)] does not apply. No air quality permits, nor a conformity determination are required for this project.

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, and/or
- Generation of greenhouse gas emissions that would significantly contribute to climate change. There are currently no Federal thresholds of significance established for greenhouse gas emissions, and so it is the responsibility of the NEPA lead agency to decide how significant effects will be determined. To this end, significance for greenhouse gas emissions was determined by comparing the greenhouse gas emissions produced for each project alternative to governmental greenhouse gas reduction goals (see Attachment 7 of Appendix A-3), while not formally adopting the greenhouse gas reduction goal per se (Table 10 and Table 11).

Table 10: Net Air Quality and Greenhouse Gas Emissions in metric tons

	Alternative 1 No Action Alternative	**Alternative 2 Concrete Armor Revetment**	**Alternative 3 Open Cell Piling Seawall**	**Alternative 4 Secant Pile Seawall**
Reactive Organic Gases aka Volatile Organic Compounds (ROG/VOC)	0	-1	-1	-1
Carbon Monoxide (CO)	0	-2	-3	-3
Sulfur Oxides (SOx)	0	0	0	0
Nitrous Oxides (NOx)	0	-2	-2	-2
Particulate Matter - 2.5 micron ($PM_{2.5}$)	0	0	0	0
Particulate Matter - 10 micron (PM_{10})	0	0	0	0
Carbon Dioxide (CO_2)	0	-508	-517	-502
Methane (CH_4)	0	0	0	0
Carbon Dioxide Equivalents (CO_2e)	0	-509	-518	-502
* Net = (no action gross) - (with action gross). Negative net values indicate the with action emissions are less than the no action emissions, and therefore have no effect on emissions.				

Table 11: Social Costs of Greenhouse Gas Emissions

	Alternative 1 No Action	**Alternative 2 Concrete Armor Revetment**	**Alternative 3 Open Cell Piling Seawall**	**Alternative 4 Secant Pile Seawall**
Gross Total	$325,675	$181,147	$168,736	$172,146
Net Total	$0	-$144,527	-$156,939	-$153,529

Note: Negative net values indicate that the alternative is expected to reduce social costs below the baseline no-action costs.

4.1.2.1 Alternative 1: No Action

Under the No Action Alternative, no Federal actions for emergency shoreline protection would be implemented. It is expected that the FWOP air quality conditions would be the same as existing conditions. Air pollution sources within the proposed action 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. For these reasons, USACE has determined the No Action Alternative would result in no effects to air quality resources.

The No Action Alternative would result in recurring repair needs for the shoreline, highway, utilities, and parks and eventually the collapse of the seawall and erosion of the surrounding land. Under the No Action Alternative, no construction would occur, however annual repairs to the wall and/or Mayor’s Complex would occur every year. The metric tons of greenhouse gases produced by this annual maintenance are the baseline for the Net emissions analysis of the action alternatives. The total social cost of greenhouse gas emissions from annual repairs over a 50-year period would be $325,675 (Table 11).

4.1.2.2 Alternatives 2-4: Revetment and Seawalls

Alternatives 2-4 have the same potential temporary insignificant effects on air quality. Gases from construction equipment may cause a temporary reduction in air quality at the project site during construction. There may be some temporary generation of dust near the construction area resulting from transport and handling of construction materials. No long-term degradation of air quality would result from implementation of the project. Construction activities involving heavy equipment are minimal and will cease once construction is completed; significant impacts to ambient air quality are not expected and will likely be immeasurable. Emissions from construction and maintenance of the action alternatives would be less than emissions from the no action alternative resulting in no net effect on air quality or greenhouse gas emissions form the construction (Table 10). For these reasons, USACE has determined the alternatives would cause less than significant impacts to air quality.

Direct emissions from a 1-year construction period and long-term indirect emissions from operations and maintenance (O&M) once every 20 years over the 50-year lifespan of the project were quantified for each action alternative in the final alternatives array.

Alternatives 2-4 would result in negative net GHG emissions over the 50-year lifespan of the project in comparison to the No Action Alternative (for full analysis see Attachment 7 of Appendix A-3). All action alternatives have net negative emissions total, indicating they would all produce less emissions over the 50-year project lifespan. The social costs of greenhouse gas emissions are presented in Table 11 and show that all action alternatives would result in a net savings to society by completing the project compared to the baseline (no-action alternative) costs to society. Effects from the alternatives would be beneficial.

The Tentatively Selected Plan, Alternative 2: Open Cell Piling Seawall, produces the least emissions of the 4 alternatives, including the No Action Alternative.

4.1.3 Geomorphology, Hydrology and 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

Table 12 compares the anticipated areas affected when implementing the alternatives.

Table 12: Area Affected by Each Alternative

Impact	Alternative 1: No Action Existing CRM Seawall	Alternative 2: Concrete Armor Unit Revetment	Alternative 3: Open Cell Pile Seawall	Alternative 4: Secant Pile Seawall
Upland *Permanent Impacts (sq. feet)*	N/A	1920	1440	2240
Beach above MHHW *Permanent Impacts (sq. feet)*	370	4780	250	490
Intertidal *Permanent Impacts (sq. feet)*	120	3600	80	150
TOTAL PERMANENT	***490***	***10300***	***1770***	***2880***
Upland *Temporary Impacts (sq. feet)*	N/A	97060	97540	96740
Beach above MHHW *Temporary Impacts (sq. feet)*	N/A	1760	740	740
Intertidal below MHHW *Temporary Impacts (sq. feet)*	N/A	1930	230	230
TOTAL TEMPORARY	**N/A**	***105550***	***98600***	***97800***
TOTAL HABITAT IMPACTS	***480***	***111050***	***100260***	***100580***

4.1.3.1 Alternative 1: No Action

Under Alternative 1, no Federal action for emergency shoreline protection would be implemented. Conditions in the proposed action area into the future are expected to be consistent with the current onsite conditions. The No Action Alternative would not change the existing conditions and could result in collapse of the seawall and erosion of the surrounding land, changing the geology and topography, and shifting the intertidal zone inland. With the absence of the seawall, ocean water would flow more landward unobstructed. For this reason, USACE has determined the No Action Alternative would not reduce risk and would cause significant impacts to hydrology, hydraulics, and geomorphology in the proposed action area.

4.1.3.2 Alternatives 2-4: Revetment and Seawalls

Alternative 2, concrete armor unit revetment, has the largest temporary (construction) and permanent (structure) footprints of the alternatives (Table 12). The revetment would convert 1920 sq feet of manicured grass, 4780 sq feet of beach, and 3600 sq feet of intertidal habitat to concrete, substantially altering the natural geologic feature of the beach and significantly impacting geomorphology.

Alternatives 3 and 4, seawalls, are direct replacements of the existing seawall on and along the beach, but the addition of splash aprons will convert 1440 and 2240 sq ft of manicured lawn to concrete, respectively.

Vertical walls are associated with increased scour of the existing beach. Since there is already a seawall at this location, Alternatives 3 and 4 are not expected to significantly alter the erosion patterns that would occur without the project. However, as future water levels rise, the change in crest elevation from +3 ft MSL to +6 ft MSL may result in slightly faster beach erosion. Without the project, the water would inundate the upland areas rather than be reflected by the new, higher crest.

USACE proposes to replace the existing seawall, i.e., hardened shoreline, with an engineered structure that has a footprint similar to the existing seawall on the beach. Accordingly, the anticipated impacts to longshore sediment transport post-construction would be similar to those of the existing seawall. However, there may be some increased erosion of the beach front under future higher water level scenarios, as the increased crest elevation would prevent inundation but cause some reflection of waves and water levels.

Alternatives 3-4 would maintain the existing shoreline and protect the existing hydrology. Seawalls are known to disrupt longshore sediment transport, causing erosion and accretion elsewhere. USACE proposes to replace the existing seawall with a new seawall that has a similar footprint and would have anticipated impacts to longshore sediment transport post-construction comparable to the existing seawall. USACE anticipates long term beneficial effects to hydrology, hydraulics, and geomorphology of the shoreline. Accordingly, Alternatives 3-4 are likely to have a less than significant impact on hydrology, hydraulics, or geomorphology in the proposed action area.

4.1.4 Water Resources and Quality

A Draft 404(b)(1) evaluation is included as Attachment 4a of Appendix A-3. The 404(b)(1) analysis demonstrates that both construction and O&M will comply with Section 404. So long as the NFS conducts O&M operations within the scope of activities characterized in the EA, it would comply with Section 404. As currently designed the project may require CWA Section 402 and Section 404 permits including but not limited to construction stormwater, dewatering, and return water from upland sources. If required, Section 401 and 402 Water Quality Certification will be requested from the USEPA and GEPA prior to construction of the project (Attachment 4b of Appendix A-3). All excavated material will either be used onsite as backfill, taken to an appropriate upland disposal site, or reused in other construction projects. There is no ocean disposal planned for this project, therefore Section 103 of the Marine, Protection, Research, and Sanctuaries Act does not apply.

Effects on water quality are 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

4.1.4.1 Alternative 1: No Action

Under Alternative 1, no Federal actions for emergency shoreline protection would be implemented. It is expected that the FWOP conditions would be relatively commensurate with existing conditions. The No Action Alternative would result in increased sediment and pollution load in the marine environment of the proposed action area due to collapse of the seawall and erosion of the surrounding land. For these reasons, USACE has determined the No Action Alternative would cause significant impacts to surface water quality.

4.1.4.2 Alternatives 2-4: Revetment and Seawalls

The concept level of design for the three structural alternatives prepared for this feasibility phase lacks detail sufficient to determine whether the footprint of the alternatives will result in a discharge of fill material into WOTUS. Based on the proximity of the existing seawall to marine waters, most of which occurs above the high tide line, USACE anticipates the discharge to be minimal and in specific areas where the existing seawall is sited closer to the water’s edge. For the most part, the seawall replacement construction will occur outside of WOTUS, with minimal temporary disturbance within the intertidal habitat of WOTUS, e.g., excavation and backfill of beach, to facilitate construction of the toe. Alternative 2 would have the greatest seaward footprint; Alternative 3 and 4 both have smaller seaward footprints. Alternative 2 would impact temporarily and permanently a total of 5,530 sq ft of intertidal habitat (Table 12). Alternatives 3 and 4 would have total temporary and permanent impact areas in the intertidal habitat of 310 sq ft and 380 sq ft, respectively. A 404(b)(1) analysis was completed assuming some discharge into a WOTUS and concluding that the discharges would not cause or contribute significant degradation of the WOTUS, including adverse effects on human health; life stages of organisms dependent on the aquatic ecosystem; ecosystem diversity; productivity and stability; and recreational, aesthetic, and economic values (Attachment 4a of Appendix A-3).

The three special aquatic sites found in the project area, the Agat subunit of WAPA (Figure 16), vegetated shallows, and coral reef, would be affected by project-related activities as these resources are located within the proposed action area.

There may be some localized, transient increases in turbidity created by excavation and setting of stones under Alternative 2, and there is sediment production with driving piles and water jetting under Alternative 3. The use of BMPS as described in Attachment 2 of Appendix A-3 will mitigate these impacts. No long-term effects on water quality are anticipated under alternatives 2 through 4. For these reasons, USACE has determined in a 404(b)(1) evaluation (included as Attachment 4 of Appendix A-3) that the alternatives would cause less than significant impacts to surface water quality with the use of appropriate BMPs as described in Attachment 8 of Appendix A-3.

4.1.5 Hazardous, Toxic, and Radioactive Waste

There are no known contaminants in the area and the project would not introduce contaminants to the environment, therefore the alternatives, including the no action alternative, are anticipated to have no effect on HTRW. If HTRW were discovered during construction, the NFS is responsible for the costs of HTRW cleanup and response.

4.1.6 Noise

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

4.1.6.1 Alternative 1: No Action

Under the No Action Alternative, no Federal actions for emergency shoreline protection would be implemented and no increase in ambient noise levels would occur. Land uses under the FWOP 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 vehicles using the highway and typical social activities conducted at the Mayor’s Complex. 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 proposed action area is not expected to measurably change over the period of analysis. The No Action Alternative would have no effect on noise.

4.1.6.2 Alternatives 2-4: Revetment and Seawalls

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 13. These sound levels are 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).

Table 13: Example of typical sound levels emitted from construction equipment

Type of Equipment [a]	Lmax at 50 ft (dBA, slow) [b]	Type of Equipment [a]	Lmax at 50 ft (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 and with the expectation that the contractor will utilize industry standard equipment and vehicles that are compliant with local ordinances pertaining to noise emittance, 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 and EC, these Alternatives have less than significant effects to sensitive noise receptors.

There may be some localized, transient increases in noise created by construction activities under Alternatives 2-4, the use of BMPs as described in Attachment 2 of Appendix A-3 and ECs in Attachment 8 will mitigate these impacts. No long-term effects on noise are anticipated under alternatives 2 through 4. For these reasons, USACE has determined the alternatives would cause less than significant impacts to noise.

4.2 Natural Environment

Project impacts may be permanent or temporary, 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 12 provides a summary of permanent and temporary impacts by action alternative for the proposed project.

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 Attachment 2 of Appendix A-3. Environmental Commitments (ECs) will be included in construction requirements.

4.2.1 Terrestrial Habitat

The Migratory Bird Treaty Act (16 USC § 703-712) and Migratory Bird Conservation Act (16 USC §715-715D, 715E, 715F-715R) were 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.

Currently none of the migratory bird species found on Guam nest in the proposed action area, therefore vegetation clearing during nesting season does not need to be avoided. If that should change, USACE will include standard migratory bird protection measures as described in Attachment 7: Migratory Bird Consultation in the project plans and specifications and will require the Contractor to abide by those requirements. The project is being coordinated with USFWS and will comply with these Acts.

E.O. 13186 Responsibilities of Federal Agencies to Protect Migratory Birds requires, among other things, a Memorandum of Understanding (MOU) between the USACE and USFWS concerning migratory birds. Neither the Department of Defense MOU nor the USACE Draft MOU clearly address migratory birds on lands not owned or controlled by USACE. For many USACE civil works projects, the real estate interests are provided by the NFS. Control and ownership of the project lands remain with a non-Federal interest. Measures to avoid disturbing migratory birds are described in Section 6.9 of this EA and are incorporated by reference. The USACE will include standard migratory bird protection requirements in the project plans and specifications and will require the contractor to abide by those requirements. The project complies with the Order.

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

4.2.1.1 Alternative 1: No Action

Under the No Action Alternative, 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 proposed action area would continue to be subject to periodic erosion and the eventual loss of some or all of the terrestrial environment in the Agat Mayor's Complex, and its associated species as the sea level rises, existing seawall collapses, and the shoreline erodes. Resources in the action area will continue to be vulnerable to inundation and wave damage from elevated sea levels during storm events. Since the shoreline in the proposed action area is generally receding landward, the threat of coastal inundation and storm damage will become more extreme and frequent over time (USACE 2015). For these reasons, USACE has determined the No Action Alternative would cause significant impacts to terrestrial habitat and species.

4.2.1.2 Alternatives 2-4: Revetment and Seawalls

Alternatives 2-4 all have the same temporary, less than significant effects on terrestrial habitats. All require the removal of 320 ft of the existing seawall requiring excavation and subsequent backfill of 20 to 40 ft inland of the wall resulting in a temporarily disturbed area of 97,540 sq ft for Alternative 3, 96,740 sq ft for Alternative 4, and 97,060 sq ft for Alternative 2 (see Table 12).

It is estimated that 12 trees (*Cocos nucifera* and *Casuaria equisetifolia*) would be removed during construction and replaced after construction with appropriate and desirable native species. Impacts to terrestrial animals would be temporary during construction and less than significant due to implementation of BMPs as described in Attachment 8 of Appendix A-3.

Construction of the alternatives would protect further erosion of land habitat zone between the wall and the road. There are no effects from the staging areas, which would be existing lots at the Agat Mayor's Complex. For these reasons, USACE has determined Alternatives 2-4 would cause less than significant impacts to terrestrial habitats and species.

4.2.2 Marine Habitat

The project construction area is between the land habitat zone and the intertidal habitat zone, and it is located completely above the low water mark. Construction of Alternatives 2-4 is anticipated to occur from the land side as much as practicable to avoid work on the beach.

USACE consulted USFWS and NMFS on the effect of the recommended alternative (Alternative 3) on fish and wildlife resources as documented in Appendix A-3, Attachments 2 and 3. A Final FWCA Survey Report was received from USFWS on April 29, 2024, findings and recommendations were incorporated into this report. The project complies with the Act. While spinner dolphins were reported in coastal waters of Agat Bay (NOAA 2005), as currently designed, all project work will be concluded from land above mean low lower water and not at a depth where dolphins occur. Recommended measures to conserve fish and wildlife resources are incorporated into the Agat CAP Section 14 BMP Master List that accompanied the ESA and EFH consultations found as Attachment 8 of Appendix A-3. The USACE will adopt these recommendations, to the extent that the measure is applicable, commensurate and practical, as enforceable conditions i.e. specifications, of any construction contract. The project complies FWCA, ESA, MSA, and MMPA (see Section 3.0 of Appendix A-3).

Effects on marine 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
- Substantial interference with the movement of migratory species
- Introduction of or contribution to the substantial spread of an invasive species

4.2.2.1 Alternative 1: No Action

Under Alternative 1, no Federal actions for emergency shoreline protection would be implemented. The No Action Alternative would result in increased sediment and pollution load in marine environment of the proposed action area due to collapse of the seawall and erosion of the surrounding land. Beach and intertidal habitat would be lost since within a 50-year period, SLR will overtop the current CRM seawall at 3 ft. Within a 100-year period, SLR will increase to 10 ft. A qualitative climate change assessment can be found in Appendix A-1.1 Coastal Engineering. For these reasons, USACE has determined the No Action Alternative would cause significant impacts to marine habitats and species.

4.2.2.2 Alternatives 2-4: Revetment and Seawalls

Alternatives 2-4 will have estimated total permanent footprints of 10,300 sq ft, 1,770 sq ft, and 2,880 sq ft, respectively (see Table 12). All require the removal of 320 ft of the existing stonewall requiring excavation and subsequent backfill of 20 to 30 ft inland of the wall. The beach and intertidal areas may be disrupted during construction, which may temporarily deter sea turtles from seeking opportunities here or hatchlings from traversing this low-profile beach that emerge from beach areas outside of the proposed action area. Adverse impacts would be avoided and/or minimized to the greatest extent practicable through implementation of BMPs and ECs as described in Appendix A-3. After completion of the project, the beach would be expected to reestablish and stabilize along the seaward edge of the seawall for Alternatives 3-4. Construction activities would convert an estimated 3,600 sq ft of intertidal zone to revetment for Alternative 2. There will be no loss of open water, only the intertidal area and beach. For these reasons, USACE has determined Alternatives 2-4 would cause less than significant impacts to marine habitat and species.

4.2.3 Threatened, Endangered Species and Critical Habitat

Pursuant to Section 7 of the ESA, USACE evaluated the potential effects to threatened and endangered species that may be affected by implementation of the TSP. USACE determined the Federal action may affect but is not likely to adversely affect the listed species in Table 1. Detailed discussion on the USACE determination is included in the Biological Assessment in Appendix A-3 Attachment 2f.

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

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

that would threaten a threatened and endangered species

Based on current observations, scalloped hammerhead sharks, giant clams and tree snails do not occur in the action area and there would be no effect. Green sea turtle, Hawksbill sea turtle, *Acropora globiceps*, and Mariana Fruit bat would not occur in the proposed action area during the project, therefore, the proposed alternatives may affect but are not likely to adversely affect these threatened or endangered species. Table 14 shows the effects determination for each listed species, and the detailed biological assessment can be found as Attachment 2 to Appendix A-3.

Table 14: ESA-Listed Species and Effects Determination

Common Name	Scientific Name	Effects Determination
Coral	*Acropora globiceps*	May affect, Not Likely to Adversely Affect (NLAA)
Giant Clam	*Tridacna derasa* *Tridacna squamosa* *Tridacna gigas* *Hippopus hippopus*	No Effect
Scalloped Hammerhead Shark Indo-West Pacific DPS	*Sphyrna lewini*	NLAA
Green Sea Turtle, Central South Pacific DPS	*Chelonia mydas*	NLAA
Hawksbill Sea Turtle	*Eretmochelys imbricata*	NLAA
Humped Tree Snail, akaleha’	*Partula gibba*	NLAA
Guam Tree Snail, akaleha’	*Partula radiolata*	NLAA
Fragile Tree Snail, akaleha’	*Samoana fragilis*	NLAA
Mariana Fruit Bat (=mariana Flying Fox)	*Pteropus mariannus mariannus*	NLAA
Guam Kingfisher	*Todiramphus cinnamominus*	NLAA
Guam Rail	*Gallirallus owstoni*	NLAA
Mariana Swiftlet	*Aerodramus bartschi*	NLAA
Short-tailed Albatross	*Phoebastria (=Diomedea) albatrus*	NLAA
Slevin's Skink	*Emoia slevini*	NLAA
Fadang	*Cycas micronesica*	No Effect
Cebello Halumtano	*Bulbophyllum guamense*	No Effect
	Dendrobium guamense	No Effect
	Tuberolabium guamense	No Effect
Ufa-halomtano	*Heritiera longipetiolata*	No Effect

4.2.3.1 Alternative 1: No Action

The No Action Alternative would result in the eventual loss of some or all of the land habitat zone at the Mayor's Complex, including any habitat suitable for ESA listed species or their prey, as the existing seawall collapses and the shoreline erodes. Erosion releases terrigenous sediments and pollution into the marine environment. The added pollutants have a range of effects on the nearshore marine habitat including impacts to marine fauna, especially sessile and photo-dependent organisms such as coral. The magnitude of the impact is dependent upon the sediment load and duration of exposure and the proximity of the organism to the pollution source. Erosion over time would contribute a chronic input of landside pollutants into the marine environment which is likely to adversely modify *A. globiceps* proposed critical habitat through water quality degradation as well as adversely affect habitat for prey species. The persistence and magnitude of the water quality degradation would be dependent upon the extent and duration of conveyance of terrestrial pollutants into the marine environment. For these reasons, USACE has determined the No Action Alternative would cause significant impacts to, and is likely to adversely affect, Federal threatened and endangered species and their habitat.

4.2.3.2 Alternatives 2-4: Revetment and Seawalls

The Alternatives 2-4 all have the same temporary impacts on green sea turtle foraging and habitat quality of the intertidal and reef flat zones in the proposed action area. Construction-related impacts, for example, associated with use of heavy machinery near the shoreline, would be mitigated with BMPs as detailed in Appendix A-3 Attachment 2i. Mariana Fruit Bats may pass through on their way to foraging areas, but none of their roosting tree species were observed in the proposed action area therefore no effect to this species is expected. Direct impacts to ESA listed species that may occur in the ESA Action Area would be insignificant.

Given the existing conditions as previously described in Section 2, the amount of intertidal habitat zone that would permanently be lost under the footprint of Alternatives 2-4 is still expected to be less than would be lost to natural forces under the No Action Alternative. Construction activities would convert an 3,600 sq ft of intertidal zone to revetment for Alternative 2, an estimated 80 sq ft of intertidal zone to open cell piling seawall for Alternative 3, and an estimated 150 sq ft of intertidal zone to secant pile seawall for Alternative 4, and could result in a loss of habitat that may affect foraging and resting green sea turtles. Sediment in the marine environment is not likely to adversely affect *A. globiceps* proposed critical habitat through water quality degradation due to Alternatives 2-4 minimizing erosion. Additionally, construction would not occur between 12 July to 9 August 2027 to avoid impacts to the peak coral spawning period during in-water activities. Direct and indirect impacts to habitat that could be used by ESA listed species in the ESA Action Area would be insignificant.

For these reasons, USACE has determined Alternatives 2-4 may affect, but are not likely to adversely affect Federal threatened and endangered species and their habitat that may be present in the action area, and that effect is expected to be less than significant with implementation of BMPs in Appendix A-3 Attachment 2i. The comprehensive impact analysis is documented in the biological assessment in Appendix A-3 Attachment 2f.

4.2.4 Essential Fish Habitat

In accordance with Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended (16 U.S.C. 1801 *et seq.*), USACE evaluated potential environmental effects on EFH from the implementation of the TSP in the proposed action area. USACE determined the Federal action may adversely affect EFH but does not have the potential to cause substantial adverse effects. Detailed discussion on the USACE determination is included in the EFH Assessment in Appendix A-3 Attachment 3b.

The USACE will continue to coordinate with NMFS as part of the public review of this Draft IFR/NEPA document and throughout the feasibility phase.

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

- Substantial direct or indirect physical, chemical, or biological alterations of the waters or substrate
- Substantial loss of, or injury to, benthic organisms and prey species
- Reduction of habitat availability or quality of a magnitude and/or duration that could substantially affect EFH species
- Substantial loss of MUS
- Reduction of habitat availability or degradation of habitat suitability of a magnitude; and/or duration that could substantially affect a MUS population
- Substantial interference with the movement of MUS
- Introduction of or contribution to the substantial spread of an invasive species

4.2.4.1 Alternative 1: No Action

The No Action Alternative would result in increased sediment and pollution load in the marine environment due to collapse of the seawall and erosion of land causing water quality degradation. The extent and duration of the adverse effects to EFH will be dependent upon the volume, duration, and composition of terrigenous and anthropogenic pollutants into the bay. Due to the vastness of the EFH designation for these fisheries beyond the proposed action area, and the finite source of pollutants along the shoreline within the proposed action area that would be slowly eroded over time (see Section 2.2.3), USACE does not anticipate the adverse effects to be substantial. For these reasons, USACE has determined the No Action alternative would cause less than significant impacts to EFH.

4.2.4.2 Alternatives 2-4: Revetment and Seawalls

Alternatives 2-4 all have the same temporary impacts during construction within the intertidal zone. Impacts to EFH which would be mitigated through implementation of BMPs as detailed in Appendix A-3 Attachment 2i. To minimize impacts that may reduce quality of water column EFH in the proposed action area during construction, construction of each of these alternatives would occur to the greatest extent practicable from the landside using machinery staged on land with a minimal amount of work occurring on the beach and in the intertidal zone for demolition of the existing seawall and site preparation for construction of the new shoreline protection measure. Consideration for weather and tidal fluctuation will be made to minimize potential inundation of the construction footprint. Construction activities along the shoreline will occur at a far enough distance from known coral reefs that no direct impacts are anticipated. Indirect impacts such as possible turbidity, noise pollution, and human presence would occur temporarily during construction and may reduce the quality of water column EFH, e.g., adversely affect EFH. As detailed in Attachment 8 of Appendix A-3, industry-standard ECs will be employed to curtail spread of construction-generated turbidity that could degrade water quality and indirectly impact distant coral reefs. The proposed alternatives would temporarily occupy the intertidal zone and minimally reduce the quality of substrate EFH, i.e., benthos, during construction and would have no permanent impact on substrate EFH as the alternatives would not convert or otherwise result in the reduction of quality or quantity of substrate EFH. Due to the spatial distance preventing direct impacts, the implementation of BMPs and ECs to minimize degradation of water quality throughout construction, which is temporary, and no permanent effects to EFH in the proposed action area, USACE anticipates the adverse effects to water column and substrate EFH for Marianas bottomfish and Pelagic fisheries would not have the potential to be substantial adverse effects and would therefore be less than significant.

4.2.5 Invasive Species

4.2.5.1 Alternative 1: No Action

There are currently no invasive species identified in the proposed action area. Under the No Action Alternative construction activities would not occur and there would be no opportunity for introduction of invasive species by way of a federal action. The No Action Alternative would have no effect on invasive species.

4.2.5.2 Alternatives 2-4: Revetment and Seawalls

All the Alternatives require mobilization of equipment and materials and will also increase human presence. These all present vectors for introduction of invasive species into the proposed action area if appropriate hygiene practices are not implemented. As detailed in Attachment 8 of Appendix A-3 Environmental Commitments, USACE will require its construction contractor to ensure equipment and material are clean and free of invasive species. Upon completion of construction, USACE will ensure no invasive species are used to re-vegetate disturbed areas. Through implementation of these precautions, USACE anticipates less than significant impacts from invasive species.

4.3 Built Environment

4.3.1 Navigation

Under the Rivers and Harbors Act of 1899, Section 10 (33 USC §403 et seq.) the proposed work would not affect navigable WOTUS. The proposed action will be subjected to the public notice and other evaluations normally conducted for activities subject to the Act. The marine waters fronting the Mayor's Complex are navigable as they are a reach of the Territorial Seas and are subject to the ebb and flow of the tide, however the direct footprint and the marine waters immediately adjacent to the existing seawall where in construction activities may occur under the proposed alternatives is intertidal and too shallow to navigate a vessel. Accordingly, both the no action alternative and the proposed alternatives with minimal and discrete footprints in intertidal marine waters will not obstruct navigable WOTUS and therefore have no effect on navigation. The Project will comply with the Act.

4.3.2 Land Use, Public Infrastructure and Utilities

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

4.3.2.1 Alternative 1: No Action

The No Action Alternative would result in loss of the current land use, infrastructure, and utilities when the seawall collapses and the land erodes. USACE has determined the No Action Alternative would cause significant impacts to land use.

4.3.2.2 Alternatives 2-4: Revetment and Seawalls

Alternatives 2-4 would have temporary effects to land use during construction, based on inaccessibility of the site during construction. Alternatives 2-4 would have a positive and long-term effect of protecting the key municipal center, community gathering space, and main power line along Route 2. For these reasons, USACE has determined Alternatives 2-4 would cause beneficial impacts to land use.

4.4 Economic Environment

4.4.1 Socio-Economic Conditions

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.

4.4.1.1 Alternative 1: No Action

The No Action Alternative would result in impacts to socio-economic conditions from the loss of land and infrastructure. For these reasons, USACE has determined the No Action Alternative would cause significant impacts to socio-economic conditions.

4.4.1.2 Alternatives 2-4: Revetment and Seawalls

Alternatives 2-4 would result in short-term positive impacts to the socio-economic conditions with employment for construction and purchase of local supplies and services and long term socio-economic conditions by protecting public infrastructure.

Effects are positive for resource; therefore, no environmental commitments are required. For these reasons, USACE has determined Alternatives 2-4 would cause beneficial impacts to socio-economic conditions.

4.4.2 Environmental Justice

USACE has determined that a proposed action or its alternatives would result in significant effects related to EJ if the proposed action or an alternative would disproportionately adversely affect an EJ community through its effects on:

- Environmental conditions such as quality of air, water, and other environmental media; degradation of aesthetics, loss of open space, and nuisance concerns such as odor, noise, and dust
- Human health such as exposure of EJ populations to pathogens
- Public welfare in terms of social conditions such as reduced access to certain amenities like hospitals, safe drinking water, public transportation, etc.
- Public welfare in terms of economic conditions such as changes in employment, income, and the cost of housing, etc.

USACE conducted an evaluation of EJ impacts using a two-step process: as a first step, the proposed action area was evaluated to determine whether it contains a concentration of minority and/or low-income populations. Following that evaluation, in the second step, USACE determined whether the proposed action would result in the types of effects listed above in a disproportionately, high adverse manner on these populations.

4.4.2.1 Alternative 1: No Action

The No Action Alternative would exacerbate the disadvantages of the community of Guam in the loss of land and public infrastructure upon which this EJ community depends, especially during emergency natural disaster response, as described in Section 4.3 Built Environment. For these reasons, USACE has determined the No Action Alternative would cause significant environmental justice impacts to the community.

4.4.2.2 Alternatives 2-4: Revetment and Seawalls

Alternatives 2-4 would provide positive impacts by protecting public infrastructure and associated resources and related opportunities for the community as described in Section 4.3 Built Environment.

USACE has determined that the proposed project would not have any adverse environmental or human health impacts that would disproportionately affect minority and/or low-income communities. The proposed project may be a benefit to the public health and safety of an economically disadvantaged community by increasing access to natural resources for subsistence purposes, increasing local and regional economic opportunities, increasing welfare of the local population, and adding social and cultural value to the community. For these reasons, USACE has determined Alternatives 2-4 would cause beneficial impacts to the community.

4.5 Cultural Resources

In accordance with 36 CFR § 800.4(a), USACE has identified the proposed undertaking's APE to include both the open cell piling seawall footprint and potential staging areas (Figure 27). The APE encompasses approximately 0.80 hectares (2.0 acres) within the proposed action area. The January 2022 non-invasive pedestrian survey did not identify any cultural resources in the project footprint. The review of published and available grey literature identified the Agat Invasion Beach (66-02-1054) as the only known historic property within the APE. The proposed undertaking is not anticipated to impact any significant characteristic of the Agat Invasion Beach, including the viewshed of Agat Invasion Beach, as the proposed seawall will only be approximately 1 ft taller than the existing seawall. There are no records that any subsurface cultural materials were uncovered during construction of the existing seawall during the 2000s. Additionally, when interviewed during the January 2022 site visit and at subsequent meetings, City of Hågat and GovGuam representatives were not aware of any cultural resources that were identified during the construction of the Agat Mayor's Complex. A finding of "no adverse effect on historic properties" was submitted to the Guam SHPO and other stakeholders on March 21, 2024, in accordance with 36 CFR § 800.5(b). The Guam SHPO concurred with the findings on March 29, 2024, and NPS concurred on March 31, 2024. The Guam Preservation Trust conducted a site visit in response to our notification letter and found no potential adverse effects to historic properties in September 2024. Figure 27 shows the APE and components of the proposed undertaking with temporary and permanent impacts.

Figure 27: APE and components of the proposed undertaking

4.5.1 Monitoring

Although there are no known subsurface cultural materials in the APE and no subsurface cultural materials were identified during the construction of the existing seawall or the Agat Mayor's Complex, due to the potential for an inadvertent discovery, USACE will have an on-site archaeologist who meets the Secretary of the Interior's Historic Preservation Professional Qualification Standards (36 CFR § 61; 48 FR 44738) to monitor all ground-disturbing construction activities within the APE. If human remains are discovered during construction of the proposed undertaking, USACE will follow the Guam Department of Parks and Recreation's General Guidelines for Archaeological Burials, including the Section IV Reburial Guidelines Amendment of 2010.

4.5.2 Alternative 1: No Action

USACE has determined the No Action Alternative would not impact any known historic and cultural resources.

4.5.3 Alternatives 2-4: Revetment and Seawalls

In accordance with 36 CFR § 800.4(a)(1), USACE has determined that the APE is similar for Alternatives 2–4. Although there are no known historic properties within the physical APE, the Agat Invasion Beach (66-02-1054), which is listed in the National Register of Historic Places, is within the visual APE (e.g., viewshed) of these alternatives. Alternatives 2 and 4 would create a visual disturbance to this historic property; however, through consultation it may be possible to minimize adverse effects to a less than significant impact. Alternative 3 would not create a visual disturbance and would have no adverse effect on the Agat Invasion Beach (see Section 106 Consultation letters, Appendix A-3). Alternative 3 would not impact any known historic and cultural resources.

Because historic properties are present in the vicinity, USACE will require an SOI-qualified archaeological monitor be present during all ground-disturbing construction activities within the APE. The Archaeological Monitoring Plan will include an appropriate and respectful Human Remains Recovery Plan that meets the requirements of Guam Territorial Executive Order No. 89-24 and adheres to the Guam Department of Parks and Recreation's 2010 Section IV Reburial Guidelines Amendments. Archaeological monitoring during construction will ensure less than significant impacts to any discovered historical and archaeological resources.

4.6 Cultural and Subsistence Activities

The Agat Mayor's Complex is a key gathering space and provides the community opportunity to practice and continue important cultural and subsistence activities. These activities occur at both the Complex and on the beach. USACE consulted the mayor's office on the community's traditional activities and on the effects of the alternatives.

Effects on cultural and subsistence activities 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 facility
- Substantial reduction in availability of and access to designated communal or open space areas

4.6.1 Alternative 1: No Action

The No Action Alternative would result in the collapse of the existing seawall, erosion of the surrounding land, loss of use of the village community center, loss of recreational access to the beach, and loss of public access for traditional fishing practices. USACE has determined the No Action Alternative would cause significant impacts to cultural and substance activities.

4.6.2 Alternatives 2-4: Revetment and Seawalls

Alternatives 2-4 would temporarily impact access to the water for traditional fishing while construction is active.

Alternative 2 concrete armor unit revetment would replace 320 ft of sandy beach with concrete armor units, eliminating recreational use at the beach. Traditional fishing practices could continue, and the revetment would have the positive effect of protecting the shoreline. Alternative 2 would cause significant impacts to cultural and substance activities due to permanently altering the beach.

Alternative 3 open cell piling seawall would have a 320 ft long and 6 ft wide above ground footprint, which is approximately 5 feet wider than the existing seawall. Existing recreational and cultural fishing practices could continue, and the seawall would have the positive effect of protecting the coastline. USACE has determined Alternative 3 would cause less than significant impacts to cultural and substance activities.

Alternative 4 secant pile seawall would have a 320 ft long and 7 ft wide above ground footprint and would have a positive effect of protecting the shoreline. The 1 ft increased width of this alternative compared to Alternative 3 would cause negligible impacts to recreational practices at the beach. Traditional fishing practices could continue after seawall construction. Alternative 4 would cause less than significant impacts to cultural and substance activities.

4.7 Aesthetics

The picturesque beachfront at the Agat Mayor’s Complex can be enjoyed by visitors and the community during events and gatherings throughout the year. Potential impacts on valued visual character, loss of natural open space, and project aesthetics value and image were evaluated.

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
- Substantial reduction of the views or aesthetic values associated with a historic property, scenic byway, or other important landmark

4.7.1 Alternative 1: No Action

The No Action Alternative would result in continued shoreline erosion. Over time, the beach fronting the Mayor’s Complex would erode away and affect the current visual aesthetics. Therefore, USACE has determined the No Action Alternative would cause significant impacts to aesthetics.

4.7.2 Alternatives 2-4: Revetment and Seawalls

Alternatives 2-4 would temporarily impact the landscaped area along the beach since trees would be removed during construction and later replaced when construction was complete. Project construction activities would also temporarily impact visual character of the proposed project area.

Alternative 2 concrete armor unit revetment would cover 320 ft of sandy beach with concrete armor units at a height of 6 feet above MSL, up to 3 feet higher than the existing wall (Table 8). It would alter visual character and reduce natural open space, since the concrete revetment is wider than the existing seawall, and the strip of beach would no longer be visible. USACE has determined Alternative 2 would cause significant impacts to aesthetics due to permanently altering the beach.

Alternative 3 open cell piling seawall has a crest 5 feet wider than the existing seawall and will extend 3 feet above the ground on the landward side, limiting but not obstructing the view of those under 3.5 feet in height and reducing the view of the beach immediately in front of the wall for everyone. Looking toward the shore from Agat Bay, the appearance of the shoreline protection structure would change, and the Mayor's Complex structures behind it would be less visible. USACE has determined Alternative 3 would cause less than significant impacts to aesthetics.

Alternative 4 secant pile seawall has a crest 6 feet wider and will extend up to 3 feet higher than the existing seawall on the landward side. The 6 ft increased structure width of this alternative compared to the existing seawall would impact visual character similarly to Alternative 3. USACE has determined Alternative 4 would cause less than significant impacts to aesthetics.

4.8 Mitigation

NEPA describes 5 types of mitigation: avoidance, minimization, rectification, reduction, and compensation. USACE has determined that compensatory mitigation is not necessary for the preferred alternative since significant impacts will be avoided through other types of mitigation as described in Section 6.9 and Appendix A-3, Attachment 2i and 8, primarily avoidance, minimization, rectification, and reduction. The majority of the best management practices detailed in Attachment 2i are avoidance and minimization measures. Rectification will include backfilling and replanting with native trees and with grass. Reduction will be relocating any endangered tree snails if found during surveys between Design and Construction.

4.9 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 seawall at Agat Mayor's Complex 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 proposed action area. Based on a review of the related actions, this analysis incorporates the following projects and activities:

4.9.1 Agat Small Boat Harbor O&M Dredging

This project may include beneficial reuse such as beach replenishment at Agat Mayor's Complex or Nimitz Beach. The 2021 survey found 8000 cubic yards are shoaling up in areas that are more impactful to safe navigation than the shoaling areas at Agana. The material is predominantly sand and would benefit the island, which is losing sand.

This project is currently in Design. Construction is anticipated in 2025. This project may result in beneficial reuse of the dredge material and ecosystem restoration, a net beneficial impact.

4.9.2 Drainage Improvements at Agat Mayor's Complex

Existing drains at the parking lot and Sagan Bisita are clogged or not positioned at proper low points to collect water runoff. The mayor's office plans to repair and improve existing storm drains and install additional drainage pipes and catchments to address proper drainage.

These projects are still in early planning phases, and the mayor is currently seeking project funding. Drainage improvements may not start for several years.

4.9.3 Latest Agat-Santa Rita Wastewater Treatment Plant Construction and Operation of Previous Plant

Construction of the new wastewater treatment plant to replace the previous existing one began in 2016 and finished in 2019. The $71 million new greenfield Biological Nutrient Removal (BNR) facility serves more than 2,000 customers in the Agat, Santa Rita, Talofofo and Windward Hills areas. Currently, the wastewater treatment plant can treat 1.6 million gallons of wastewater per day during dry weather and up to 9.3 million gallons per day during wet-weather conditions, and it can accommodate future wastewater flows from a nearby U.S. Navy installation. This connection would increase the dry and wet weather design flows to 4.6 and 13.3 million gallons per day, respectively.

In 2014, a wastewater spill occurred at the previous existing facility. About 12,000 gallons of treated wastewater went into the drainage ditch between the plant and the Agat Cemetery and it also spilled into the shoreline nearby when plant operators encountered mechanical issues at the facility and had the wastewater bypass the problem area. Residents were advised to avoid Ga'an Point Beach, War In The Pacific Nation Historic Park, and the Agat Cemetery areas for two days.

4.9.4 Construction of Sankara Resort-Agat Housing Subdivision Project

The groundbreaking event for the new housing subdivision project occurred on September 14, 2017. The project will convert 5.9 acres of undeveloped private land into a residential subdivision on Umang Road in Agat. The $7.6 million project will feature 33 housing units with a park and add infrastructure such as power, water, sewer, and roads to the property. The initial project completion date was scheduled for mid-2019, but the project could be paused.

4.9.5 National Park Service Update to the Agat Unit Management Plan (UMP)

The NPS has proposed to update the current UMP that will guide the long-term management of the Agat Unit. The current UMP presently relies on the management zoning established in the park’s 1983 general management plan and 1988 statement for management. The NPS would use a new UMP to focus resource restoration efforts on endemic and sensitive ecosystems at Agat, such as its marine ecosystem. The NPS plans to enhance and rehabilitate native vegetation along the beach and in riparian areas while maintaining the open character of the cultural landscape. Native mangrove vegetation, including nipa palm (*Nypa fruticans*), and wetland vegetation would be re-introduced where appropriate to protect the coastline and river outfalls from erosion. Invasive species management would be conducted to the greatest extent possible. Existing vegetation would be managed to protect key views and vistas that allow park visitors to understand the influence of the island’s landforms and vegetation on Japanese and U.S. military strategy. The importance of tree canopy and providing shade for visitors would be considered in viewshed enhancement and vegetation rehabilitation activities. To support coral reef health and resilience, the park would expand efforts to select and outplant coral species that are more likely to be adaptable to ocean acidification and temperature increase. This would also support the health of other marine species that rely on coral, such as fish and invertebrates. In the event of significant coral loss, the NPS would employ an adaptive management approach to determine the increased risk to the shoreline and necessary mitigation measures.

Table 15 considers and summarizes the direct, indirect, negative, and beneficial impacts the described projects may have on the resources in the proposed action area. The Agat-Santa Rita Wastewater Treatment Plant has previously and temporarily impacted water quality of Agat Bay, thus affecting the water quality and marine environment within the proposed action area. The future drainage improvement project may add additional impacts to water quality and the marine environment, assuming that the runoff from land is transferred to the beach. These projects also contribute beneficial effects to Socio-economics and Land Use, Public Infrastructure & Utilities. The use of dredged sediment from the Agat Small Boat Harbor Dredging Project and possible improvements to the management of the Agat Unit provide few temporary insignificant effects during construction, i.e., noise and sand in the water, and provide long-term beneficial effects to the affected resources in the proposed action area. At this time, it is unknown when work will begin or resume for the Sankara Resort. This project would temporarily impact air quality and noise at the proposed action area should construction occur and project vehicles travel on Route 2. Cumulatively, these projects would have less than significant effects on the resources at the proposed action area when combined with the effects from the preferred alternative.

Table 15: Cumulative Actions and Potential Impacts to Resources in the Proposed Action Area

	Type			Affected Resource																		
Cumulative Action	Past	Present	Reasonably Foreseeable Future Actions	Climate	Air Quality/Greenhouse Gas	Geomorphology, Hydrology & Hydraulics	Water Resources and Quality	HTRW	Noise	Terrestrial Habitat	Marine Habitat	Threatened, Endangered Species & Critical Habitat	Essential Fish Habitat	Invasive Species	Navigation	Land Use, Public Infrastructure & Utilities	Socio-economics	Environmental Justice	Historic and Archaeological Resources	Cultural and Subsistence Activities	Aesthetics
Agat Small Boat Harbor O&M Dredging			x			x			x			x	x			x	x	x		x	x
Drainage Improvements at Agat Mayor's Complex			x				x		x	x	x	x	x			x	x				
Agat-Santa Rita Wastewater Treatment Plant	x						x				x	x	x				x			x	
Sankara Resort-Agat Housing Subdivision Project Construction			x		x				x												
NPS Updated Agat UMP Actions			x				x				x	x	x	x			x	x	x	x	x

5.0 PLAN COMPARISON AND SELECTION

5.1 Plan Evaluation

5.1.1 Federal Objective

In accordance with EP 1105-2-58, 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 costs of the alternative is less than the costs 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 a limited economic analysis:

5.1.3 P&G Criteria – Completeness, Effectiveness, Efficiency, and Acceptability

Completeness, effectiveness, efficiency, and acceptability are the four evaluation criteria specified in the P&G in the evaluation and screening of alternative plans (USACE ER 1105-2-103). 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 an alternative provides and accounts for all features, investments, and/or other actions necessary to realize the planned effects, including any necessary actions by others. It does not necessarily mean that alternative actions need to be large in scope or scale.

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 viability and appropriateness of an alternative from the perspective of the Nation's general public and consistency with existing Federal laws, authorities, and public policies. It does not include local or regional preferences for particular solutions or political expediency.

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 (Section3.5). In this section, the final array of alternatives will be compared against each other for cost and performance using each of the four P&G accounts.

5.2.1 Identification of the Least-Cost Alternative Plan

Under the CAP Section 14 authority, the TSP is identified as the least cost alternative plan that is environmentally acceptable, technically feasible, and meets study objectives. The cost to protect must be less than the cost to relocate the threatened facility ($19.7M).

The Plan formulation process compares the estimated project first costs for each alternative within the final array at the same FY 2024 price levels. A summary of cost estimates for each of the alternatives in the final array is included in Table 16. Detailed cost estimates can be found in Appendix A-2.

Table 16: Alternative Cost Comparison

Alternative	Project First Cost (FY24 Price Level)	Cost Ranking
Relocation of the Mayor's Complex	$19.65M	N/A
Alt 1: No Action	N/A	N/A
Alt. 2: Concrete Armor Unit Revetment	$7.57M	2
Alt 3: Open Cell Piling Seawall	$6.71M	1 (Least cost)
Alt 4: Secant Pile Seawall	$8.45M	3 (Highest cost)

5.2.2 P&G Account Comparison

This section compares the final array of alternatives using the four P&G accounts: NED, Regional Economic Development (RED), Other Social Effects (OSE), and Environmental Quality (EQ). A summary of this comparison is presented in Table 17.

Table 17: Alternative Comparison Across P&G Accounts

1 = highest 3 = lowest Alternative	Account			
	NED Ranking	RED Ranking	OSE	EQ
Alt 2: Concrete Armor Unit Revetment	2	3	All alternatives are expected to provide similar OSE benefits by preserving community cohesiveness.	3
Alt 3: Open Cell Piling Seawall	1	2		1
Alt 4: Secant Pile Seawall	3	1		2

5.2.2.1 NED

All alternatives in the final array are expected to provide similar levels of protection to the Agat Mayor's Complex over the 50-year period of analysis, benefitting the national economy through the avoidance of erosion damage to the shoreline that would result in the eventual loss of land and structures. Given a similar level of benefits, net economic benefits would decrease across alternatives as project costs increase. Alternative 3 has the lowest project costs as described in Table 16 and therefore ranks highest in NED benefits.

5.2.2.2 RED

The RED account evaluates impacts of each alternative on levels of income, output, and employment throughout the region. Loss of a communal gathering place and emergency evacuation center will negatively impact the local economy. For this reason, all structural alternatives protecting the Complex resulted in positive RED benefits. To compare these alternatives against each other, benefits are measured by the number of jobs expected to be created for each alternative and the income generated from these jobs. It is assumed that RED benefits scale with estimated labor hours projected for each alternative. Alternative 4 estimates the highest number of labor hours and is ranked highest for RED benefits.

5.2.2.3 OSE

Maintaining community cohesiveness is the primary OSE benefit associated with protecting the Agat Mayor's Complex. Because all alternatives in the final array are expected to provide similar levels of protection from shoreline erosion, it is assumed that OSE benefits are similar across all alternatives. Therefore, the cost-effectiveness of OSE benefit provision decreases as total project costs increase.

5.2.2.4 EQ

An evaluation of potential environmental impacts by resource category for each of the alternatives in the final array is included in Section 4.0. 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 18 provides an assessment of environmental acceptability for each proposed alternative in the final array.

Table 18: Assessment of Environmental Acceptability

Alternative	Significantly Affected Resources	Environmental Impacts
Alt 1: No Action	Geomorphology, Hydrology, Hydraulics, Water Resources and Quality, Special Aquatic Sites, Terrestrial Habitat, Marine Habitat, Threatened and Endangered Species, Critical Habitat, Land Use, Public Infrastructure, Utilities, Socio-economics, Environmental Justice, Cultural and Subsistence Activities, and Aesthetics	High
Alt 2: Concrete Armor Unit Revetment	Geomorphology, Cultural and Subsistence Activities, and Aesthetics	Medium
Alt 3: Open Cell Piling Seawall	None	Low
Alt 4: Secant Pile Seawall	None	Low

Alternative 1 and 2 are expected to cause significant impacts to the resources listed above. However, Alternative 2 is environmentally acceptable since its effects on the other resources range from beneficial to less than significant. The resources of Geomorphology, Cultural and Subsistence Activities, and Aesthetics would be significantly impacted regardless under the No Action plan if Alternative 2 is not implemented. Alternatives 3 and 4 are also environmentally acceptable and are not expected to result in significant impacts on environmental resources after implementation of BMPs listed in Section 6.9. Alternative 3 has the smallest structure footprint (Table 8), an estimated 6-month construction period, and it affects the least amount of area (Table 12). Therefore, it ranks highest in EQ. Alternative 4 ranks second in EQ for a slightly larger structure footprint and an estimated 8-month construction period. Alternative 2 ranks third due to having the largest structure footprint and an estimated 12-month construction period.

5.3 Plan Selection

Based on the comparison of the final array of alternatives, Alternative 3: Open Cell Piling Seawall is selected as the TSP. Alternative 3 was assessed as environmentally acceptable and is not expected to result in significant impacts on environmental resources (Table 18), engineeringly feasible, and is the least cost alternative (Table 16) that meets study objectives. Alternative 3 is more cost effective than relocating the Agat Mayor’s Complex (Table 16). As it meets all the study objectives described in Section 5.1, Alternative 3 was selected as the TSP.

6.0 THE TENTATIVELY SELECTED PLAN

6.1 Plan Components

The TSP is Alternative 3: Open Cell Piling Seawall. This alternative consists of removal of the existing seawall and the construction of a 320 ft long by 2 ft wide seawall along the shoreline fronting the Agat Mayor's Complex. The TSP includes the following components:

- Demolition and removal of the existing seawall
- Installation of open cell vinyl sheetpile cells until refusal (approximately 12 ft below existing ground surface)
- 2-inch diameter pin piles to anchor the open cell sheet piles, installed approximately 5 ft into existing limestone shelf
- Reinforced concrete fill to backfill the open cells
- Tieback anchors placed every 8 ft for the length of the seawall

See Figure 23 for cross section of the TSP and Figure 24 for footprint and staging areas.

6.2 Plan Accomplishments

The construction of the TSP (Alternative 3: Open Cell Piling Seawall) will reduce the imminent risk of coastal erosion damage at the Agat Mayor's Complex. The Complex will continue to serve the community as an emergency shelter, evacuation facility, community center, and community gathering place. The Complex will also continue to support subsistence activities such as *talaya* throwing, rod and reel fishing, and free diving. Continued accessibility to and use of the Mayor's Complex will result in community cohesion and increase public health and safety. At the FY24 discount rate of 2.75%, the project first cost estimate of the TSP is approximately $6.7 million dollars. The TSP accomplishes the project objectives while meeting USACE engineering standards.

6.3 Cost Estimate

The project first cost of the TSP (Alternative 3: Open Cell Piling Seawall) is $6.7 million. In accordance with the cost share provisions of Section 14 of WRDA 1986, as amended (33 USC 2213), the Federal share of the project first cost is estimated to be $5.0 million, and the non-Federal share is estimated to be $1.7 million. This cost share estimate does not include additional interest to the mid-point of construction, which will be estimated with the fully funded project costs in the final report.

Table 19 provides the cost breakdown for the total project first cost. Detailed information on project costs can be found in the Appendix A-2 Cost Engineering.

Table 19: Cost Breakdown of the TSP

Construction Item Cost	Project First Cost (FY24 Price Level)
Construction	$4,160,000
Environmental & Cultural Mitigation	$825,000
LERRDs	$58,000
Preconstruction Engineering & Design	$1,040,000
Construction Management	$624,000
Total Project First Cost	**$6,707,000**

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

The requirements for lands, easements, rights-of-way and relocations, and disposal (LERRDs) areas should include the rights to construct, maintain, repair, operate, patrol, and replace ecosystem restoration measures. The NFS is responsible for acquiring all necessary real estate interests required for the project. The NFS will acquire adequate interest in both land and water holdings of the Territory of Guam. Should it be determined that additional real estate is required for the project after the completion of the plans and specifications, the NFS will be responsible for providing the additional lands identified. See the Real Estate Appendix for further details regarding real estate considerations.

6.5 Operations, Maintenance, Repair, Replacement and Rehabilitation

Per EP 1105-2-58 (USACE 2019), operations, maintenance, repair, replacement, and rehabilitation (OMRR&R) is a 100% non-Federal responsibility.

The vinyl cells used for the design of the open cell piling seawall have an estimated life expectancy of 75 years, which is longer than the 50-year horizon used for this planning study. The tiebacks will be constructed out of corrosion resistant materials such as stainless-steel fasteners, stainless steel, galvanized, or fiberglass rebar, and portland cement concrete. These products have an estimated life expectancy of 75 to 100 years which is longer that the 50-year horizon used for this planning study. Maintenance of the seawall includes filling cracks/holes with pressurized epoxy as needed (does not need to be watertight), filling depressions behind the wall (if falling through cracks), replacement of single cells as needed (likely not needed for a minimum of 20 years), clearing of vegetation, and cleaning out weepholes. OMRR&R costs for the TSP are estimated at 10% of the initial construction cost at year 20 for replacement of single cells and an annual cost of $15,000 for vegetation removal and regular maintenance.

6.6 Project Risks

The TSP, open cell piling wall, will provide protection from imminent failure due to coastal erosion to the Agat Mayor's Complex. The following high-risk items were identified during the plan formulation process:

Estimated costs are subject to inflation and supply chain risks, potentially affecting market conditions, bidding climate, and material costs. 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 in remote areas such as Guam, 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 Abbreviated Cost Risk Analysis in Appendix A-2.

Lack of existing geotechnical data may affect design quantities and thus, plan selection. For feasibility level of analysis, existing LiDAR data is sufficient to make a risk informed decision on plan selection. During the D&I phase, the team recommends geotechnical borings and testing to provide more specific depth to limestone. A deeper limestone shelf affects the revetment alternative, requiring a wider extent for excavation. Since both seawall alternatives have limited excavation extents regardless of depth to limestone, this risk is determined tolerable by the study team.

Residual risk: For all sea level rise scenarios 25 years into the future under storm conditions for a 10-year wave event or greater have water elevations that exceed the ground elevation (+3 ft MSL) and crest of the proposed seawall (+6 ft MSL). The crest of the open cell piling seawall (the TSP) is raised +3ft in front of the Mayor's compound from the existing seawall. This elevation is consistent with the height of the seawall in front of the Sagan Bisita, which is mostly not being included in this study as it lies on NPS lands. This height is also within reason for the use of the property as a community and cultural center, raising the wall height higher than the additional 3 feet would impede the viewshed and use of the property. A paved promenade is also included to aid in stabilizing the backshore during high overtopping and/or inundation events. However, it is recognized that the project will not be able to completely prevent inundation during future 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. As the open cell pilling seawall design is further developed in the PED phase, the design must account for the anticipated degree of future inundation and overtopping to ensure structure stability.

This residual risk was determined to be acceptable for this project since the shore protection structure will provide increased stability to the eroding shoreline. To further mitigate against coastal hazard inundation, a more comprehensive study should be completed including the evaluation of other nonstructural floodproofing measures such as elevating structures, or dry floodproofing; however, such considerations are beyond this project's authority.

Residual Risk: Based on the project authority, i.e., emergency shoreline protection, the proposed project is appropriately limited in nature. Shoreline erosion is likely to impact other unprotected shoreline areas, such as the seawall on park lands adjacent to the existing structure, where erosion is occurring. The Mayor's Compound could continue to be vulnerable to erosion depending on the extent of the impacts. This residual risk was determined to be acceptable for this project since the Recommended Plan will provide shoreline protection in the most urgent area where shoreline erosion is threatening the stability of the Mayor's Compound.

6.7 Cost Sharing

Projects implemented under the Section 14 authority are generally cost shared 65/35 Federal to non-Federal, or as described by the terms of the Project Partnership Agreement (PPA). Model PPAs can be found online at https://www.usace.army.mil/Missions/Civil-Works/Project-Partnership-Agreements/model_cap/. Per the terms of the PPA, the NFS is responsible to contribute a minimum of 35 percent, up to a maximum of 50 percent, of construction costs.

U.S. Territories such as Guam are subject to an additional waiver reduction (value based on FY) in accordance with Section 1156 of WRDA 1986, as amended (33 U.S.C. 2310). In FY23 when the FCSA was executed, the Section 1156 waiver was $665,000. The D&I Section 1156 waiver is based on the FY24 level of $648,000.

CAP Section 14 projects have a Federal expenditure limit of $10 million after accounting for costs in both the feasibility and D&I phases. To identify whether the projected study costs remain with the authorized limit, Table 20 breaks down the share of project study first costs for the Federal government and NFS.

The Federal share for the feasibility phase is $860,500 and $5.0 million for the D&I phase, summing to a total of $5.9 million, which is well within the CAP Section 14 Federal per-project limit of $10 million.

The non-Federal share is $95,500 for the feasibility phase and $1.7 million for the D&I phase, for a total study share of $1.8 million.

Table 20: Cost Sharing Breakdown (First costs, FY24)

Alt 3: Open Cell Piling Seawall (TSP)	Federal	Non-Federal	Total
Feasibility Phase			
Federal Interest Determination	$100,000	$0	$100,000
Feasibility Study	$760,500	$95,500	$856,000
Total Feasibility Phase	**$860,500**	**$95,500**	**$956,000**
D&I Phase			
Construction (Incl. PED/S&A)	$6,649,000	$0	$6,649,000
LERRD	$0	$58,000	$58,000
Subtotal D&I Phase	$6,649,000	$58,000	$6,707,000
Adjustments			
5% Min Cash Contribution	($335,000)	$335,000	$0
Additional Cash Contribution	($1,954,000)	$1,954,000	$0
Total Before Waiver	$4,360,000	$2,347,000	$6,707,000
	65%	35%	
Sec 1156 Waiver	$648,000	($648,000)	$0
Total D&I Phase	**$5,008,000**	**$1,669,000**	**$6,707,000**
Feasibility & D&I Phases			
Feasibility Phase	$860,500	$95,500	$956,000
D&I Phase	$5,008,000	$1,669,000	$6,707,000
Total Cost Apportionment	**$5,868,500**	**$1,794,500**	**$7,663,000**

**Note: Numbers may not add up due to rounding*

6.8 Design and Construction

6.8.1 Design Considerations

The LiDAR-determined topography elevations, AEP curves, SLC curves, and results of wave modeling were used to inform the crest elevations of the revetment and other proposed structural alternatives. With this information, it was concluded that a new crest elevation of +6 ft MSL, or a 3-ft increase from the existing seawall, is appropriate in front of the Mayor's compound. This elevation aligns with the seawall at Sagan Bisita, creating a uniform barrier along the shoreline to prevent weak points and enhance safety. While the designs are not optimized for overtopping, the raised crest helps mitigate erosion and reduces overtopping events.

Considering 100-yr SLR, it is expected that the low curve will still function under the current design criteria, however the intermediate and high curves will likely require additional modification of the structure height. A detailed account of engineering design considerations is included in the Engineering Appendix.

Weep holes will be installed in the wall to allow escape of trapped water from overwash or rain events. Connections between the individual cell panels will not be water tight so water may be able to drain in between the panels as well.

6.8.2 Construction

Construction of the open cell wall would not require any trenching to install the open cell panels. The panels will be driven into the ground with a vibratory hammer. Once the panels are driven to refusal, the insides will be cleaned out using a water jetting method where the soil plug is washed out the top of the cell. The only trenching that should be involved in the installation process is for the installation of the deadman anchors. These anchors are spaced every 8 ft throughout the length of the project and extend approximately 10 ft behind the wall. The trench will be approximately 6 inches wide and 5 ft deep and the dead man anchor will be a 2 ft by 2-ft concrete block that is buried 3 ft below the existing ground surface. There will be approximately 40 anchors installed with 1 yard of excavation per anchor.

6.9 Environmental Commitments

USACE and its contractors commit to avoiding and minimizing adverse environmental effects during construction activities by including the ECs described in Attachment 8 of Appendix A-3 and any other appropriate recommendations that arise in consultation into in the contract specifications. Due to the limited nature of construction disturbance, the activities of the proposed action are not expected to cause any long term adverse environmental effects. ECs and BMPs would be implemented to ensure that potential construction-related effects are avoided and/or minimized to a less than significant level. Impacts to certain resources are not anticipated for the proposed action and therefore no additional minimization measures are proposed for these resources.

6.10 Environmental Operating Principles

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

- 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 has coordinated with partners and stakeholders early in the process and has made a concerted effort engage the resource agencies.
- The TSP incorporates lessons learned from similar actions (e.g., other Flood Risk Management 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., USACE nonstructural working group, Engineering with Nature). The study team also sought technical assistance from state and Federal resource agencies.
- 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 3) considered areas of relevant risk and plans to implement mitigation where risks exist.

6.11 Views of the Non-Federal Sponsor

Alignment for the NFS’ support was coordinated with the Governor of Guam. The GovGuam expressed support for the TSP (Alternative 3: Open Cell Piling Seawall) at the TSP milestone meeting held July 30, 2024. Concurrent with the draft decision document release, the study team will coordinate a public meeting in Guam to complete necessary outreach with the public, local agencies, and specific stakeholders.

7.0 ENVIRONMENTAL COMPLIANCE

7.1 Environmental Compliance Table

Details of environmental compliance are given by law, regulation, or policy in Section 3 of Appendix A-3. USACE is in compliance with the feasibility phase to move into the design phase. USACE will continue to be in compliance in the design and construction phase.

Table 21: Status of Environmental Compliance

Law, Regulation, Policy	Status
National Environmental Policy Act	In Progress
Clean Air Act	In Progress
Clean Water Act	In Progress
Rivers and Harbors Act	In Progress
Marine Protection, Research, and Sanctuaries Act	Not Applicable
Migratory Bird Treaty and Conservation Acts	In Progress
Marine Mammal Protection Act	In Progress
Anadromous Fish Conservation Act	Not Applicable
Fish and Wildlife Coordination Act	In Progress
Endangered Species Act	In Progress
Magnuson-Stevens Fishery Conservation and Management Act	In Progress
Coastal Zone Management Act	In Progress
Uniform Relocation and Real Property Acquisition Act	Not Applicable
Farmland Protection Policy Act	Not Applicable
National Historic Preservation Act	In Progress
Federal Water Project Recreation Act	Not Applicable
Wild and Scenic River Act	Not Applicable
Estuary Protection Act	Not Applicable
Coastal Barrier Act and Coastal Barrier Improvement Act	Not Applicable
EO 14008 Justice40	In Progress
EO 13571 Invasive Species	In Progress
EO 13690 Floodplain Management	Not Applicable
EO 13045 Protection of Children from Environmental Health Risks	In Progress
EO 12898 Environmental Justice	In Progress
EO 11990 Protection of Wetlands	Not Applicable

7.2 Public Involvement

7.2.1 Scoping

A charette was held July 17 and 18, 2023, and included representatives from GDPW, GBSP, Guam Coastal Management Program, Department of Land Management, GEPA, SHPO, NPS Guam, Agat Mayor’s Office, USFWS, NMFS PIRO HCD, USEPA Region 9, and USACE.

7.2.2 Agency Coordination

A Resource Agency Workshop was held on July 17, 2023, as part of the project Charette and Resource Agencies Workshop, and included representatives from the Agat Mayor’s Office, Guam EPA, Guam Department of Land Management, Guam State

Historic Preservation Office, GDPW, GBSP, Guam Coastal Management Program, DPR, USEPA, NPS, USFWS and the National Marine Fisheries Service (NMFS).

USACE will continue coordination with the USEPA and GEPA during the feasibility phase draft IFR/EA public review period and through the design phase for this project to determine whether a Section 401 Water Quality Certification (WQC) is required. If required, a Section 401 WQC will be requested from GEPA for any CWA permits requested from either USEPA or USACE prior to construction of the project. With respect to the Section 401 water quality certification, USACE would be responsible for compliance during construction while the GDPW would need to comply separately with Section 401 for O&M, as applicable.

7.2.3 Public Comments Received and Responses

This section will be updated with comments received during the public comment period following release of the Draft IFR/EA.

8.0 DISTRICT ENGINEER RECOMMENDATIONS

I have considered all significant aspects of this project, including environmental, social, and economic effects and engineering feasibility. I support Alternative 3, the TSP, for the Agat Emergency Shoreline Protection 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 first cost of the TSP is approximately $6,707,000. The Federal portion of the estimated total project cost is approximately $5,008,000. The non-Federal sponsors' portion of the estimated total project costs is approximately $1,699,000. All amounts are in FY24 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, in accordance with the terms of a project partnership agreement entered into prior to commencement of design work for the project and as further specified below:
    - Pay, during design and implementation, cash contribution of funds equal to a minimum of 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 USC 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 USC 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 approved for implementation funding. However, prior to approval, the Government of Guam, 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.

Based on this report, the reviews by other Federal, State and local agencies, input of the public, and the review by my staff, it is my determination that the Recommended Plan would not cause significant adverse effects on the quality of the human environment; therefore, preparation of an Environmental Impact Statement is not required, and I recommend the Recommended Plan for implementation based on economic justification and environmental acceptability.

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ADRIAN O. BIGGERSTAFF
Lieutenant Colonel, U.S. Army
District Engineer

9.0 PREPARERS OF THE ENVIRONMENTAL ASSESSMENT

9.1 List of Preparers

The team members listed below provided substantial text to the Agat Emergency Shoreline Protection Study IFR/EA.

Table 22: List of IFR/EA Preparers

Name	Contribution	Affiliation
Mike Terlaje	Project Management	USACE Honolulu District
Marian Dean	Environmental Resources	USACE Hawaii & Alaska Regional Planning Team
Connie Chan-Le	Environmental Resources	USACE Hawaii & Alaska Regional Planning Team
Tyler Teese	Cultural Resources	USACE Hawaii & Alaska Regional Planning Team
Vera Koskelo	Plan Formulation	USACE Honolulu District
Cindy Acpal	Plan Formulation/ PM support	USACE Honolulu District
Phillip Ohnstad	Cost Engineering & NED/RED development	USACE Walla Walla District
Catie Dillon	Coastal Engineering	USACE ERDC CHL
Jessica Podoski	Coastal Engineering	USACE Honolulu District
Justin Miller	Geotechnical Engineering	USACE Alaska District
Patricia Lemay	Real Estate	USACE Alaska District

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AGAT EMERGENCY SHORELINE PROTECTION
CONTINUING AUTHORITIES PROGRAM - SECTION 14
AGAT, GUAM

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

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Honolulu District

Appendix A-1.1: Coastal Engineering

Agat, Guam

CAP Section 14 Emergency Shoreline Protection

Draft Integrated Feasibility Report and Environmental Assessment

September 2024

Table of Contents

1. General

The following describes the technical assessment completed as part of the U.S. Army Corps of Engineers (USACE) Agat, Guam CAP Section 14 Emergency Shoreline Protection study. The purpose of the study is to conduct a feasibility level evaluation of the existing coastal and hydraulic conditions including extreme water levels, wave climate evaluation, and sea level change that affect the study area, and evaluation of the proposed shoreline stabilization alternatives to determine the recommended plan.

1.1. Previous Reports

Previous Federal reports, listed below, have assessed various conditions within the region and are referenced within this document as needed.

- **Guam Shoreline Atlas**, U.S. Army Corps of Engineers, Honolulu Engineer District, October 2021. The Guam Shoreline Atlas describes the physical characteristics of the Guam shoreline, and is focused on an evaluation of shoreline erosion problems, potential of at-risk infrastructure, and identification of shorelines needing additional protection.
- **Agat Bay Regional Shoreline Investigation, Planning Assistance to States Program, Final Assessment Report**, U.S. Army Corps of Engineers, Honolulu Engineer District, July 2020. This study conducted a regional assessment of the Agat shoreline located on the Island of Guam to identify areas of significant shoreline erosion, determine the causes of the erosion, develop conceptual plans for shoreline stabilization, and investigate various modifications to Agat Small Boat Harbor to address issues experienced by harbor users.
- **Typhoon-Induced Stage-Frequency and Overtopping Relationships for the Commercial Port Road, Territory of Guam**, Edward F. Thompson and Norman W. Scheffner, U.S. Army Corps of Engineers Engineering Research and Development Center, January 2002. This report describes the procedures and results of a typhoon stage frequency and overtopping analysis for a vulnerable section of the commercial port road along Cabras Island, Apra Harbor, U.S. Territory of Guam. Techniques from this study were applied in this report. The results of this study have been incorporated into the analyses contained in this report.
- **Flood Insurance Study, Territory of Guam**, U.S. Army Corps of Engineers, Pacific Ocean Division, September 1983. The study was completed by the U.S. Corps of Engineers for the Federal Emergency Management Agency (FEMA) under the authorities of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. The flood insurance study investigated the existence and severity of flood hazards on the island of Guam. The study also developed flood risk data for various areas of the community that have been used to establish actuarial flood insurance rates and assist the community in their efforts to promote sound flood plain management. A section of the report covered the problems of coastal flooding and documented several accounts of damages by wind generated waves.

1.2. Problem Description

Currently, the municipal government headquarters of Agat, commonly referred to as the "Mayor's Office," is located directly on the coastline and under threat of coastal erosion. This collection of buildings includes the mayor's office, emergency shelter and evacuation facility, post office, and community gathering space spanning approximately 450 feet along the shoreline. Route 2 runs parallel to the shoreline on the landward side of the public structures (approximately 500 feet from the coastline) and is the only road along the western shore from the administrative capital of Guam (Hagatna) to Agat and other municipalities. A main power line also runs along Route 2. The furthest oceanward building is just a few feet from a concrete rock masonry (CRM) seawall that protects it from the eroding shoreline (*Figure 1*). Adjacent to the mayor's office is another community facility, Agat Sagan Biesta, with pavilions along the shoreline and an adjoining seawall. The proximity of these buildings and facilities to the seawall make them vulnerable to wave overtopping during high wave events. The seawall itself is vulnerable to undermining due to continued erosion of the beach.

Figure 1. Existing Seawall

2. Existing Site Conditions

The following is a general description of the existing conditions of the project area, as known at the time of this study, which are utilized in developing the proposed alternatives for the site.

2.1. Study Area

The study area is located on the south west coast of Guam in the village of Agat. Agat is one of 19 municipalities on the Island of Guam. Located along Guam's western shore, it is home to an existing Corps of Engineers Small Boat Harbor and exhibits development typical of moderately urbanized coastal communities on islands with narrow, steep watersheds where both flash flooding from riverine sources can occur concurrently with coastal flooding due to coastal storms such as typhoons. Located immediately south of the study area is historical National Park Service lands, which overlaps the "Mayor Office" compound, reducing the project area length by approximately 130 ft. (*Figure 2* and *Figure 3*).

Ga'an Point NPS Boundary

Figure 2. National Park Service Land Extents into Project Area

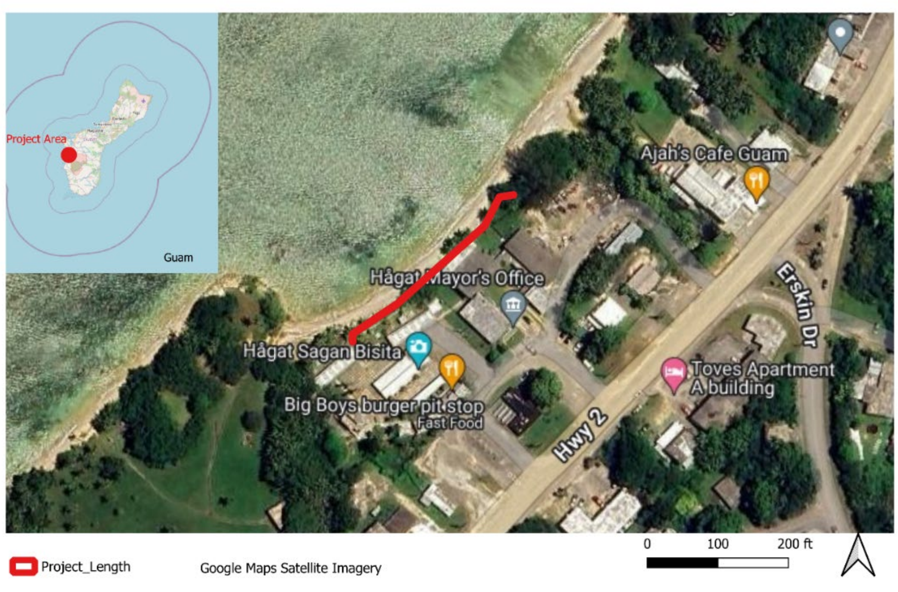


Figure 3. Project Area

The project area is fronted by a fringing reef, approximately 0.2-0.3 miles wide, with maximum water depths of ~6 feet. The reef is continuous for most of its length, and is highly effective at dissipating most wave energy from reaching the beach during periods of typical water levels and wave heights. Due to the south-westerly location on Guam, and the protection provided by the large headland, Orote Point to the north, the shoreline within this area is sheltered from the prevailing wind and wave energy from the northwest to the south. The beach within the project area is narrow, approximately 20-30 ft wide. The beach appears stable with evidence of past erosion occurring on the backshore or upland side of the existing seawall. This erosion is thought to be caused by storm induced elevated water levels and wave energy.

An existing seawall runs the length of the project area. This wall's foundation is located at an unknown depth, but assuming typical historical construction methods for the area, is likely located only a few feet below the current shoreline elevation, and not onto hard substrate or constructed footings. Site visit explorations determined that the depth of the wall likely varies along the length of the existing wall, a product of the walls being constructed at different times. Since construction, erosion of the backshore and at the flanks of the wall, have degraded the overall stability and functionality of the wall. Due to the continued exposure of the beach to elevated water levels and wave energy, this structure will continue to be susceptible to further undermining and eventual failure.

Figure 4 and *Figure 5* present a sample of the general conditions of the existing seawall following Typhoon Mawar in 2023.

Figure 4. Post Coastal Storm--Existing Conditions

Figure 5. Post Coastal Storm--Existing Conditions

The shoreline was assumed to be relatively consistent throughout the project limits with subtle changes to the orientation, profile and elevation of the foreshore and beach elements. There is some variation along the backshore area throughout the project limits, with varying widths of backfill between the shoreline and buildings. As mentioned, the sandy foreshore is approximately 20-30 feet wide along the project area.

Sparsely grouped trees lie along the project area, with 5-8 trees located just behind the existing structure. Between the Mayor's Building and the Sagan Bisita are a set of access stairs which lead to the beach.

There is one outflow point located adjacent to the stairs within the project length. There is riverine outflow on the south side of the Sagan Bisita, but is located on National Park Lands, outside of the project area. It is assumed that the outflow point located within the project area is for storm water management; as there is no other permanent inland waterway within the project limits.

2.2. Climatology

The Guam climate is tropical, with warm and humid conditions throughout the year. The surrounding ocean has a year-round temperature of 81 degrees and is largely responsible for the island's climate. There are two distinct seasons, defined by variations in wind and rainfall. A dry season extends from January through May, and a wet season from July through November. December and June are transitional months. Annual rainfall averages are typically above 80 inches. Easterly trade winds occur throughout the year but are dominant during the dry season. From July to October the winds become variable, and the occurrence of typhoons increases.

2.3. Tropical and Extratropical Storms

In the western Pacific Ocean, west of the International Date Line, hurricanes are referred to as typhoons. This term is analogous to hurricanes in the eastern Pacific Ocean or western Atlantic Ocean. The low latitude location of Guam is favorable for tropical storm and typhoon formation and passage. The island often experiences typhoon impacts which are highly dependent on the storm track. Typical typhoon impacts include wind and rainfall damage to buildings, roads and crops, and coastal inundation and resulting damage during periods of high waves and water levels.

Typhoons are tropical storms with winds of 65 knots or greater with associated intense rainfall. Although severe typhoons occur in the western Pacific throughout the year, the period from July to December is characterized as the primary typhoon season. From 1900 to 1941 Guam was affected by 23 typhoons, and from 1945 to 1990 Guam was affected by 37 typhoons. Gaps in the data exist from 1942-1944 when Guam was occupied by Japanese forces (Weir 1983). In 1962, Typhoon Karen destroyed 90% of the homes on Guam, with estimated peak sustained wind of 135 knots (Rupp and Lander, 1996). Typhoon Pamela in 1976, with sustained winds of 120 knots, stalled off the west coast of Guam for several days, resulting in extensive damage to coastal facilities. Typhoon Yuri in 1991 caused extensive beach erosion and structural damages with gusts up to 100 knots. The storm also produced extreme waves in the area. Typhoon Omar and Gay devastated the island in 1992, with sustained winds of 170 knots and 87 knots, respectively. Then in 1997, Typhoon Paka, with an estimated maximum sustained wind speed of 107 knots at Apra Harbor, destroyed roughly 1,500 buildings, leaving an estimated 5,000 people homeless (EQE International 1998 and NCDC 1997). Typhoon Pongsona in 2002, left more than 60% of the island's water wells inoperable and destroyed approximately 1,300 homes (FEMA 2003 and Gillespie 2002). The most recent typhoons to affect Guam was Typhoon Wutip in February 2019, with sustained winds of 130 knots and Typhoon Mawar in June 2023, with sustained winds of 122 knots.

Extratropical storms are generated far from the island of Guam. These types of events can be generated by an extratropical storm in the northern or southern Pacific Ocean or a large event in the Southern Ocean. They are characterized by waves generated far away from the project site that propagate across the open ocean, interact with each other, and finally impact the project site with large waves. Distant typhoons are also capable of generating a wave-only event if the storm is large enough and traveling in specified direction in relation to the island. The difference between a typhoon condition and the extratropical swell condition is the longer period of the swell conditions along with a minimal increase to the nearshore water levels.

2.4. 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.

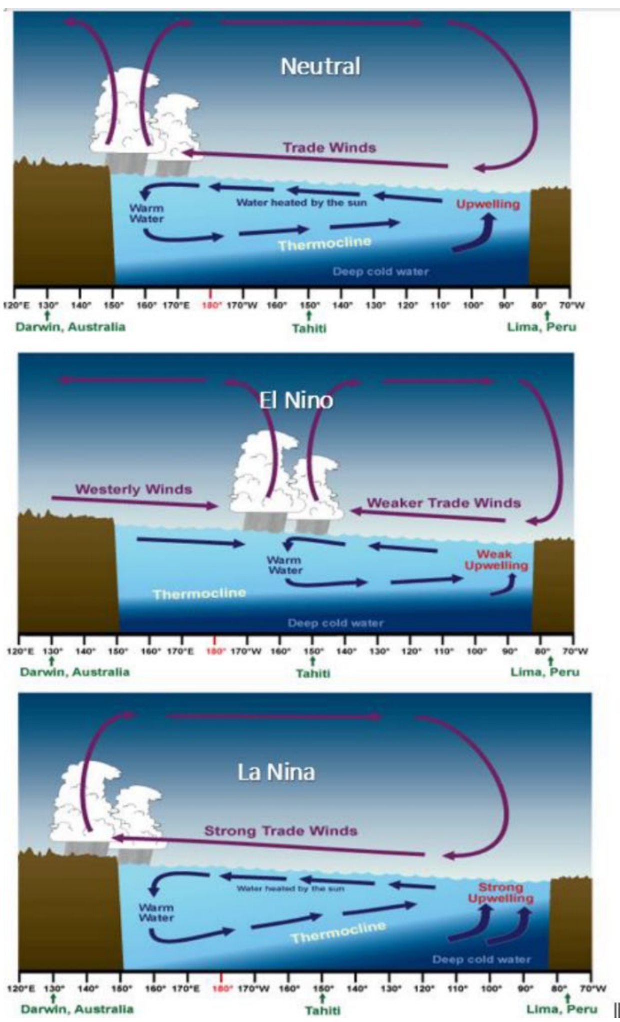


Figure 6. ENSO Fluctuations in the Pacific: Neutral, El Niño, and La Niña (Source: NOAA)

2.5. Winds

The USACE Wave Information Study (WIS) provides offshore wind statistics at selected stations around Guam. The nearest WIS station to the Agat project area is station 81414, located at 13.5° N and 144° W, approximately 45 miles from the project site. A wind rose displaying the frequency (%), wind speed (in meters/second), and wind direction (wind coming from) for 1980-2022 is shown in *Figure 7*. The dominant winds in Guam are the easterly trade winds, which approach from the sector northeast through east-southeast. They occur approximately 70 percent of the time throughout the year, but are particularly pronounced during the dry season, January through April, when they occur more than 90 percent of the time. Typical trade wind speeds fall in the 3.6 to 8.2 m/s range. Wind speeds greater than10 m/s only occur about 5 to 10 percent of the time. Wind directions are variable with frequent calms during the main typhoon season from July to December. Trade winds, although they occur less frequently than during the dry season, are still the most common winds during this period. The highest percentage of strong winds come from the northeast.

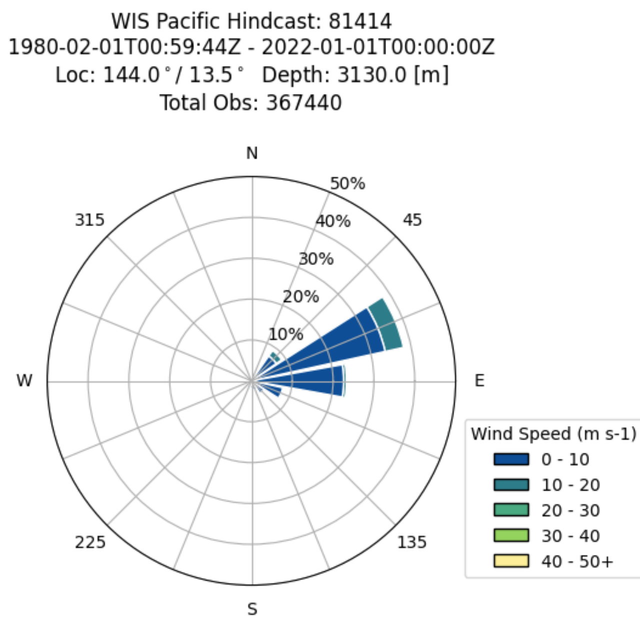


Figure 7. Wind Rose from WIS Station 81414 near Guam

From 1999 to 2020, the average yearly max wind speed recorded at NOAA Station 630000 located in Apra Harbor, was 22.3m/s. The average wind speed was 5.3m/s, with a modal wind speed of 1.3m/s. During this twenty-one-year record there were three incidences of recorded sustained wind speeds with typhoon intensities - in December 1999 (63.5m/s), November 2000 (75.5m/s), and December 2001 (63.5m/s). This indicates that while Guam is affected by one or more typhoons almost every year, they often do not pass directly over Guam, and/or that high winds can be very localized. Data records can also be limited by failure of the measurement equipment during high winds.

2.6. Tsunamis and Earthquakes

An earthquake is a series of seismic waves created by the sudden release of stored energy in the Earth's crust. A tsunami is a long period open ocean wave or series of waves typically caused by an earthquake or underwater landslide. There have been 12 major earthquakes and

4 tsunamis recorded in Guam since 1849. The most significant earthquake event occurred in August 1993, with an 8.1 magnitude. No deaths were reported, but approximately 50 people were injured and more than $200 million in property damage were reported (Brunsdon, 1993). The 1993 earthquake caused land subsidence, affecting Guam's relative sea level change rates (see Section 2.8.2). This earthquake also generated a minor tsunami. A report from Lander et al. (2002) that considered the risk of destructive tsunamis in Guam, notes that locally generated tsunamis are most likely to affect the less populated east coast due to the location of the Marianas Trench, which is the main origin of Guam's earthquakes. The most recent tsunami event to affect Guam occurred in February 2010. The tsunami was generated from an 8.8 magnitude earthquake near Chile and measured 0.5 ft at Apra Harbor.

2.7. Bathymetry and Topography

The recently available 2020 National Ocean and Atmosphere Administration (NOAA) National Geodetic Survey (NGS) topography and bathymetry (topobathy) LiDAR was retrieved from the NOAA digital coast data access viewer (https://coast.noaa.gov/digitalcoast/tools/dav.html) for evaluation of nearshore and foreshore elevation conditions. The LiDAR data accuracy is set according to the National Map Accuracy Standards (NMAS) which requires vertical accuracy with a root mean square error (RMSE) of ±7 feet and horizontal accuracy within ±40 feet for 90% of tested points for 1:24,000 scale maps. These standards ensure that LiDAR-derived products meet the reliability needed for detailed topographic and mapping applications. All topo lidar data were collected simultaneous to meet United States Geological Survey, Quality Level 1 (USGS QL1) with a minimum of 8 pts per square meter at an accuracy of 10cm RMSEz. A minimum of 2 points per square meter were acquired for bathymetric lidar data. The LiDAR had a resolution of 1-meter meaning that the LiDAR system can distinguish objects or features that are at least 1 meter apart on the ground. This resolution indicates the smallest distance between two separate points that the LiDAR can reliably detect and measure. A 1-meter resolution is considered moderate for LiDAR applications and is suitable for various mapping, terrain modeling, and infrastructure planning tasks where a balance between detail and data volume is necessary. The Topobathy data was also used in the numerical modeling effort discussed below in Section 3.

The topobathy water depths and elevations range from deep water (2200 ft depth) to landward elevation of +100 ft. *Figure 9* illustrates the bathymetry and topography contours of the project site and surrounding areas.

The Guam Vertical Datum of 2004 (GUVD04) is the official vertical datum for Guam and is approximately equal to Mean Sea Level (MSL). The following describes the data's coordinate system and datums:

- Coordinate System: UTM (Universal Transverse Mercator) Zone 55N
- Horizontal Datum: NAD83, meters
- Vertical Datum: GUVD04 (~MSL)

Without asbuilts the elevations of the existing condition are determined through the use of the LiDAR. As stated above, the LiDAR is provided in a 1-meter resolution, which is wider than the crest of the existing wall and with the location of the Mayor's buildings being a few feet from the existing wall, exact heights are uncertain. However, the following is the project's elevation assumptions based on the LiDAR and site visit explorations:

The depth of the bedrock layer fronting the project area and underlying sandy shoreline was determined to be -6 ft. (-1.8 m) below MSL. The depth of bedrock was estimated from the boring refusal depths encountered during the preliminary geotechnical subsurface investigation. The bedrock underlaying the site is likely to be limestone, but volcanic rocks are also in the project vicinity.

The existing wall is composed of two different wall sections, one fronting the Sagan Bisita, and the other fronting the Agat Mayor’s Office. The crest elevation in front of the Agat Mayor’s Office is approximately 3ft (1.2m) and in front of the Sagan Bisita it is approximately 6ft (1.8m) MSL.

The ground height landward of the existing seawall ranges between 3ft (1.2m) and 5ft (1.5 m) MSL, depending on the wall section.

The "bottom" of the wall, or where it appears to toe into the sand (depending on the location along the existing wall the foundation could extend deeper) is approximately 1.7ft (0.5m) MSL.

The effect of these elevations is if you were standing on the oceanside and facing the wall, the existing wall would appear to be between 3ft to 6 ft tall along the length of the structure, and if you were standing on the landward side and facing the ocean, looking over the wall, the wall would appear to be at the ground elevation to approximately 3 ft tall along the length of the structure. Figure 8 shows the varying wall heights fronting the project area.

Figure 8. Depiction of the varying wall heights in front of the Agat Mayor's office (left) and the Sagan Bisita (right)

The topobathy profiles along the project area are shown in Figure 9.

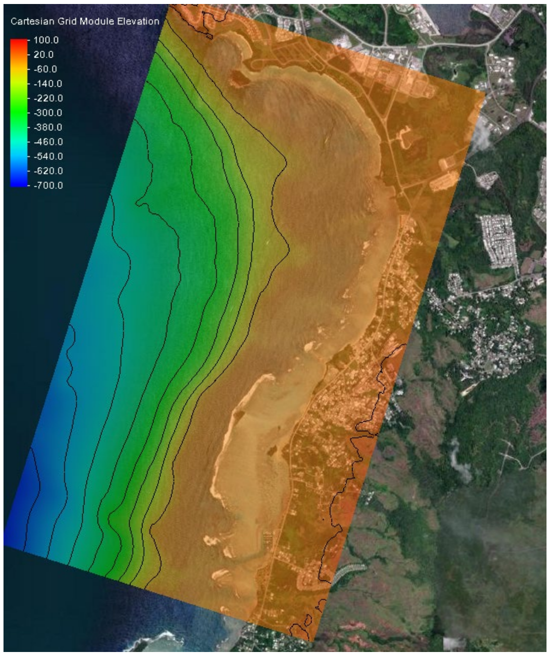


Figure 9. Bathymetric and Topographic contours in meters

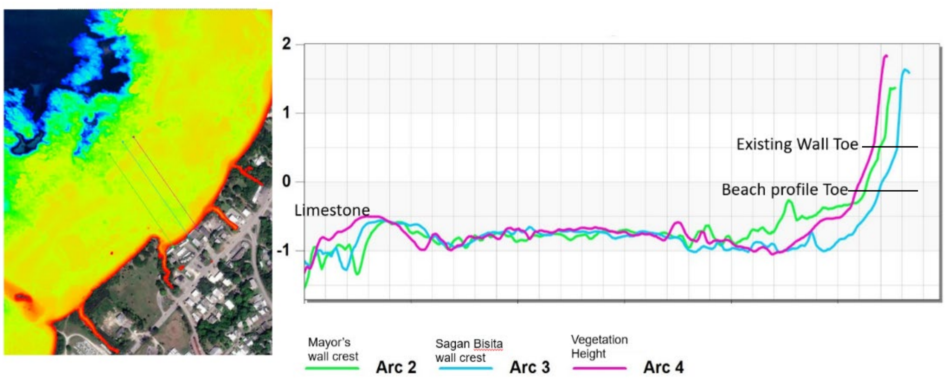


Figure 10. Elevation Profiles for the Project Area in meters

A scour depth analysis was performed using the Coastal Engineering Manual's (CEM) equations to determine if a shallower depth could be utilized for the foundation of the wall.

For breaking waves at a vertical wall the max scour depth is determined by:

$$\frac{S_m}{(H_{mo})_o} = \sqrt{22.72\,\frac{h}{\left(L_p\right)_o} + 0.25} \qquad (1)$$

Where, S_m is the maximum scour depth from bed level; $(H_{mo})_o$ is the deep water significant wave height; h is the pre-scour water depth at wall; and $\left(L_p\right)_o$ is the deep water wavelength associated with the peak period.

For breaking waves on a sloping structure the max scour depth is determined by:

$$\frac{S_m}{H_s} = 0.04[1 - e^{-4.0(KC-0.05)}] \quad (2)$$

and

$$KC = \frac{U_m T_p}{B} \quad (3)$$

Where, S_m is the maximum scour depth from bed level; B is the Diameter of circular head at bed; T is the regular wave period; U_m is the maximum wave orbital velocity at bed; H_S is the significant wave height; KC is the Keulegan-Carpenter number.

For the project area, if scour at a vertical wall was assumed under a breaking wave, the most conservative case, the maximum scour depth was found to be -16.5 ft. (-5.02 m) far greater than the depth of the limestone at 5.9 ft. (-1.8 m) depth. If assume a sloping structure under breaking waves, the maximum scour depth was found to be 6.33 ft. (-1.93 m), or just deeper than the assumed depth of the hard substrate.

2.8. Water Levels

The closest water level station to the study area, maintained by the National Oceanographic and Atmospheric Administration (NOAA), is Apra Harbor, Guam (Station 1630000). The tidal station is located 4.3 miles north of the project area, within Apra Harbor. Due to this protected location, the water level station would be expected to capture water level components including astronomic tide, sea level rise, seasonal fluctuations, and some storm surge due to wind setup and reduced central pressure during a tropical cyclone. It is not expected to capture elevation of the water level due to wave setup caused by wave breaking, which is experienced at the project area during both tropical and extratropical events. This introduces a potential source of uncertainty in the use of this station to fully represent extreme water levels.

2.8.1. Tides

Tides in the western Pacific are mixed-type, semi-diurnal with two highs and two lows of different levels every lunar day. Tides in the open ocean typically have spatial characteristics on the order of hundreds of miles. Tidal ranges tend to be small, on the order of 2 feet, and are spatially uniform.

The Apra Harbor, Guam tidal gauge was established in 1948 and has been in continuous operation since 1989. Tidal datums relative to Mean Sea Level (MSL) from this station are summarized in Table 1. The local vertical datum, GUVD04, is 0.01 feet above MSL, and the two datums are used interchangeably throughout this analysis.

Table 1. Tidal Datums at Apra Harbor, Guam

Station: 1630000, Apra Harbor, Guam		
Epoch: 1983-2001		
Units: Feet	**Reference Datum:** MSL	
Datum	**Value**	**Description**
MHHW	0.97	Mean Higher-High Water
GUVD04	0.01	Guam Vertical Datum of 2004
MSL	0.00	Mean Sea Level
MLLW	-1.37	Mean Lower-Low Water
Max Tide	2.92	Highest Observed Tide

Max Tide Date & Time	08/28/1992 18:54	Highest Observed Tide Date & Time
Min Tide	-3.71	Lowest Observed Tide
Min Tide Date & Time	10/24/1972 00:00	Lowest Observed Tide Date & Time

2.8.2. Sea Level Change

The USACE considers potential relative sea level change in every project undertaken within the tidally influenced zone. Engineering Regulation (ER) 1100-2-8162 (Dept. Army, 2019) establishes procedures for projecting sea level change into the future based on global sea level change rates, local historic sea level change rate, base year of project analysis, and the number of years in the period of analysis. It is generally accepted that sea level will continue to rise and that the rate of rise may accelerate due to climatic changes. The USACE provides guidance on the calculation of sea level change and its application to the planning process. This regulation requires that three scenarios be evaluated which result in low, intermediate, and high predictions of sea level rise. The low value is based on an extrapolation of the local historic sea level rise rate. The intermediate and high values are based on the National Research Council (NRC) sea level rise predictive Curves I and III, respectively.

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 (Merrifield and Maltrude, 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 cause sea level variations which 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, such as Apra Harbor, Guam (Merrifield 2011, Merrifield et al. 2012).

Due to the variability in MSL trends in the western Pacific, and the short post-earthquake trend (1993-present) at Apra Harbor, Guam, the rate of relative SLC in Guam is estimated by using the global eustatic rate of SLC, +1.7 mm/year, added to a measured rate of Vertical Land Movement (VLM) rate of -0.889 mm/year (as reported by the NASA Jet Propulsion Laboratory website https://sideshow.jpl.nasa.gov/post/series.html – an average of two monitoring stations on Guam). Since eustatic sea level is rising, and the land is subsiding, this results in a relative SLC rate of 2.59 mm/year (= +1.7 mm/year – (-0.89 mm/year)) or 0.0085 feet/year for Guam.

The USACE SLC calculator was used to plot the three potential curves based on this rate, shown in *Figure 11*. The curves show that by halfway through project planning horizon in 2050, the relative SLC in the area will be 0.6 feet (low curve), 0.78 ft (intermediate curve), or 1.73 ft (high curve), and by the end of the project planning horizon in 2075, the relative SLC in the area will be 0.7 feet (low curve), 1.3 ft (intermediate curve), or 3.3 ft (high curve) relative to the existing MSL datum (as well as GUVD04). By the end of the adaptation planning horizon in 2125, the relative SLC in the area is projected to be 1.10 ft (low curve), 2.7 ft. (intermediate curve), or 7.6 ft. (high curve). Also shown on the plot is the +6 ft MSL highest elevation of the existing wall crest. This threshold is exceeded by the still water elevation by the high sea level curve over the course of the 100-year adaption horizon. The USACE Sea Level Tracker tool was also utilized to compare existing recorded water levels at Apra Harbor with SLC projections. *Figure 12* shows the SLC curves, the 5-year moving average in cyan, and the 19-year moving average in dark blue. The moving averages illustrate the significant variability in the SLC rate as described above. Since the 1993 earthquake, the 19-year moving average trend has exceeded the “high” curve due to land subsidence and tradewind intensification. The 5-year moving average suggests that this trend may be reversing in recent years, and is more closely tracking the “intermediate” curve. Sensitivity to the various SLC scenarios was evaluated and will be discussed in later sections.

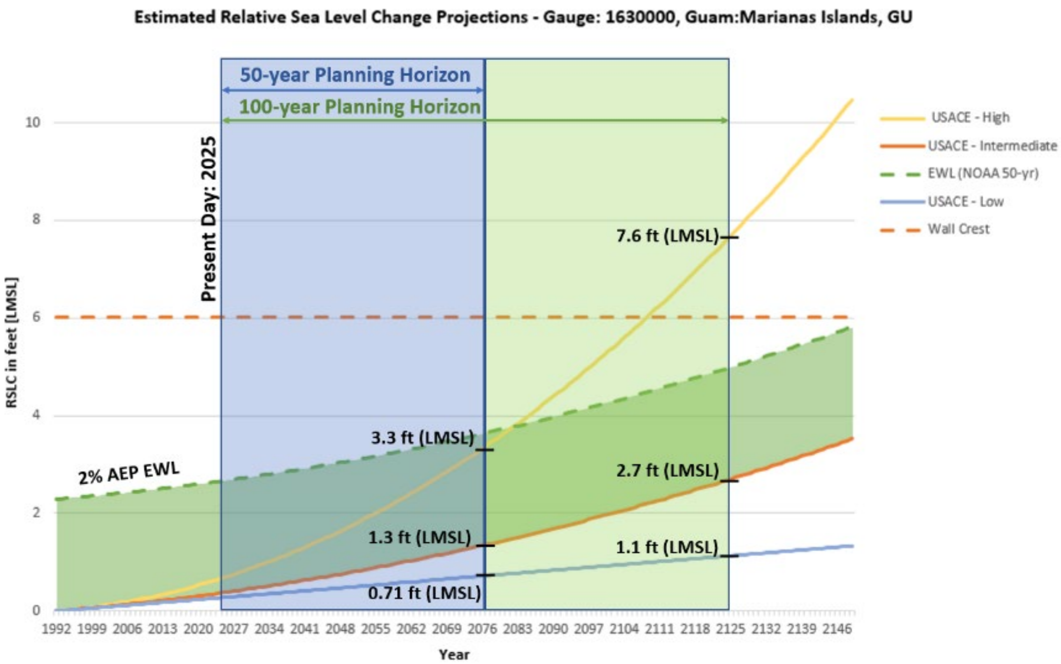


Figure 11. USACE SLC Curves for Guam Including 50-year Planning Horizon and 100-year Adaptation Horizon

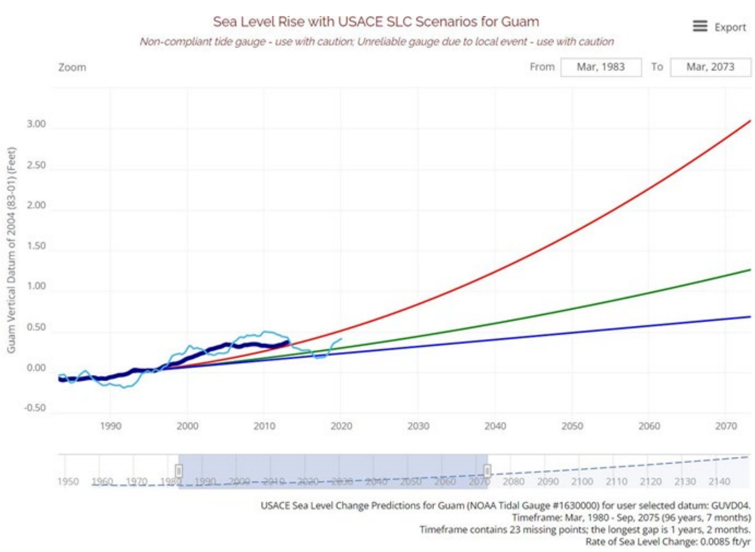


Figure 12. USACE Sea Level Tracker for Guam Including 5-year (cyan) and 19-year (blue) Moving Avg.

2.8.3. Extreme Water Levels

The extreme water level (EWL) is comprised of short-term, storm-driven water level changes superimposed on the astronomical tides. The probabilistic frequency of extreme water levels for the project region are shown in the annual exceedance probability (AEP) curves, determined at the NOAA water level station in Apra Harbor Guam (*Figure 13*). The annual exceedance probability curves show the extreme water level elevations as a function of return period in years. These elevations are determined after the Mean Sea Level (MSL) trend is removed. As shown, the 2% AEP or 50-year return period water elevation at Apra Harbor Guam is approximately 1.5 ft (0.46 m) relative to MHHW or 2.3 ft (0.71 m) relative to MSL. This additional water level component is superimposed on the intermediate curve shown in *Figure 11* to assist with visualization of extreme water level occurrences on top of rising sea level for present day and throughout the project planning horizon.

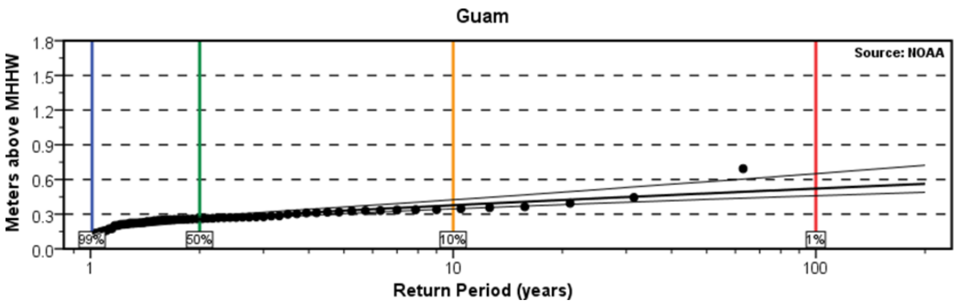


Figure 13. AEP curves relative to MHHW

2.9. Waves

There are three distinct wave patterns near Guam: local wind (trade wind) generated waves, long period swell energy generated by distant storms, and waves associated with tropical cyclones. Trade wind waves are typically from northeast through east-southeast, with wave heights in the range of 1 to 6 feet (0.3 to 2 m) and wave periods between 5 to 10 seconds. Swell waves from distant storms (usually in the north Pacific) can range from 6 to 18 feet (2 to 6 m) in height and have wave periods from 10 to 16 seconds. Tropical storm and typhoon waves can approach from almost any direction (though the storms typically track east to west or southeast to northwest), resulting in waves up to 40+ feet (13+ m) in deep water and wave periods in the 8 to 14 second range. The most common condition is trade wind generated waves, which due to the orientation of Guam’s coastline, do not affect the western side of the island. Due to incident wave direction and shoreline orientation within the project area, only swells originating in the west and tropical cyclones have the potential to cause damages to the project area.

2.9.1. Typical Conditions

The USACE’s Wave Information Study (WIS) is a 42-year (1980– 2022) wave hindcast, which can be used to perform wave climate analysis at a given station location. The water depths at the station are greater than 10,000 ft. Basic statistics of information recorded at this virtual point is shown in Table 2. The largest calculated wave height was generated from a tropical storm (Typhoon Yuri – 1991).

Table 2. Statistics for WIS Station 81414 (1980-2022)

Statistic	Value	
Average wave height:	6.1	ft
Standard deviation of wave height:	2.2	ft
Average wave period:	9.6	sec

Standard deviation of wave period:	1.5 sec
Maximum wave height:	49.5 ft
Period associated w/ max wave height:	15.1 sec
Direction associated w/ max wave height:	99.0 deg
Date associated w/ max wave height:	11/27/1991 17:00
Total number of wave records:	280,511

Using WIS Station 81414, the typical wave climate oceanward of the northwestern side of Guam can be determined. *Figure 14* shows the frequency of occurrence for various wave heights and associated wave directions in the area, and the location of the WIS station relative to the project area. As previously discussed, the shoreline orientation within the project area and the presence of the fringing reef significantly reduces the amount of wave energy that reaches the project area.

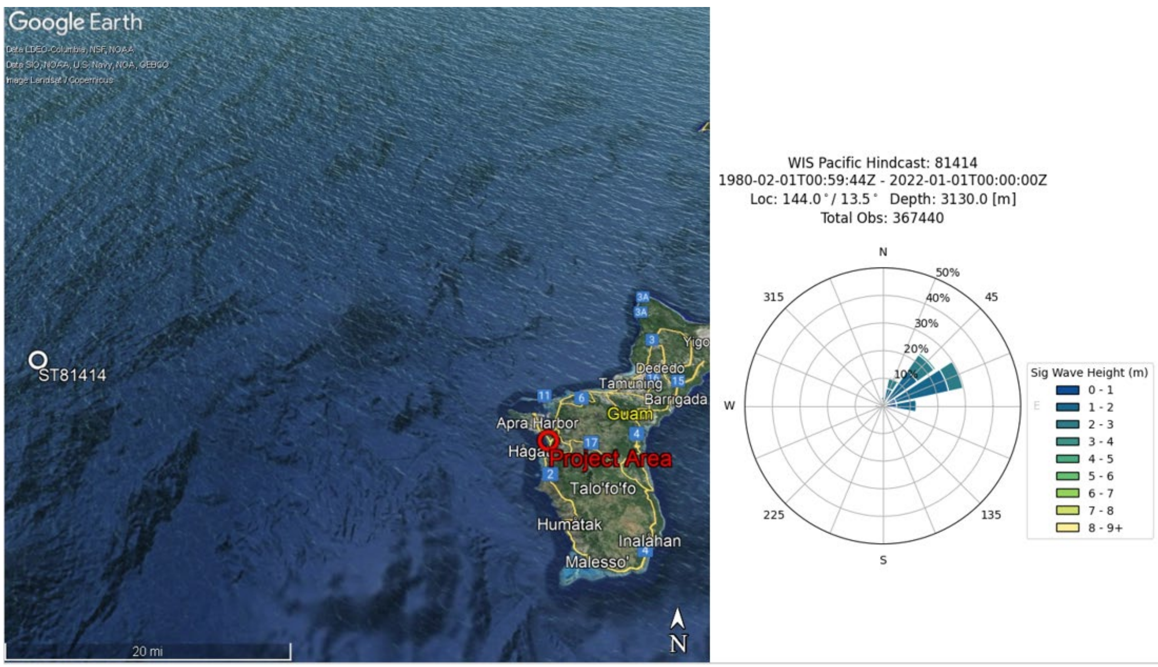


Figure 14. WIS station location and Wave Height Rose for Station 81414

2.9.2. Extreme Wave Frequency Analysis

Due to the project area's location on the southwest side of Guam, it is assumed that only waves propagating from the southwest to the northwest of the island, regardless of the generation source, may impact the project location. To verify this assumption the nearshore steady state wave model, STWAVE, was used to evaluate the directional sensitivity for the project area. STWAVE is discussed in more detail in Section 3. The directional sensitivity analysis, was conducted by propagating 2 wave heights (6.1 ft and 49.1 ft,) representative of the mean and max wave heights typical for the area and the two associated peak periods (10 and 15 seconds) in conjunction with 5 mean wave directions (360°, 315°, 270°, 225°, 180°) over the model domain, also described in more detail in Section 3. The results, taken in two transects along the reef edge and nearshore of the project area, shown in Table 3 and Figure 15 below, verified the assumed wave exposure window (225° to 315°) as the directions which produce the greatest wave heights in the project area. It was also determined that longer period waves (15 sec) give higher wave heights on the reef edge as they shoal higher than the shorter period (10 sec) waves.

Figure 15. Locations of the two observation-point transects for wave height (Hs) outputs from STWAVE

Table 3. Outputs from the two obwervation tracts per wave height, period, and direction combination

				Nearshore Obs. Pts Hs [m]				Reef Obs. Pts. Hs [m]			
idd	wavd	hs	tp	1	2	3	4	5	6	7	8
1	360	1.8	10	0.27	0.29	0.20	0.31	0.71	0.62	0.60	0.57
2	315	1.8	10	0.27	0.29	0.20	0.31	1.70	1.59	1.57	1.56
3	270	1.8	10	0.27	0.29	0.20	0.31	1.92	1.82	1.66	1.78
4	225	1.8	10	0.27	0.29	0.20	0.30	1.38	1.26	1.31	1.25
5	180	1.8	10	0.27	0.29	0.19	0.29	0.38	0.34	0.35	0.33
6	360	1.8	15	0.27	0.29	0.19	0.29	0.39	0.33	0.31	0.30
7	315	1.8	15	0.27	0.29	0.20	0.31	1.99	1.81	1.65	1.69
8	270	1.8	15	0.27	0.29	0.20	0.31	2.00	2.15	1.81	2.04
9	225	1.8	15	0.27	0.29	0.20	0.31	1.68	1.58	1.60	1.59
10	180	1.8	15	0.14	0.15	0.11	0.14	0.13	0.12	0.13	0.12
11	360	15	10	0.27	0.29	0.20	0.31	1.96	2.23	1.79	2.00
12	315	15	10	0.27	0.29	0.20	0.31	1.95	2.17	1.77	1.98
13	270	15	10	0.27	0.29	0.20	0.31	1.94	2.07	1.76	1.98
14	225	15	10	0.27	0.29	0.20	0.31	1.93	2.01	1.75	1.97

15	180	15	10	0.27	0.29	0.20	0.30	1.92	1.92	1.70	1.86
16	360	15	15	0.27	0.29	0.20	0.31	2.01	2.05	1.74	1.87
17	315	15	15	0.27	0.29	0.20	0.31	2.01	2.23	1.82	2.05
18	270	15	15	0.27	0.29	0.20	0.31	2.00	2.15	1.81	2.05
19	225	15	15	0.27	0.29	0.20	0.31	1.99	2.10	1.80	2.05
20	180	15	15	0.27	0.29	0.20	0.31	1.08	0.98	1.04	1.01

After confirming the exposure window, an extremal analysis was performed to produce the return wave heights for the project area. A schematic of the wave exposure window is shown in *Figure 16*. To do this, the WIS dataset was filtered for only those wave directions that were within the exposure window (225° to 315°) and would impact the shoreline of the project area. Then, from the subset of hindcast wave heights they were further filtered by the wave events with wave heights greater than 2 standard deviations above the mean and ranking them highest to lowest. From the resulting ranked list, the return period analysis was performed.

Figure 16. Agat Wave Exposure Window

A total of 454 wave heights over the 42-year period match these criteria. The extreme value distribution provides for wave height estimates from 1 to 100-year return period (100 to 1 percent occurrence), shown in *Figure 17* and Table 4. The largest recorded wave height within the wave exposure window, 29.4ft. (8.96 m), is just below the 100-year wave height (39.9ft./9.1m), and is associated with Super Typhoon Paka which passed through Guam on December 16th, 1997. The 10, 25, and 50-year events were lower, at 21ft.(6.4m), 24.6ft(7.5m), and 27.2ft.(8.3m), respectively.

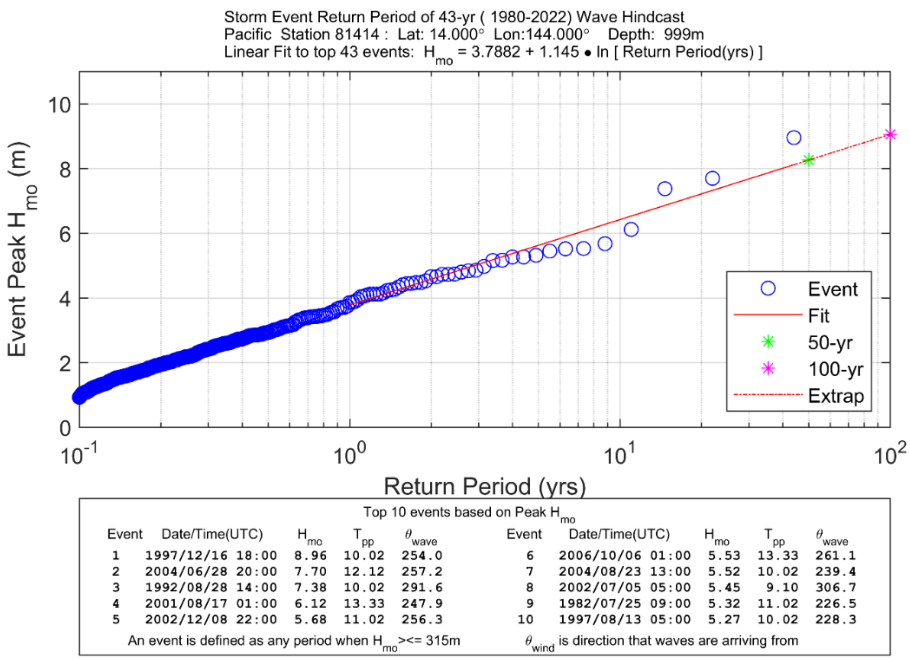


Figure 17. Extremal Analysis for Southwest to Northwest generated events

Table 4. Return Period of Filtered Wave Events

Return Period	Wave Height [m]	Wave Height [ft]
100-year	9.1	39.9
50-year	8.3	27.2
25-year	7.5	24.6
10-year	6.4	21.0

2.10. Design Waves & Water Levels

Design wave data was developed by conducting nearshore wave modeling using STWAVE. The water level and wave conditions must be known to supply boundary conditions to the model. The deep-water incident wave conditions used were based on the extremal analysis values (*Figure 17*), as described in section 2.9.2.

Wave height and period are largely independent of one another. That is, a given wave period can have any number of associated wave heights. A limiting factor is that steepness, or the ratio of wave height to wavelength (derived from wave period and water depth), cannot exceed 1/7 otherwise breaking will occur. The return period for wave heights and wave periods can be independently computed and an assortment of combinations of wave heights and periods can be made where each pairing has a 1% annual chance of occurrence. Therefore, another parameter is needed to decide which pairing to use. Since, the formulas for the stability of coastal revetment structures is based largely on wave height. The 10, 25, 50, and 100-year wave heights were combined with periods associated with the longest associated period of similar wave height found in the hindcast record. The longest period was used, as the directional sensitivity analysis confirmed that longer periods produced higher wave heights on the reef edge. In addition, since the top ranked event (Super Typhoon Paka) in the hindcast was higher than the 50-yr wave event, the top ranked event was also included in the model simulations. The mean wave directions were chosen to cover the wave exposure window in 45-degree increments (315°, 270°, 225°).

Given the shallow nature of the fringing reef, changes in water level can greatly change the nearshore wave action, as deeper water allows for larger wave events to propagate across the reef without breaking. To fully evaluate the effect of water level on wave action at the project area, twelve water level scenarios were used. To represent the elevation of water on the reef from wave's breaking on the reef edge, ponding and setup, were included in all twelve of the selected water level scenarios. Ponding is the increase in water elevation on the reef platform due to offshore waves breaking at the oceanward edge of the reef. Seelig (1983) conducted a set of laboratory experiments for fringing reefs typical of Guam to investigate hydraulics of reef-lagoon systems. He found that the ponding water level is a function of the still water level (astronomical tide and other elevation factors), incident deep water significant wave height and wave period. Gourlay (1996) confirmed these findings. Seelig's equation is as follows:

$$n = a_1 + a_2 \log \left(H_o^2 T\right) \tag{4}$$

Where,

n is the ponding level in m, H_o is the deep-water significant wave height in m, T is the wave period in sec, and a_1 and a_2 are empirical coefficient dependent on the still water level and wave spectrum (see Table 5 for irregular wave values).

Table 5. Ponding Level Coefficient for Irregular Waves (Seelig 1983)

Depth (m)	a_1	a_2
0	-0.92	0.77
2	-1.25	0.73

While the large offshore waves break on the reef, there is still a significant amount of wave energy which propagates across the reef to shore. These wave heights are limited by the shallow depths of the reef and based on previous research are approximately 0.4 times the local water depth (e.g., Smith 1993). These waves propagate and break nearshore, again elevating the water depth on the reef. The nearshore wave setup was calculated using the Shore Protection Manual's (1984) equation as follows:

$$S_w = 0.15 d_b - \frac{\sqrt{g}(H_o')^2 T}{64 \pi d_b^{1.5}} \tag{5}$$

Where,

S_w is nearshore wave setup, d_b is water depth at breaking over the reef, H_o' is the equivalent normally incident significant wave height over the reef.

Table 6 shows the extrapolated wave heights, periods, and directions from the WIS extremal analysis, Table 7 shows the ponding and setup computed for each wave and water level scenario combination.

Table 6. Extrapolated significant Wave heights, Peak Periods, and Mean Wave Directions for use in the numerical model

Event	Significant Wave Height (ft)	Peak Period (sec)	Mean Wave Direction (deg)
Top Ranked	29.4	10.02	315, 270, 225
10-year	21.0	13	315, 270, 225
25-year	24.6	12	315, 270, 225
50-year	27.2	12	315, 270, 225
100-year	39.9	10	315, 270, 225

Table 7. Ponding and Setup Calculated for each Wave and Water Level Scenario

Scenario	MSL	MHHW	2%AEP+ MHHW	25low	50low	25int	50int	25high	50high	100low	100int	100high
Top ranked	4.2	4.1	3.9	3.8	3.8	3.8	3.7	3.7	3.5	3.0	3.6	3.8
10-year	3.6	3.5	3.4	3.3	3.3	3.3	3.2	3.2	3.0	2.5	3.1	3.2
25-year	3.9	3.8	3.7	3.6	3.6	3.6	3.5	3.5	3.3	2.8	3.3	3.5
50-year	4.2	4.1	3.9	3.8	3.8	3.8	3.7	3.7	3.5	3.0	3.6	3.8
100-year	4.2	4.1	3.9	3.9	3.9	3.8	3.8	3.7	3.5	3.0	3.6	3.8

The twelve water level scenarios that were identified to investigate the effect of water level on wave action at the project area are described below. The first water level simulated was the MSL datum with no sea level change, in order to provide a lower-bound value of "waves only" for comparison purposes. The second and third water level simulated was representative of present-day water level conditions and included the MHHW (M) water level relative to MSL (+0.97ft) and then MHHW with the linear superposition of the 2% AEP (2A) water level relative to MSL(+2.3ft). The fourth and fifth water levels represented MHHW, the 2%AEP water level and the addition of the low sea level rise curve for 25 and 50 years into the future (M2A25L, M2A50L), +2.9ft and +3ft, respectively. The sixth and seventh water levels represented MHHW, the 2%AEP water level and the addition of the intermediate sea level rise curve for 25 and 50 years into the future (M2A25I, M2A50I), +3.97ft and +4.1ft. Similarly, the eighth and ninth water levels represented MHHW, the 2%AEP water level and the addition of the high sea level rise curve for 25 and 50 years into the future (M2A25H, M2A50H), +4.1ft and +5.6ft. Finally, the last three water levels represented the low, intermediate, and high curve for 100 years into the future ((M2A100L, M2A100I, M2A100H)), +3.4ft, +5.0ft, and +9.9ft. The final summary of water levels with the addition of the ponding and setup formulations is shown in Table 8.

Table 8. Design Water Levels in feet

Scenario	MSL	M	2AM	M2A 25L	M2A 50L	M2A 25I	M2A 50I	M2A 25H	M2A 50H	M2A 100L	M2A 100I	M2A 100H
Top Rank	4.2	5.0	6.2	6.7	6.8	6.9	7.7	7.8	9.1	6.4	8.6	13.7

10-year	3.6	4.5	5.7	6.2	6.3	6.4	7.2	7.3	8.6	5.9	8.1	13.2
25-year	3.9	4.8	6.0	6.5	6.6	6.7	7.4	7.6	8.9	6.2	8.4	13.5
50-year	4.2	5.0	6.2	6.7	6.8	6.9	7.7	7.8	9.1	6.4	8.6	13.7
100-year	4.2	5.1	6.2	6.8	6.9	7.0	7.7	7.8	9.1	6.4	8.6	13.7

As shown in table 8, for all sea level rise scenarios 25 years into the future under storm conditions (ponding and setup) for a 10-year wave event or greater have water elevations that exceed the crest of the highest portion of the existing seawall (+6 ft MSL). In the proposed alternatives discussed in detail in Section 4, the proposed structure crest is assumed to be raised +3ft in front of the Mayor's compound to a total elevation of +6ft MSL. This elevation is consistent with the height of the seawall in front of the Sagan Bisita, which is mostly not being included in this study as it lies on NPS lands. By keeping the crest elevations consistent ensures a uniform barrier along the shoreline, preventing potential weak points that could arise from varying elevations between properties. Additionally, raising the crest to +6ft MSL increases safety to individuals using the promenade and surrounding areas. This height is also within reason for the use of the property as a community and cultural center, raising the wall height higher than the additional 3 feet would impede the viewshed and use of the property.

Each alternative's designs presented herein were not optimized for inundation or overtopping and are proposed as emergency erosion protection alternatives as is appropriate for a CAP Section 14. However, the raising of the crest does offer improved mitigation against overtopping in the project area. The higher elevation helps reduce the frequency and volume of overtopping events, thereby decreasing potential damage to the backshore of the mayor's Complex and surrounding infrastructure.

Measures that could be taken to mitigate inundation for the project area in the future outside of this CAP study, include elevating the structures which would reduce the risk of damage during high water events. Dry floodproofing the structures by making the buildings watertight with barriers and sealants, preventing water from entering and causing damage, or potentially relocating the backshore structures further inland away from vulnerable areas. Additionally, establishing community preparedness plans will also help with readiness for future flooding events. These non-structural measures, individually or combined, will help mitigate inundation risks.

3. 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. To account for this, the numerical model, STWAVE, was used to transform waves from deep water to the nearshore water depths at the project site. This model has been extensively used throughout the United States and the Pacific Ocean, including Guam.

3.1. STWAVE

STWAVE 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. STWAVE numerically solves the steady-state conservation of spectral wave action for the following equation:

$$\sum \frac{S}{\sigma} = \left(C_g\right)_i \frac{\partial}{\partial x_i} \frac{C_g C cos(\alpha) E(\sigma,\theta)}{\sigma} \tag{6}$$

Where,

i is tensor notation for x- and y- components, Cg is group celerity, θ is wave direction, C is wave celerity, σ is wave angular frequency, E is wave energy density, and S is energy source and sink terms. Source and sink mechanisms included surf-zone wave breaking, wind input, wave-wave interaction, whitecapping, and bottom friction.

STWAVE 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.

3.2. Model Domain

A single grid was created to transform the incident deep water waves from the offshore to the nearshore environment at the project area. The model domain was developed using the available 2020 NOAA LiDAR (section 2.6) and a grid cell resolution of 32.8 ft (10 m) was used to incorporate the fetch and fringing reef characteristics of the area, given that the reef flat was fairly uniform. The projection of the grid was UTM NAD83 Zone 55 with a vertical datum relative to LMSL. The model domain extends north to just below Orote Point, and south to Agat Small Boat Harbor. The domain stretches west to east about 2.2 miles, and north to south about 3.9 miles. The same domain extents were used to generate a Manning's n friction coefficient grid, with 0.025 representing open water and 0.25 representing the fringing reef.

The properties of the STWAVE domain are provided in Table 9, and the extents and friction coefficients are shown in *Figure 18* for the depths refer to *Figure 9*.

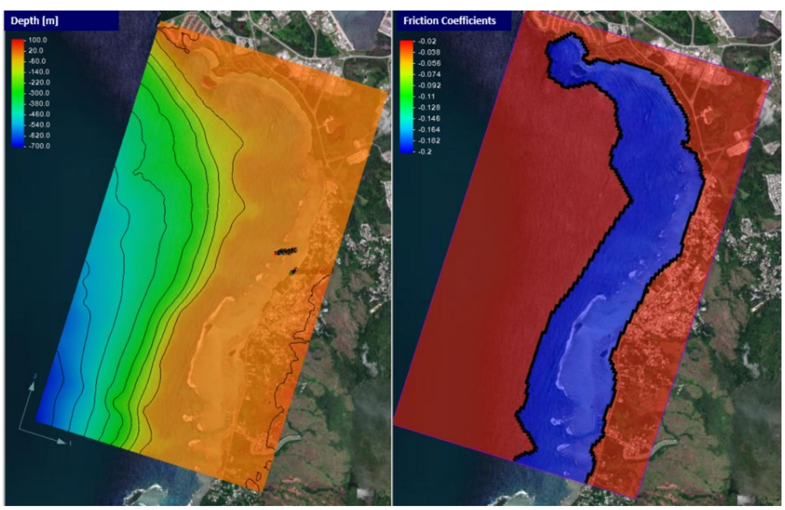


Figure 18. Model Domain Extents and Friction Coefficients

Table 9. Model Domain Parameters

Grid	Projection	Grid Origin (x,y) [m]	Azimuth [deg]	Δx and Δy [ft]	Number of Cells	
					I	J

STWAVE	UTM Zone 55 NAD83 LMSL	(256013.93, 1491713.41)	342	32.8	357	627

3.3. Offshore Boundary Spectra

The five identified return period wave events (wave height, period, and direction) from Table 6 were used to create 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 225° to 315° with respect to the x- axis (306.0°). Additional offshore inputs included were the twelve selected water elevations from Table 8. The 156 total combinations of wave and water levels that are simulated within the STWAVE model domain are referred to as “idds”.

3.4. Model Execution

The STWAVE simulation used the full-plane mode of STWAVE to allow for wave generation and transformation in a 360-degree plane. The full-plane version of STWAVE uses an iterative solution process that requires user-defined convergence criteria to signal a suitable solution.

Boundary spectra information is propagated from the boundary throughout the domain during the initial iterations. Once this stage converges, winds and water levels are added to the forcing, and this final stage iteratively executes until it also reaches a convergent state. The convergence criteria for both stages include the maximum number of iterations to perform per time step, the relative difference in significant wave height between iterations, and the minimum percent of cells that must satisfy the convergence criteria (i.e., have values less than the relative difference.) Convergence parameters were selected based on a previous study by Massey et al. (2011) in which the sensitivity of the solution to the final convergence criteria was examined.

The relative difference and minimum percent of cells were set as (0.1, 100.0) and (0.1, 99.8) for the initial and final iterations, respectively. STWAVE was set up with parallel in-space execution whereby each computational grid is divided into different partitions (in both the x- and y-direction), with each partition executing on a different computer processor. The number of partitions in the x-direction was 3, while the number of partitions in the y-direction was 5. The maximum number of initial and final iterations was set to a value of 20, higher than the largest partition size.

3.5. Model Outputs

STWAVE transformed the extreme waves and combined water levels discussed in section 2.10. The modeling outputs were analyzed at two transects one nearshore of the project area and one at the reef edge as described in section 2.9.2. (Figure 15). The output wave heights along the two observation transects, were delineated at every grid cell or every 32.8 ft (10 m).

The reef edge transect gives larger wave heights compared to the nearshore transect per each combination of incident waves and water levels. Figure 19 shows the comparison of wave heights along the transects, for a single selected water level (MHHW + 2%AEP + 50 year of intermediate SLC), for each of the incident wave heights and wave directions. As shown, for a single water level, the greatest variability is found on the reef edge than nearshore. Along the reef edge, the depth and location of the observation point across the transect produces values that can differ in range up to 2 feet. The reef edge is such a sensitive location due to several interrelated factors. Firstly, wave refraction and diffraction play a significant role as waves approach the reef. Refraction causes waves to bend towards shallower areas, concentrating wave energy in some regions while dispersing it in others, whereas diffraction occurs when waves encounter the reef itself, leading to wave spreading. Additionally, the variations in water depth are crucial; as waves travel over deeper waters, they retain their energy, but as they move into shallower areas near the reef, they slow down and increase in height due to the shoaling effect. The physical structure and topography of the reef, including its contours, ledges, and gaps, further influence the wave behavior. Waves may break over the crest of the reef, losing energy and height, while in other areas, the existence of slight to deeper channels allow waves to pass through with less energy loss. Not captured in the model bathymetry but important to note that localized reef features like coral heads, sandbanks, and boulders can also focus or disperse wave energy, leading to variations in wave heights along the reef edge.

In contrast, the nearshore observation points along the transect give values that differ less than 0.5ft. The nearshore area experiences more consistent wave action because, as waves moves into the shallower, more uniform depths, their energy becomes more evenly distributed. The reef acts as a barrier, absorbing and dissipating much of the wave energy, resulting in smaller and more uniform waves reaching the shore. Additionally, the bathymetry nearshore is generally more consistent with fewer areas of complex topography, which would otherwise contribute to wave refraction, diffraction, shoaling and localized energy focusing. This uniformity leads to more stable and predictable wave patterns.

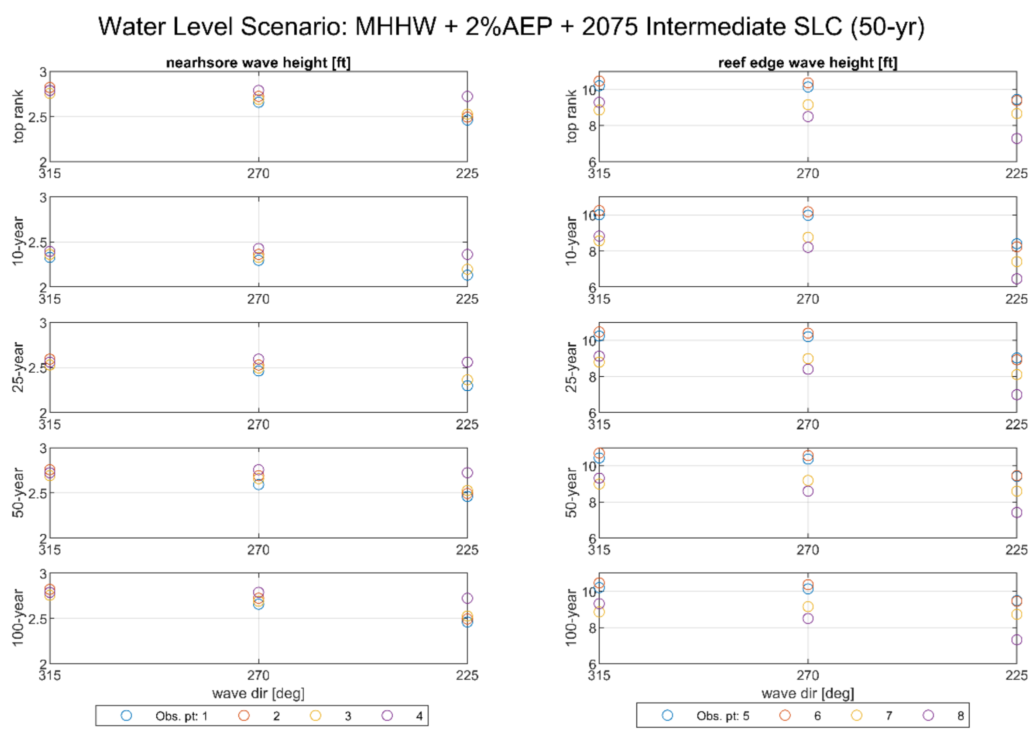


Figure 19. Observed Wave Heights along the Reef Edge and Nearshore Transects for a single water level scenario

Figure 20 and Figure 21, give another look at the resulting wave heights along the two transects by showing the maximum observed outputs for the various water level scenarios. It is shown that both the observed significant wave heights along the reef edge transect, Figure 20, and the nearshore transect, Figure 21, are the most impacted by significant increases in water level. This is congruent with the fact that higher water levels allow waves to pass over the reef crest with less obstruction, maintaining more of their energy and height. When water levels are higher, the increased depth reduces the frictional drag exerted by the reef's surface on the waves, allowing them to travel with greater force and height. Conversely, at lower water levels, the reef is more exposed, causing waves to break earlier and lose significant energy, resulting in reduced wave heights. Thus, the depth of water over the reef directly correlates with the height of the waves observed. As such, there is a small increase in wave height when the water level increases during the MHHW+2%AEP+50 years in the future high SLC and the MHHW+2%AEP+100years in the future high SLC (MA50H and MA100H). The maximum significant wave height on the reef edge for all water levels was consistently associated with the offshore wave event representative of the 50-year wave event and the maximum significant wave height nearshore is associated with the 100-yr wave event. The 50-year wave height is the maximum at the reef edge because these waves, while substantial, is less extreme than 100-year event, resulting in less intense energy dissipation right at the reef edge. The 50-year wave retains their height (27.2 ft.) as they haven't yet lost significant energy through breaking and friction. In contrast, 100-year waves (39.9 ft), with much greater energy, cause more intense breaking and energy dispersion upon impacting the reef edge, which can paradoxically reduce their peak height at this point. However, as these 100-year waves propagate toward the nearshore, despite the energy loss from the reef structure, they still retain enough residual energy to result in maximum wave heights nearshore, surpassing the heights of 50-year waves that have already been more significantly dissipated by this stage. Thus, the extreme initial energy of the 100-year event overcomes the dissipative effects, leading to higher wave heights nearshore compared to the 50-year event.

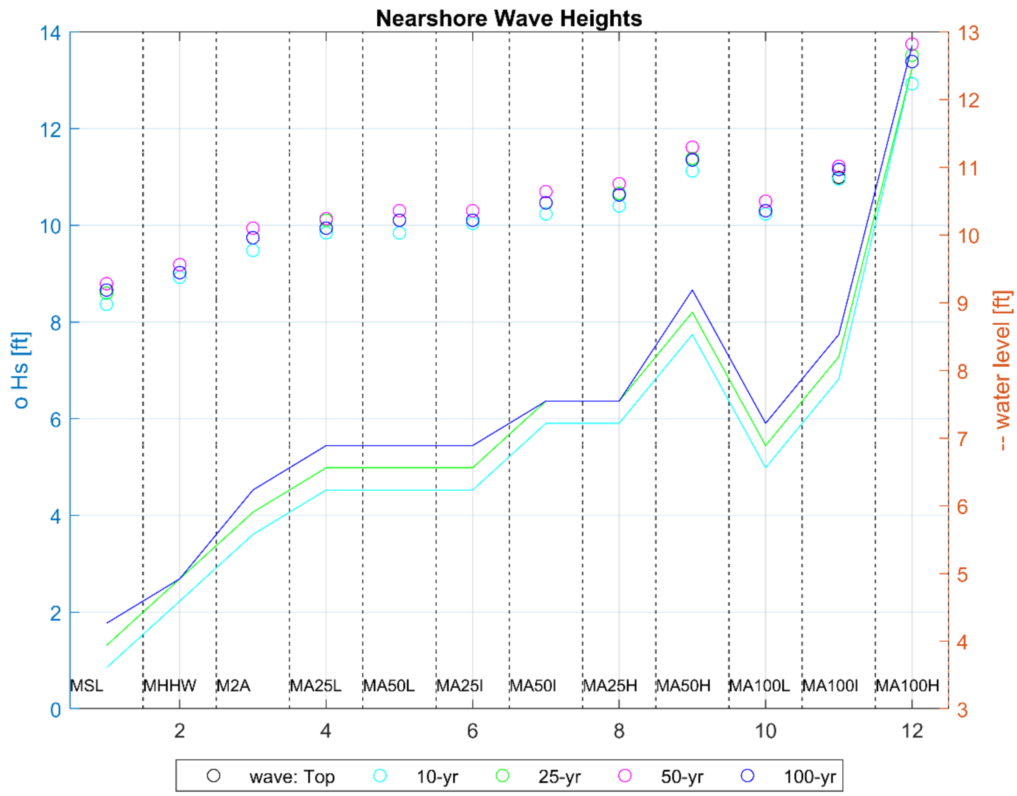


Figure 20. Maximum model outputs along the reef edge transect. Significant wave height in feet is shown on the left y-axis and water elevations (feet) is shown on the right y-axis

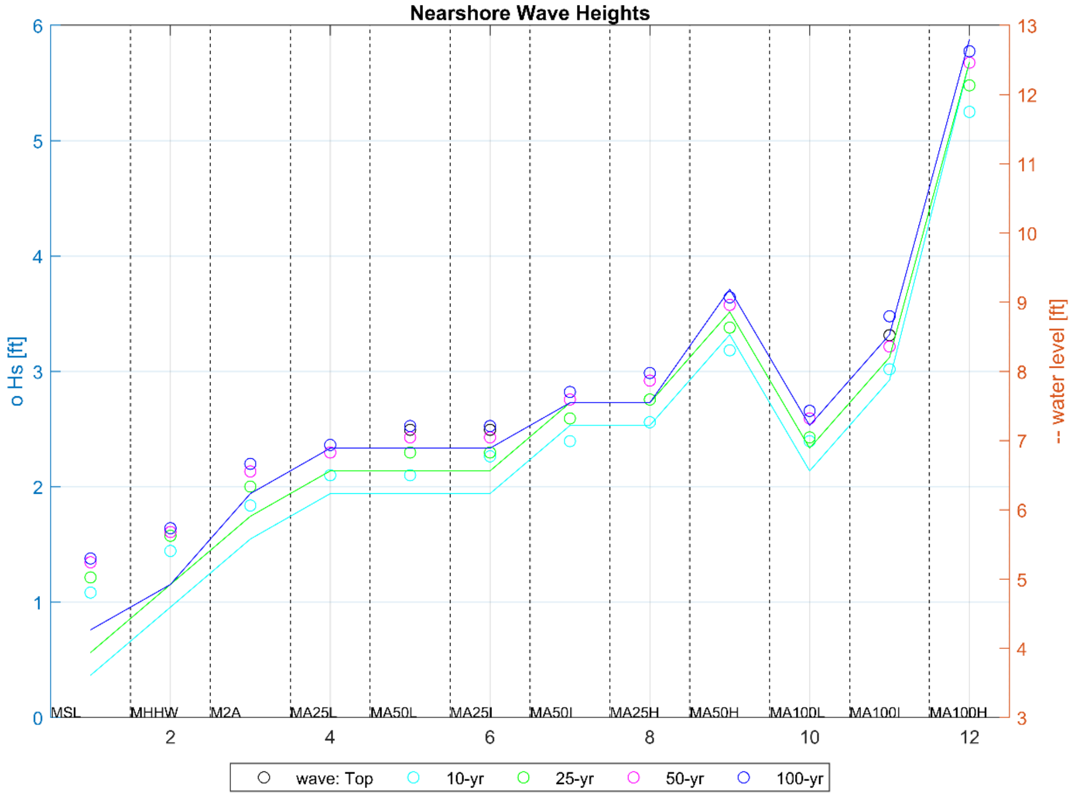


Figure 21. Maximum model outputs along the nearshore transect. Significant wave height in feet is shown on the left y-axis and water elevation (feet) is shown on the right y-axis.

For use in design of the alternative measures, described in more detail in section 4, wave height and water level values need to be identified. To do this, a maximum wave height value observed for each water level scenario along the nearshore transect was extracted into Table 10 below. Also, considering that the bathymetry within the model reflects the current conditions where a protective layer of sand covers the limestone substrate, representing the "without project" scenario, when considering "future without project" projections this sand layer is likely to erode, exposing the limestone to a depth of -6 feet (MSL). Therefore, a depth-limited wave height calculation was included for comparison in Table 10 to address this potential future condition, ensuring that the analysis accounts for the protective role of the reef while acknowledging uncertainties in coastal dynamics. The final array of potential wave heights for design are summarized in Table 10.

Table 10. Final array of Design Wave Heights per Water Level Scenario

Water Level Scenario	idd	100-yr Offshore Wave Height (ft)	Water Level (ft +MSL)	Depth Limited Wave height above Toe (ft)	Nearshore Max Wave Height (ft)	Reef Edge Max Wave Height (ft)
MSL	5	39.9	4.2	4.0	1.38	8.67
M	20	39.9	5.1	4.4	1.64	9.04
M2A	35	39.9	6.2	4.9	2.21	9.76

MA25L	50	39.9	6.8	5.1	2.36	10.11
MA50L	65	39.9	6.9	5.1	2.51	10.11
MA25I	80	39.9	7.0	5.2	2.51	10.47
MA50I	**95**	**39.9**	**7.7**	**5.4**	**2.83**	**10.64**
MA25H	110	39.9	7.7	5.4	2.99	11.34
MA50H	125	39.9	9.1	6.0	3.65	10.29
MA100L	140	39.9	6.4	4.9	2.67	11.17
MA100I	155	39.9	8.6	5.8	3.48	13.38
MA100H	170	39.9	13.7	7.8	5.79	8.67

There is little variability between the MA25L, MA50L, MA25I, MA50I, and MA25H water levels and corresponding transect wave heights, however as shown in Section 2.8.2. and *Figure 12* the intermediate SLC curve aligns with the recently observed water level trend records at the Apra Harbor Gauge. Therefore, the MA50I water level was selected for design purposes. The depth limited wave height of 5.4 ft. was also selected as it represents exposed limestone, a conservative condition possible over the next 50 years. The use of the depth limited wave height avoids underestimating wave heights at shallower nearshore points that might see increased exposure if the sand cover erodes, while conversely, it prevents overestimation at the reef edge, where large offshore waves break but are less relevant to the nearshore conditions. By moving forward with the depth-limited wave height approach, the study simplifies the analysis while directly addressing the critical concern of future reef exposure. This approach is conservative in nature, ensuring that assessments prioritize preparing for potential increases in wave impacts due to erosion.

Figures of the wave fields from each idd of the model simulation are in the Model Output Appendix.

4. Engineering Alternatives

4.1. Preliminary Array of Measures

To develop preliminary costs and layouts to assist project analysis for other disciplines, a preliminary array of measures consists of:

1. No action (section 4.2)
2. Rock Revetment (section 4.3)
3. Concrete Armor Unit Revetment (section 4.4)
4. Precast Concrete Wall (section 4.5)
5. Concrete Rubble Masonry (CRM) Wall (section 4.6)
6. Secant Wall (section 4.7)
7. Open Cell Piling Seawall (section 4.8)
8. Beach nourishment section (section 4.9)

Descriptions and details of all the measures are provided in the following sections. However, the Rock Revetment, Precast Concrete Wall, CRM wall, and Beach Nourishment measures were screened out for costs of equipment, labor, and materials (details of the screening are provided within their section). The no action, tribar revetment, secant wall, and Open Cell Wall measures were carried forward, with the open cell wall as the tentatively selected least cost environmentally acceptable plan.

4.2. 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 Mayor's Compound. This would eventually lead to undermining and failure of the existing wall and ultimately damages to the buildings.

4.3. Rock Revetment (screened out)

A revetment consists of armoring a shoreline slope designed to hold-the-line (Figure 22) 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 project area shoreline. Contractors in Guam are familiar with the construction methods for a rock revetment and the work can be completed without specialized equipment. The rock revetment design was created as to replace the existing seawall and extend seaward.

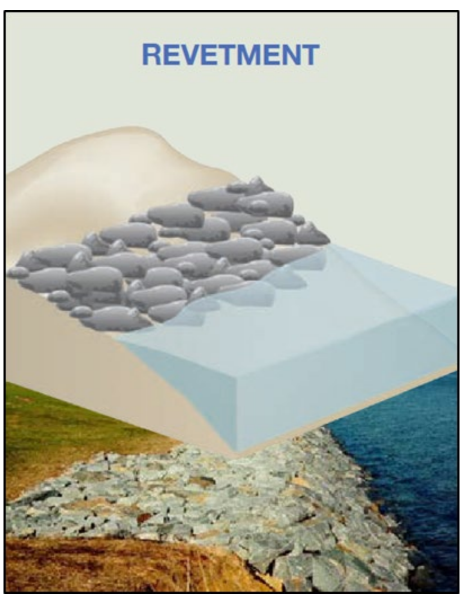


Figure 22. Revetment Measure

4.3.1. Design Considerations

Although the design was not optimized to reduce runup and overtopping from future sea level rise scenarios, estimates of runup and overtopping were calculated to evaluate the performance of the alternative, as runup and overtopping can result in backshore erosion. Wave runup and overtopping are complex physical processes occurring in the surf and backshore zones where waves encounter the shoreline and break, resulting in an uprush of water. They depend on the local water level, incident wave conditions, and the nature of the beach or structure encountered.

The lidar determined topographic and bathymetric elevations and depths were used to inform the crest elevations of the revetment and the other proposed structural alternatives. The limestone is assumed to be at approximately -6 ft. MSL and the structure crest is assumed to be raised +3ft in front of the Mayor's compound to a total elevation of +6ft MSL. The total structural height relative to the toe is approximately 12 ft.

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

$$\frac{R_{u2\%}}{H_{m0}} = 1.65 * \gamma_b * \gamma_f * \gamma_\beta * \xi_{m-1,0} \tag{7}$$

with a maximum of

$$\frac{R_{u2\%}}{H_{m0}} = 1.0 * \gamma_f * \gamma_\beta (4 - \frac{1.5}{\sqrt{\gamma_b * \xi_{m-1,0}}}) \tag{8}$$

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):

$$\frac{q}{\sqrt{g * H_{m0}^3}} = \frac{0.023}{\sqrt{\tan\alpha}} \gamma_b * \xi_{m-1,0} * \exp\left[-\left(2.7 \frac{R_c}{\xi_{m-1,0} * H_{m0} * \gamma_b * \gamma_f * \gamma_\beta * \gamma_v}\right)^{1.3}\right] \tag{9}$$

with a maximum of

$$\frac{q}{\sqrt{g * H_{m0}^3}} = 0.09 * \exp\left[-\left(1.5 \frac{R_c}{H_{m0} * \gamma_f * \gamma_\beta *}\right)^{1.3}\right] \tag{10}$$

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.

Under the design water level relative to the structure toe (-6ft MSL), which integrates MHHW, the 2%AEP water level, 50 years of intermediate SLC, and ponding and setup from the 100-year event for a total of 13.6 ft. of water (+7.7 ft relative to MSL) as described in section 2.10, the project area would be submerged (total structure height of 12 feet). Therefore, to evaluate overtopping and runup, an analysis of the sensitivity to water level as it relates to runup and overtopping for structure stability was performed.

This was completed by increasing the water level in 0.5-foot increments starting at MHHW + ponding and setup from the 10-year incident wave event (+4.5 ft MSL) relative to the toe of the structure (-6ft MSL). The decision to use the 10-year ponding and setup was in an effort to evaluate the structure without submergence, and also evaluate the structure under a more frequent occurring high water levels present day. The depth limited wave height of each water level increment was used, and both rock and concrete armor units were included in the analysis. For rock, it was assumed that the revetment was composed of 2-layers of stone with an impermeable core, setting the roughness coefficient, γf, to 0.55 per the EurOtop Manual Table 6.2. The results of the concrete armor units are discussed in section 4.4.1.The results of this analysis are summarized in Table 11.

Table 11. Runup and Overtopping Rates under Water Levels

Water Level Depth	**10.5**	**11**	**11.5**	**12**				
Depth Limited Wave Height (ft)	4.2	4.4	4.6	4.8				
Peak Period (s)	10	10	10	10				
Runup (ft)	7.9	8.3	8.6	8.9				
	Crest Elev. +3' MSL (existing elevation)							
	ft³/s per foot				**m³/s per meter**			
Overtopping	10.0	13.3	17.1	21.2	0.7	1.0	1.3	1.6
	Crest Elev. +4' MSL							
	ft³/s per foot				**m³/s per meter**			
Overtopping	5.4	7.7	10.6	14.0	0.4	0.5	0.8	1.0
	Crest Elev. +5' MSL							
	ft³/s per foot				**m³/s per meter**			
Overtopping	3.5	4.7	6.1	8.4	0.2	0.3	0.4	0.6
	Crest Elev. +6' MSL (proposed elevation)							
	ft³/s per foot				**m³/s per meter**			
Overtopping	1.8	2.9	4.2	5.3	0.1	0.2	0.3	0.4
	Crest Elev. +7' MSL							
	ft³/s per foot				**m³/s per meter**			
Overtopping	0.8	1.4	2.3	3.5	0.0	0.1	0.1	0.2
	Crest Elev. +8' MSL							
	ft³/s per foot				**m³/s per meter**			
Overtopping	0.3	0.6	1.1	1.8	0.0	0.0	0.0	0.1
	Crest Elev. +9' MSL							
	ft³/s per foot				**m³/s per meter**			
Overtopping	0.1	0.2	0.5	0.9	0.0	0.0	0.0	0.0

As shown, runup for this structure ranges from approximately 7.9 ft. to 8.9 ft. with overtopping rates of 1.8ft^3/s/ft to 5.3ft^3/s/ft. According to Engineering Manual 1110-2-1100 Part VI, as shown in *Figure 23*, these rates exceed critical thresholds (0.54 cfs/ft for unpaved and 2.1 cfs/ft for paved), beginning at water levels of 11 ft relative to the toe (+5ft MSL) suggesting vulnerabilities even with proposed mitigation measures of raising the crest by 3 feet and paving the promenade. Even with these measures the structure under high water levels may remain susceptible to damage from severe storm surges and rising sea levels. Therefore, proactive measures such as ongoing monitoring, maintenance, and potential adjustments are necessary to ensure long-term resilience and functionality of the structure amidst evolving uncertain coastal conditions.

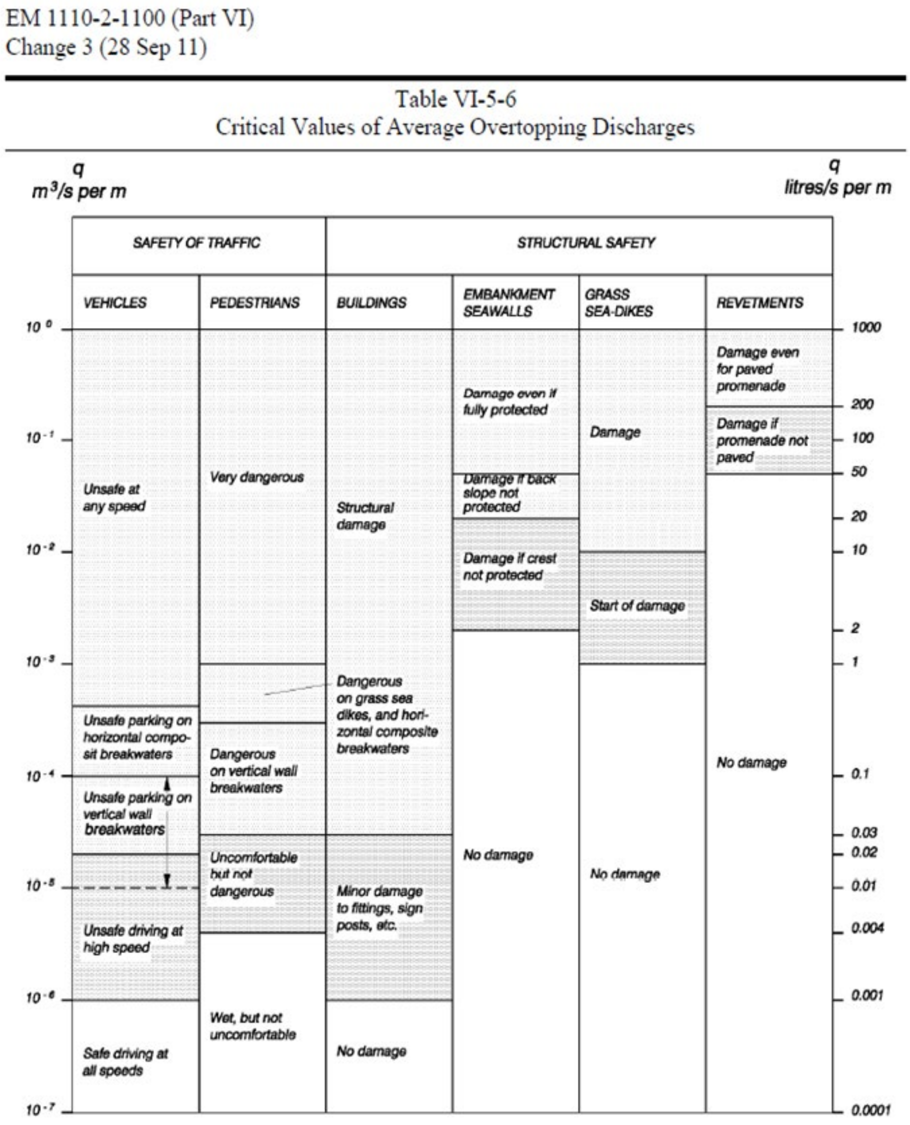


Figure 23. Critical Values of Overtopping Discharges

4.3.2. Screening

A threshold of 500 lbs (0.25 tons) stone was discovered through investigations of available stone size able to be procured on Guam. As the sized stone needed in the design of the rock revetment (1.7 tons) exceeds this threshold the stone would need to be imported. The closest quarry for import is Japan, which significantly increase the cost of this alternative in comparison to the other measures. Thus, the rock revetment was not carried forward into the final array of alternatives, due to the unavailability of quality and quantity of appropriately sized rock on Guam and the cost prohibited nature of importing sized stone.

4.4. Concrete Armor Unit Revetment

The Concrete Armor Unit Revetment is the same in purpose and function as the rock revetment, but has an optimization of material form rock to concrete. There are many different designs of concrete armor units available today, such as COR-LOCK, Dolos, cubes, tribar, tetrapods and many others. Each design has been well tested with slight differences in shape for better performance under various scenarios. For the Agat Mayor Concrete Armor Unit Revetment, tribar was selected as the design for its compact interlocking and turning radius, and the higher likelihood of available and experienced contractors with the design. The proposed revetment footprint is shown in Figure 24.

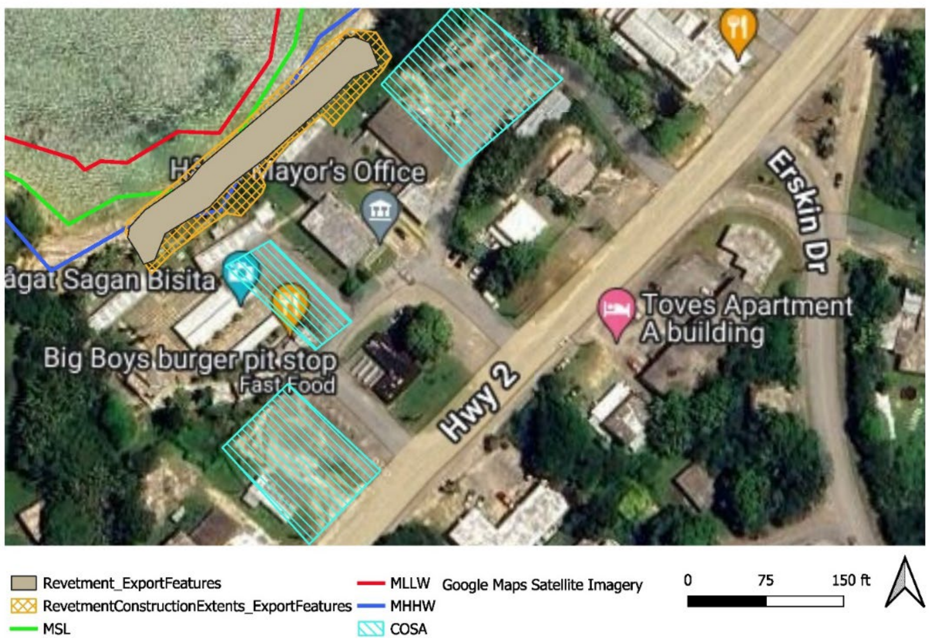


Figure 24. Concrete armor unit revetment preliminary footprint including anticipated construction extents.

4.4.1. Design Considerations

The same design considerations as the Rock Revetment were assumed in the design of the Concrete Armor Unit Revetment. Overtopping and Runup was calculated for the same considerations, except for Tribar, the roughness coefficient was set to 0.44 per the EuroTop Manual. The results of this analysis are summarized in table 12. Comparatively, runup and overtopping performance is improved for the concrete armor units when compared to the rock revetment, due to the increase in friction.

Table 12. Runup and Overtopping values for various water levels

Water Level Depth	10.5	11	11.5	12
Depth Limited Wave Height (ft)	4.2	4.4	4.6	4.8
Peak Period (s)	10	10	10	10
Runup (ft)	6.3	6.6	6.9	7.2

Overtopping (cfs/ft)	1.4	2.5	3.9	5.4

4.4.2. Preliminary Design

The concrete armor unit revetment design is typical for such a structure and is shown in Figure 25 and 26. It was assumed the tribar units would be placed in a single layer, uniformly, with the terminal or toe tribar unit cemented in the limestone trench, and geotextile bags would serve to seal the crest. The Hudson Equation was used to determine the appropriate sizing of the armor units. The armor units form the outermost layer and dissipate energy to provide protection from waves and water levels along the structure. The Hudson Equation, as shown below, was used to determine the appropriate stone sizing of the armor stones.

$$W = \frac{\gamma_r H^3}{K_D (S_a - 1)^3 cot\alpha} \tag{11}$$

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 the selection of Tribar as the specific armor unit design. Table 13 provides the assumed variables and coefficients used in the Hudson Equation calculations.

Table 13. Hudson Equation Variables and Coefficients

Specific Weight (γ_r)	145 lb/ft3
Stability Coefficient (K_D)	12
Sideslope Angle (cotα)	1.5
Design Wave Height (H)	5.4 ft
Specific Gravity (S_a)	2.3
Layers	1

The underlayer is added to support the armor layer such that the armor units 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 units. This size requirement prevents underlayer stones from escaping through voids in the armor layer.

A 1-ton sized unit, was determined to be of sufficient size for the project area. The 1-ton unit has an individual arm diameter of 1.3 ft., a unit diameter of 4.1 ft., and an average layer thickness of 2.7 ft.

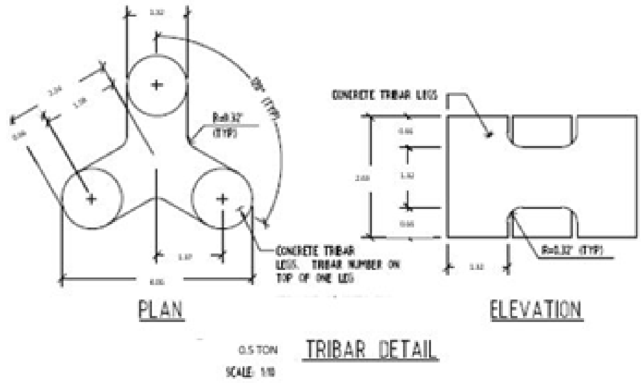


Figure 25. 1 Ton Tribar Armor Unit Design Schematic

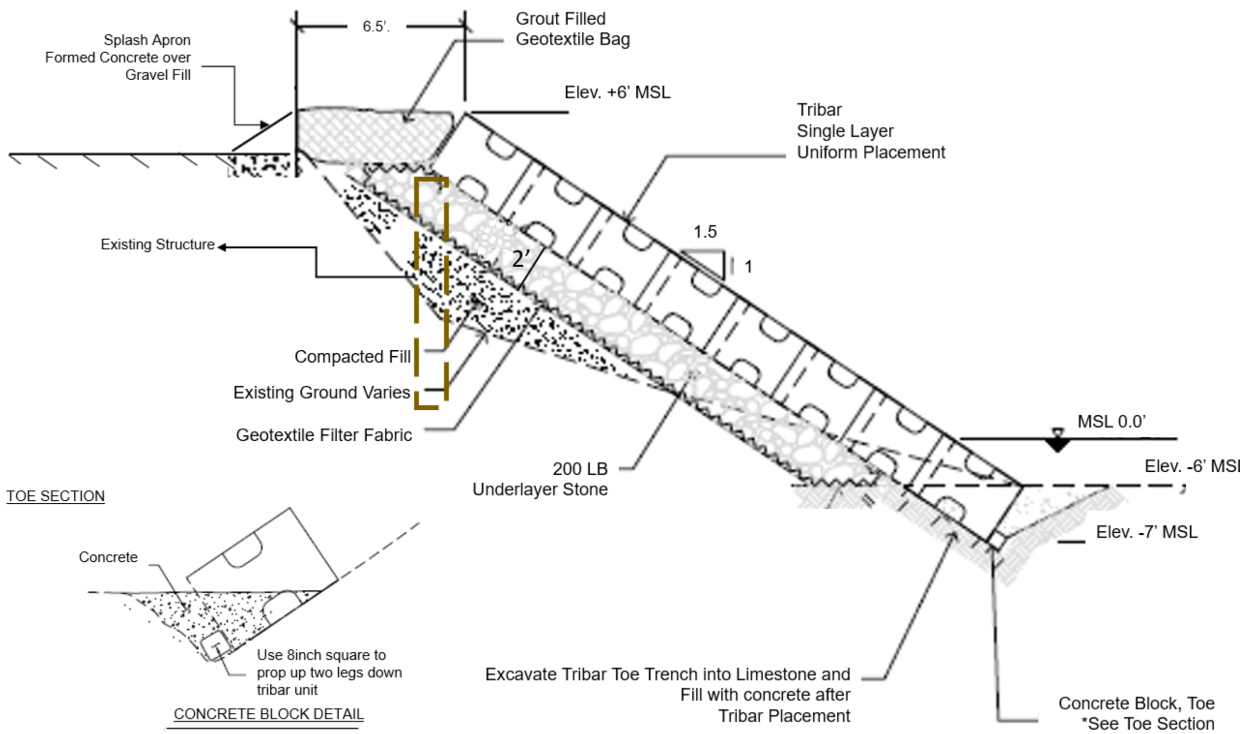


Figure 26. Preliminary Concrete Armor Unit Design Schematic

4.4.3. Construction

Construction of the concrete armor unit revetment would be conducted with the use of conventional land-based earth moving equipment. The existing wall would be removed, and the revetment would be constructed from the toe to the crest elevation. To provide stability to the toe of the structure, a 1-2 ft trench would be excavated into the limestone with an 8-inch concrete block placed flushed into the bottom of the trench which will prop up the terminal unit and then be sealed by a concrete fill. The tribar units have fixed dimensions and are placed directly on top of each other in sloped rows. Careful placement during construction will ensure that units properly interlock, units are not damaged during placement, and that design dimensions are met. A splash apron composed of formed concrete over a gravel fill behind the crest of the structure will tie the structure to the existing ground. Excavated material can be used to backfill the beach in front of the structure, or on the ends fronting the tie backs. The final footprint would be approximately 30 ft. wide. The total structure height is approximately 13 ft. from toe to crest (-7 ft to +6 ft MSL), with the crest of the revetment aligned (and replacing) the crest of the existing wall.

Common types of damage to a concrete armor unit revetment include broken units, loss of underlayer material, and flanking. The extent of damage will dictate the need for repairs. However, typically concrete armor unit revetments require little overall maintenance.

4.4.4. Adaptive Management

Adaptation measures for the concrete armor unit revetment alternative, to provide adequate shoreline protection within the 100-year adaptation horizon should be considered. As water levels continue to rise, more wave energy will propagate to the shoreline and the shoreline will experience greater wave conditions. As discussed in section 2.10, all sea level rise scenarios past 25 years into the future under storm conditions (ponding and setup) for a 10-year wave event or greater have water elevations higher than the anticipated structure crest, indicating that assessments for raising the crest elevation should be considered and weighed against the impact on the use of the Mayor's compound. If raising the structure in the future, is deemed viable in the future, it could be accomplished through a CRM wall behind the crest or additional layers of armor units on the revetment.

Vertical Seawall Measures

Differing from the sloped design of the Revetment, the following alternatives (Section 4.5 to 4.8) are vertical in nature. The vertical wall alternatives, or seawalls, are constructed parallel to the shoreline and function as rigid, vertical or near vertical retaining walls (Figure 27). They are 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. The material options include various types of sheet pile, grouted rock, and prefabricated or cast in place concrete elements. Advantages of the seawall measures include prevention and/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 or to ambient shorelines 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. The vertical or near vertical property of these measures creates an increase in runup and overtopping compared to the sloped revetment as the waves are not able to dissipate energy over a slope. 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. The vertical measures proposed in the following sections include a precast concrete wall, a CRM wall, a secant wall, and an open cell wall.

A similar overtopping and runup sensitivity analysis as was conducted for the revetment alternatives was also calculated for the three vertical wall alternatives (table 14). This was done assuming a roughness coefficient of 1, for a smooth impenetrable surface and a structure slope of 0°. Given that overtopping on vertical structures has a lower critical threshold (0.54 cfs/ft) than a revetment (2.1cfs/ft) (Figure 23), while also incurring higher values for runup and overtopping, a paved promenade will be included in the design of all of the vertical structures, and it is strongly recommended that monitoring and continual assessment of the structure is conducted to allow for the timely identification and remediation of any weaknesses or damage caused by changing conditions and extreme weather events.

Table 14. Runup and Overtopping values for various water levels

Water Level Depth	10.5	11	11.5	12
Depth Limited Wave Height (ft)	4.2	4.4	4.6	4.8
Peak Period (s)	10	10	10	10
Runup (ft)	16.2	16.9	17.7	18.46
Overtopping (cfs/ft)	2.9	3.8	4.6	5.3

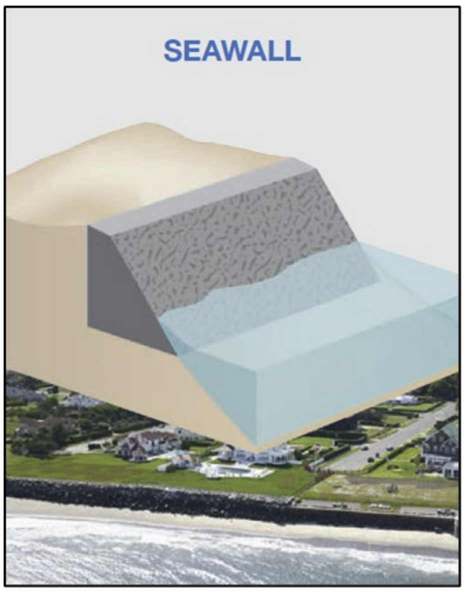


Figure 27. Example of Seawall Measure

4.5. Precast Concrete Wall (Screened Out)

4.5.1. Design Considerations

The proposed precast concrete wall acts as a cantilever retaining wall. These types of cantilever retaining walls utilize the weight of the backfill to provide resistance to the lateral earth pressures. The precast concrete panel wall consists of individual concrete panels that are installed throughout the length of the project. This type of structure provides adequate structural stability with the buried reinforced section of the panel wall and adequate overtopping protection from the crest elevation.

4.5.2. Preliminary Design

This design of the Precast Concrete Wall is as follows. The wall will be constructed of precast concrete panel units. The panels can be cast either on-site or cast off-site and transported to the site. Existing conditions indicate a natural limestone bench at -6 feet (MSL) on top of which the panels would sit. 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. Placement would replace the existing seawall.

The concrete panels were determined to be approximately 1 ft. thick and would extend upward from the existing ground level at the limestone bench (-6 ft MSL) to +6 ft. (MSL). The buried panel section would extend landward 7 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 27.

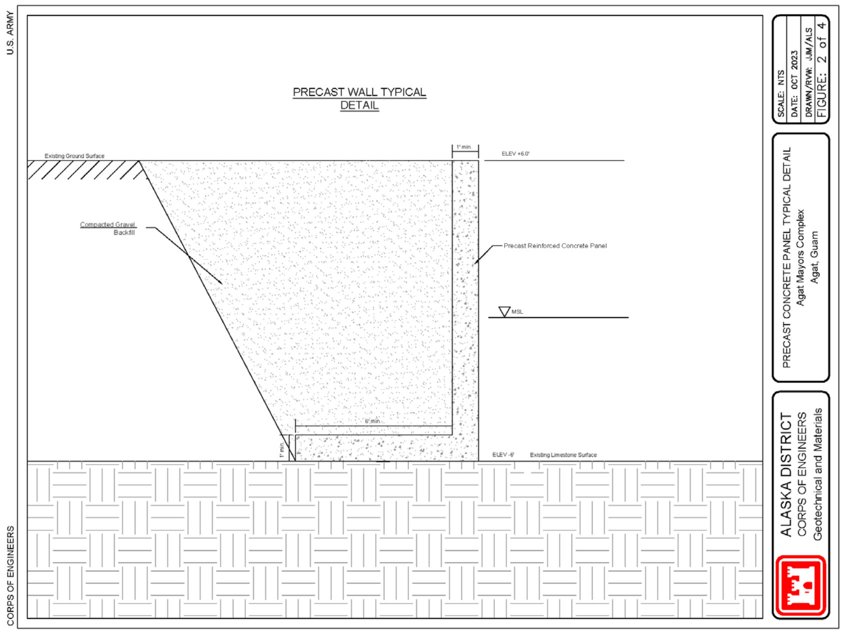


Figure 28. Preliminary Precast Concrete Wall Design Schematic

4.5.3 Construction

Construction of the precast concrete panel wall will consist of excavating approximately two to three feet of coastal soils and placing the individual wall panels on the limestone shelf.

Following the construction of the precast concrete panel wall, the area should be regraded to the elevation of the existing ground surface. It is anticipated that precast concrete panel wall would be installed within the same footprint of the existing wall. The final footprint would be approximately 7 feet at its widest (with 6 ft. buried under ground as shown). The total disturbed area is estimated at approximately 20 feet due to excavation and backfill of the existing soils. In addition to the approximately 20 feet of disturbed area, a minimal additional 30 feet will be needed landward of the disturbed area for the working platform of the construction equipment.

4.5.4 Screening

This alternative was screened out due to the close proximity of the Mayor's office building to the existing seawall. The required landward excavation for placement of the Precast Cantilever wall would require removal and rebuild of the existing community center, significantly increasing cost.

4.6. Concrete Rubble Masonry (CRM) Wall (Screened Out)

4.6.1 Design Considerations

A concrete rubble masonry (CRM) wall consists of a CRM wall bearing on a reinforced concrete foundation. The CRM wall would be a vertically oriented structure generally shore-parallel along the shoreline to protect from overtopping due to waves and water levels and to fix the shoreline so erosion cannot occur landward. CRM walls are typical structures used throughout the area.

4.6.2 Preliminary Design

The CRM wall would replace the existing sea wall and be constructed in two parts. The first, a reinforced precast concrete base, and the second, the CRM wall which would sit on top of the concrete foundation. The precast concrete base can be cast either on-site or cast off-site and transported to the site. Existing conditions indicate a natural limestone bench at -6 feet (MSL). The concrete base would sit on top of the limestone bench. The proposed CRM wall will act as a gravity retaining wall. Gravity retaining walls use their own weight to resist the lateral earth pressures. The typical cross section for a CRM wall is shown in Figure 28.

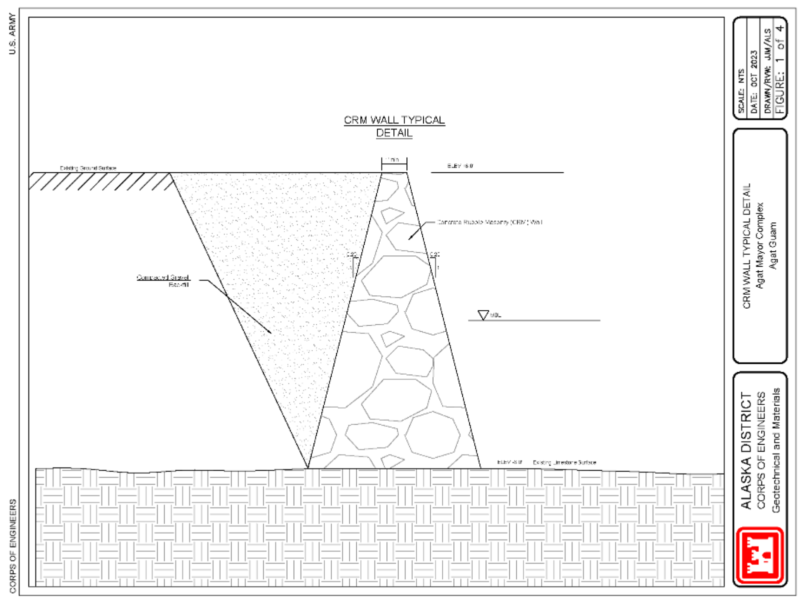


Figure 29. Preliminary CRM wall design schematic

4.6.3 Construction

Construction of the CRM wall would consist of excavating approximately two to three feet of coastal soils and placing the reinforced concrete foundation on the limestone shelf. Following the construction of the reinforced concrete foundation, a CRM wall will be installed to the planned project heights (+6 ft MSL). After the CRM wall is constructed, the area should be regraded to the elevation of the existing ground surface. Based on the proposed CRM cross-section, the final footprint would be approximately 9 feet with the total disturbed area being approximately 20 feet due to excavation and backfill of the existing soils. In addition to the approximately 20 feet of disturbed area, a minimal additional 30 feet will be needed landward of the disturbed area for the working platform of the construction equipment.

4.6.4 Screening

Similar to the Precast Concrete Wall, the CRM wall alternative was screened out due to the close proximity of the Mayor's office building to the existing seawall. The required landward excavation for placement of the CRM wall would require removal and rebuild of the existing community center, significantly increasing cost.

4.7. Secant Wall

4.7.1 Design Considerations

Secant piling is a robust, rigid system which can be used to construct earth retention walls. A secant wall is a vertically oriented structure, constructed shore-parallel along the shoreline, to protect from overtopping due to waves and water levels and to fix the shoreline so erosion cannot occur landward. A secant wall is comprised of drilling overlapping concrete columns. The secant wall footprint is shown in Figure 29.

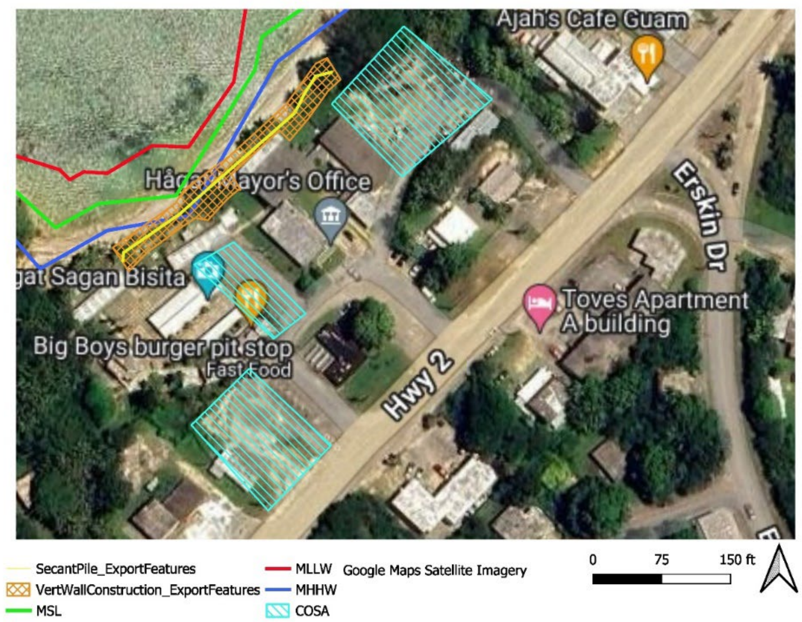


Figure 30. Secant Pile Wall footprint including excavation extents

4.7.2. Preliminary Design

The Secant wall could replace the existing seawall or the position could also be shifted to the landward side of the seawall. The benefit of placing the secant pile wall behind the existing wall is added flexibility to the construction schedule, and/or a cost savings on demoing the existing seawall. Secant walls overlap individual piles which allows for flexible layouts accommodating linear or curved alignments with multiple corners. Vertical reinforcement is typically installed only in secondary piles and may be either a steel pile or rebar cage. The top elevation of the structure will be +6 feet MSL. The preliminary secant wall schematic is shown in Figure 30.

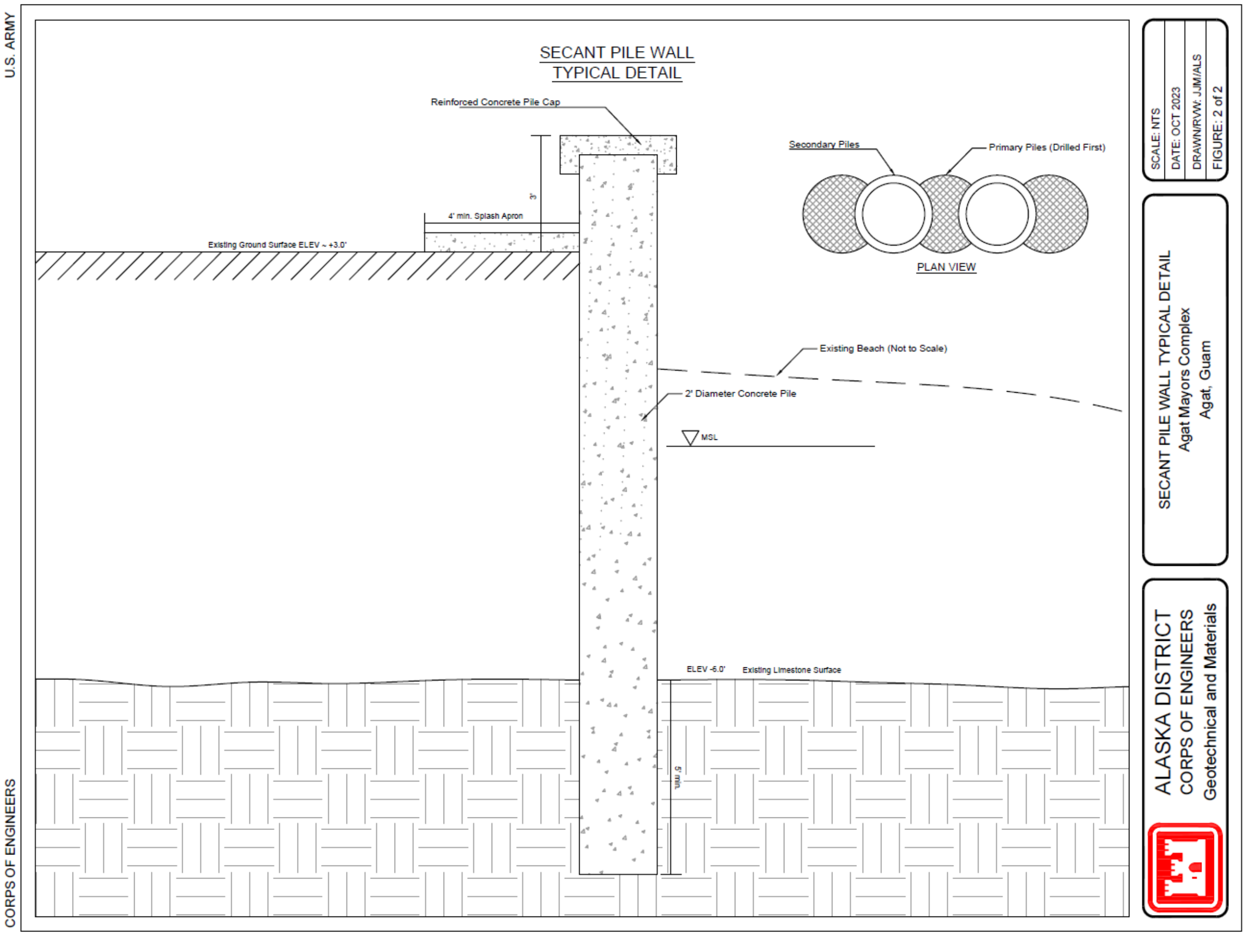


Figure 31. Preliminary Secant Pile Wall Design Schematic

4.7.3. Construction

The continuous secant wall is constructed by drilling overlapping concrete piles. A wide range of drilling techniques can be employed allowing the secant pile walls to be constructed in variable ground conditions. The initial or “primary” piles are drilled into existing ground at the selected center spacing. The wall is completed by drilling structurally reinforced “secondary” piles which cut into and overlap with the adjacent primaries.

4.7.4. Adaptive Management

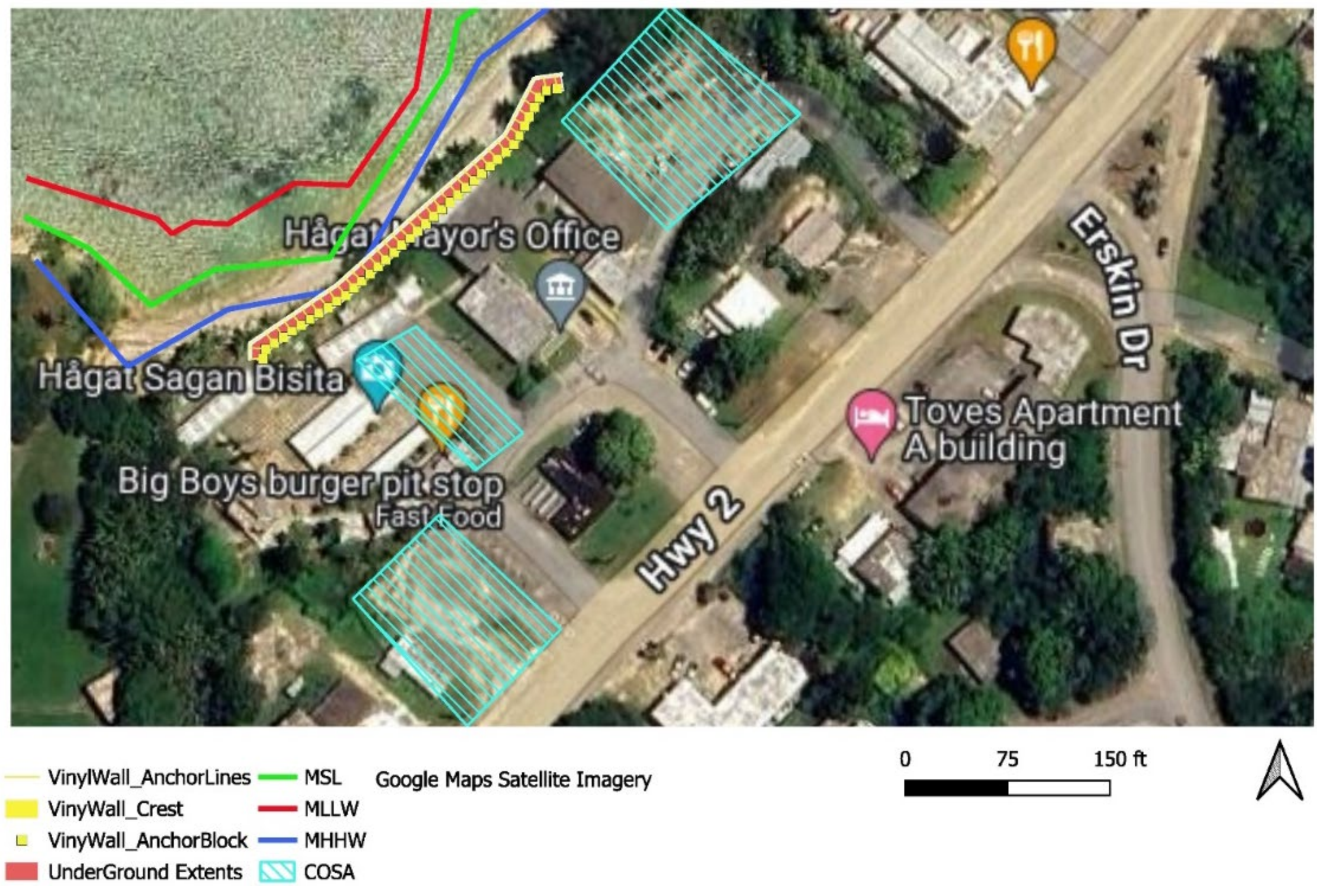
Adaptation measures for the secant pile wall alternative to provide adequate shoreline protection within the 100-year adaptation horizon are similar to those discussed in section 4.4.4. for the concrete armor unit revetment. As sea level rises, the increase in water levels will increase wave energy and intensify wave conditions along the shoreline. As detailed in section 2.10, all sea level rise scenarios beyond 25 years indicate that, during storm conditions with a 10-year wave event or greater, water elevations will surpass the anticipated structure crest. Therefore, raising the crest elevation should be assessed and balanced against its impact on the use of the Mayor’s compound. If deemed necessary, this could be achieved by adding additional concrete or CRM applied to the top of the wall, or behind the crest of the wall.

4.8. Open Cell Piling Seawall

4.8.1 Design Considerations

An Open cell piling seawall is a vertically oriented structure, constructed shore-parallel along the shoreline, to protect from overtopping due to waves and water levels and to fix the shoreline so erosion cannot occur landward. With this alternative, a hybrid approach to a seawall is presented, which combines the strength of steel-reinforced concrete with the durability of vinyl sheet piling. This is accomplished through a dual-interlocking form which creates a closed cell in which steel-reinforced concrete can be poured. This method can be installed in rock soil conditions with a pin-pile allowing for the install of tall walls, appropriate for the Agat Mayor location. There are currently no known constructed projects in the region where this technology has been employed. As such, it is recommended to consult with design and construction teams that have successfully executed a similar design.

The open cell wall footprint is shown in Figure 31.



4.8.2 Preliminary Design

Alternative 3 consists of removal of the existing seawall and the construction of an open cell piling seawall. The open cell piling seawall will be 320 ft long and consist of 1 ft wide vinyl cells filled with reinforced concrete installed to the consolidated limestone shelf. The individual wall panels will be anchored with a 2-inch diameter pin pile installed into the limestone. The seawall will have a 2 ft wide pile cap and a 4 ft wide splash apron. The seawall will be constructed by driving vinyl open cell sheet piling using a vibratory mandrel hammer to the limestone shelf. Following the driving of the vinyl piles, the soils in the annulus will be removed by a water jet method. A 2-inch diameter pin pile will be installed approximately 5 ft into the limestone shelf and the annuls will be back filled with reinforced concrete. The seawall will be attached to reinforced concrete deadman anchors using tieback rods at a minimum of 3 ft deep in the backfill. The deadman anchors will be placed every 8 ft for the length of the seawall. At the location of the Mayor's office building, the 2 x 2 x 2 ft square space required to place the deadman anchors will be removed and then re-laid in the concrete porch. The individual panels will be tied together at the top with a 2 ft wide reinforced concrete pile cap. The finished seawall will have a top elevation of approximately 6 ft MSL and will extend down to -11 ft MSL. For more detailed descriptions of the presented alternative including construction methods refer to the Geotechnical appendix A.2. The preliminary open cell piling seawall schematic is shown in Figure 31.

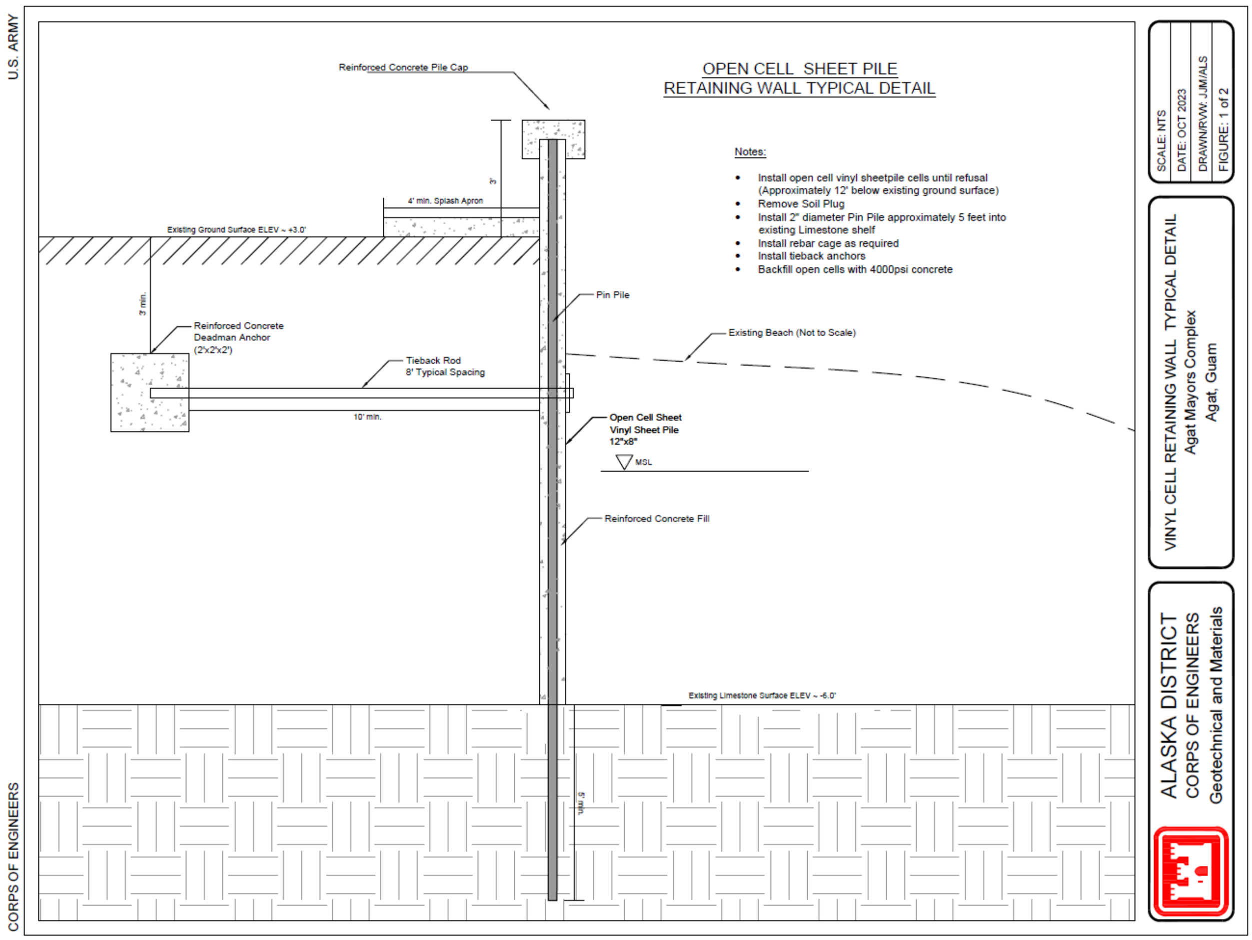


Figure 32. Preliminary Schematic of the Open Cell Piling Seawall

4.8.3 Adaptive Management

Adaptation measures for the open cell wall alternative, to provide adequate shoreline protection within the 100-year adaptation horizon are similar to those discussed in Section 4.4.4 for the concrete armor unit revetment. Section 2.10 highlights that all sea level rise scenarios beyond 25 years indicate water elevations will surpass the structure crest during significant storm events. To ensure long-term shoreline protection, especially as future sea level rise will increase wave energy and conditions nearshore. Monitoring, maintenance and assessment of the structure must be conducted regularly. If deemed necessary regardless of impact to the Mayor's

Compound's use, the crest of the structure could be elevated by additional concrete or CRM applied to the top of the wall, or behind the crest of the wall.

4.9. Beach nourishment (Screened Out)

Beach Nourishment consists of beach quality sand added from an adjacent or outside source to nourish an eroding beach. 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 are possible impacts to regional sediment transport. Environmental considerations include large physical footprint requirement, moderate environmental impact, impacts may be reversible, and permitting is required.

4.9.1 Screening

Considering the narrow beach profile of the study area, widening of the beach footprint, through beach nourishment, could provide some additional protection to the Mayor's compound. However, as a location with a limited sediment supply, a source of beach quality sand was not identified. Additionally, the need for regular re-nourishments would be difficult for the non-federal sponsor to maintain, limiting the longevity of this measure.

5. 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 open cell piling seawall as the Tentatively Selected Plan based on the least cost alternative that meets the study objectives.

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7. Model Output Appendix

As water level increases in the area, larger waves are able to propagate nearshore. The greatest wave heights per water level scenario were observed for the 100-year wave event from

270-degree direction (westerly). The lowest wave heights per water level scenario were observed for the 10-year wave event from the 225-degree direction (southwesterly).

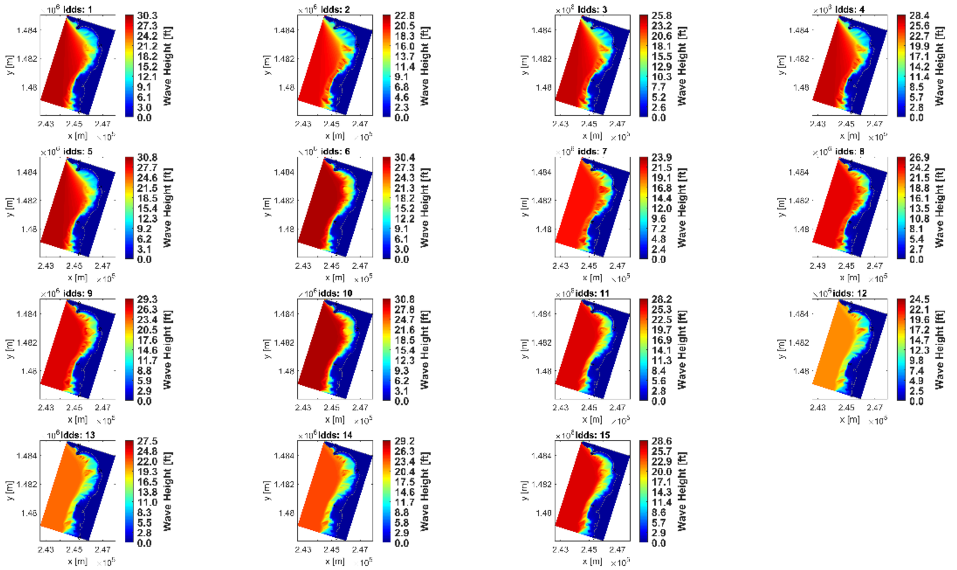

Figure 33. MSL

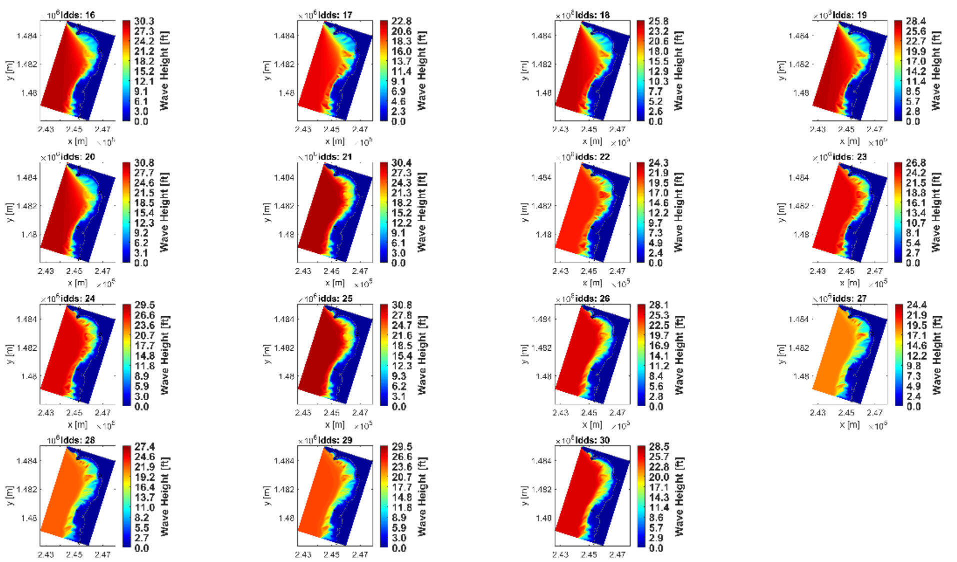

Figure 34. MHHW

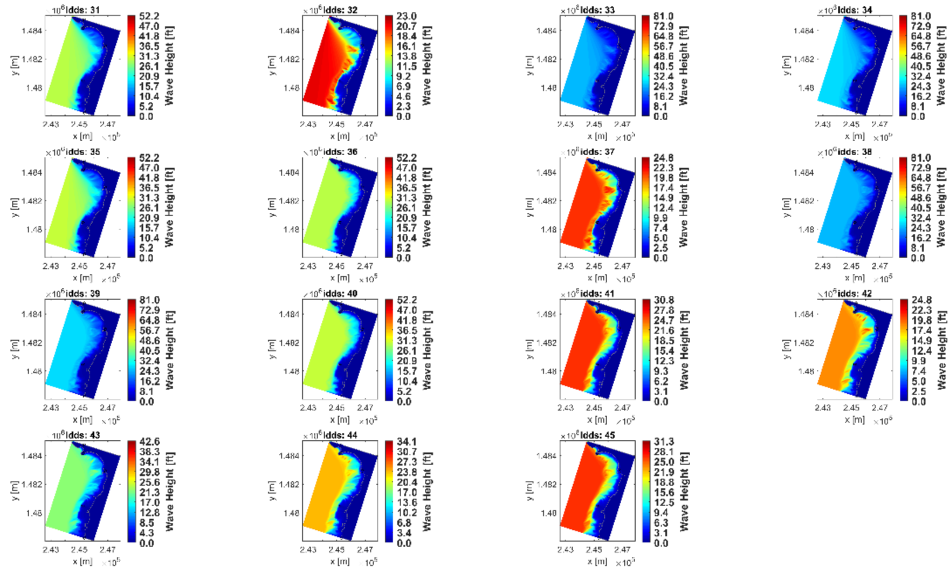

Figure 35. MHHW + 2%AEP

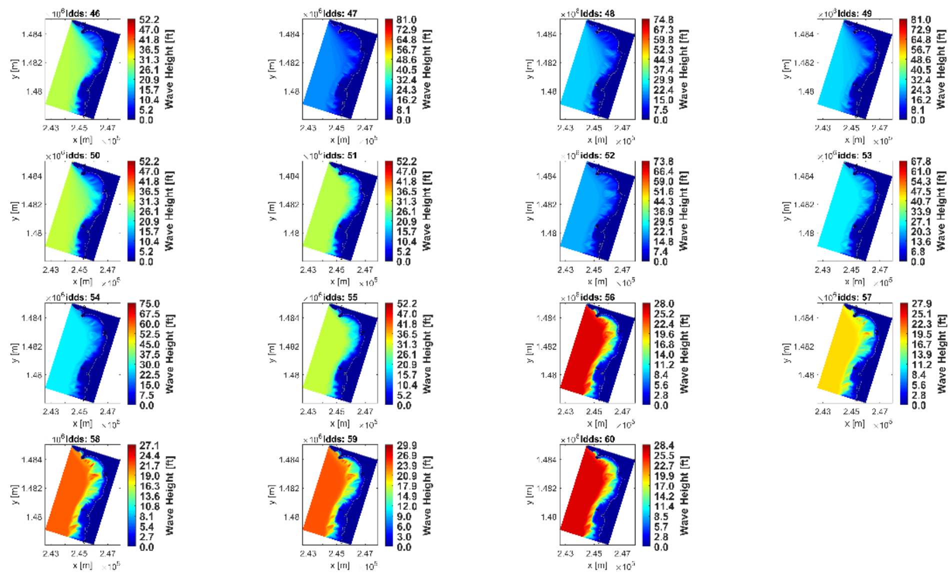

Figure 36. . MHHW + 2%AEP +25lowSLC

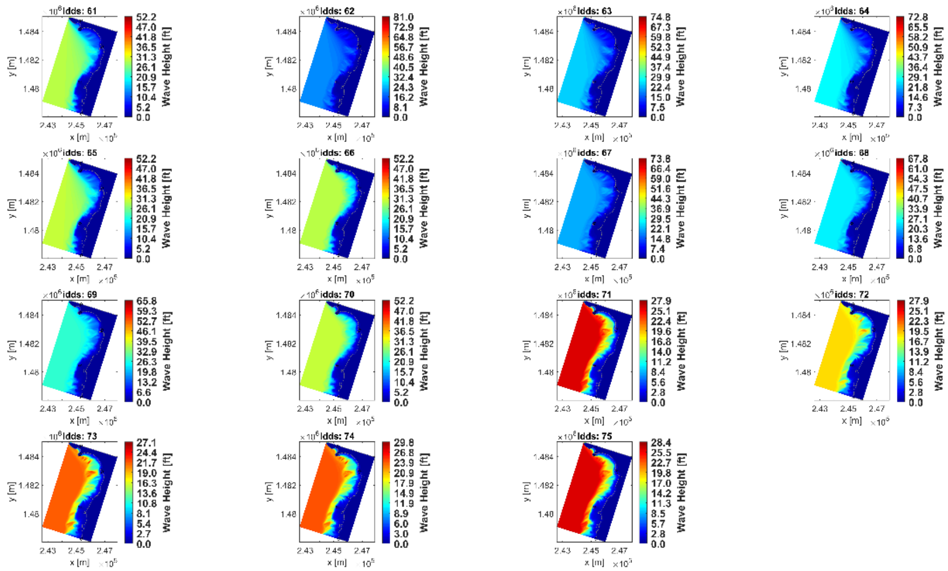

Figure 37. MHHW + 2%AEP +50lowSLC

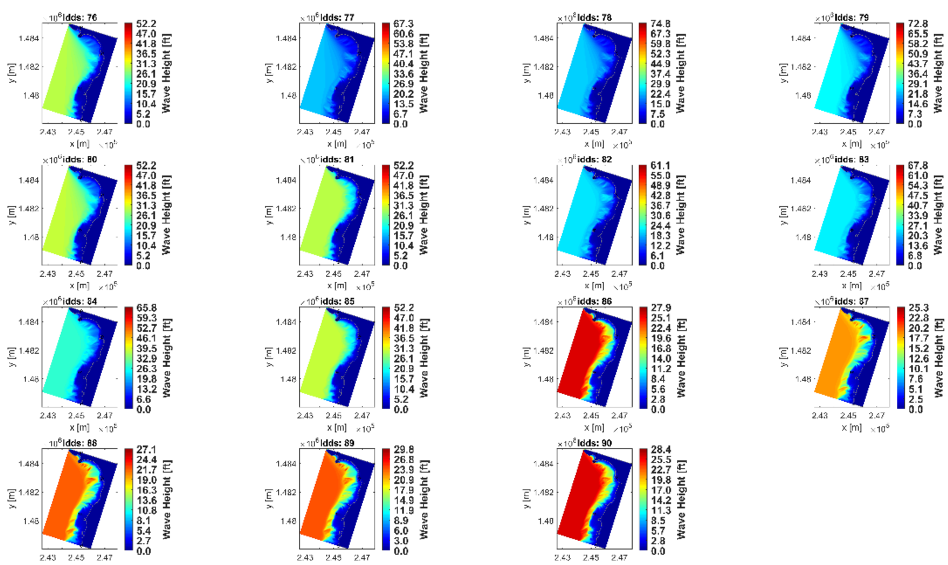

Figure 38. MHHW + 2%AEP +25intermediateSLC

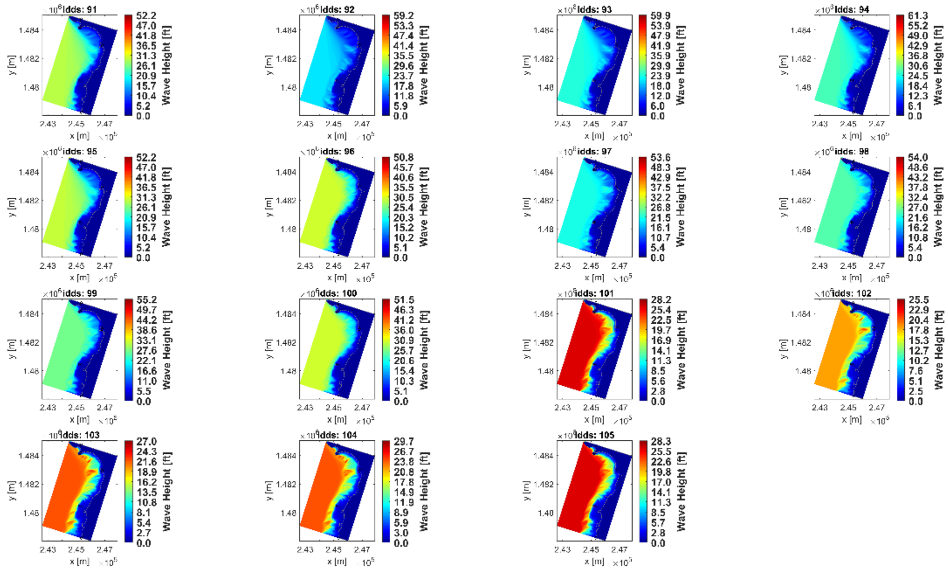

Figure 39. MHHW + 2%AEP +50intermediateSLC

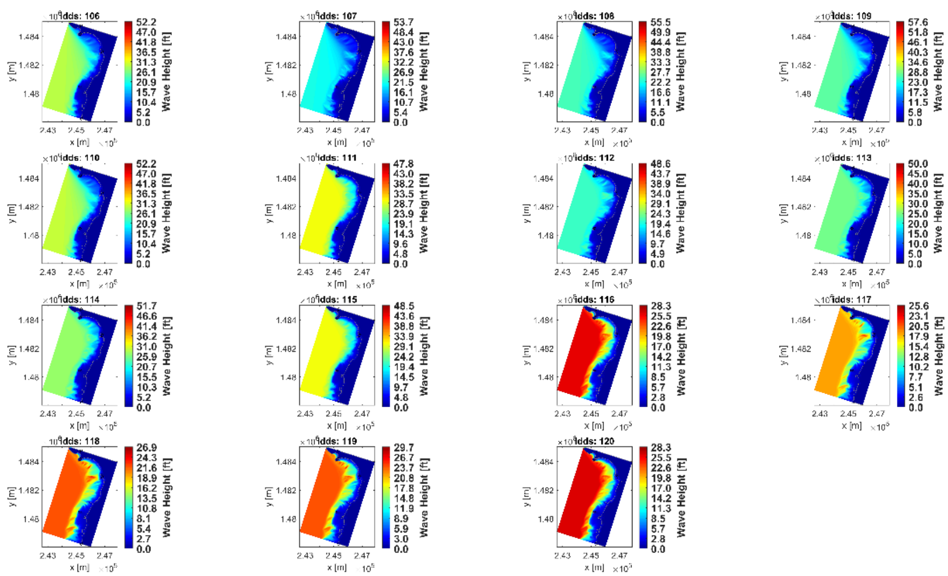

Figure 40. MHHW + 2%AEP +25highSLC

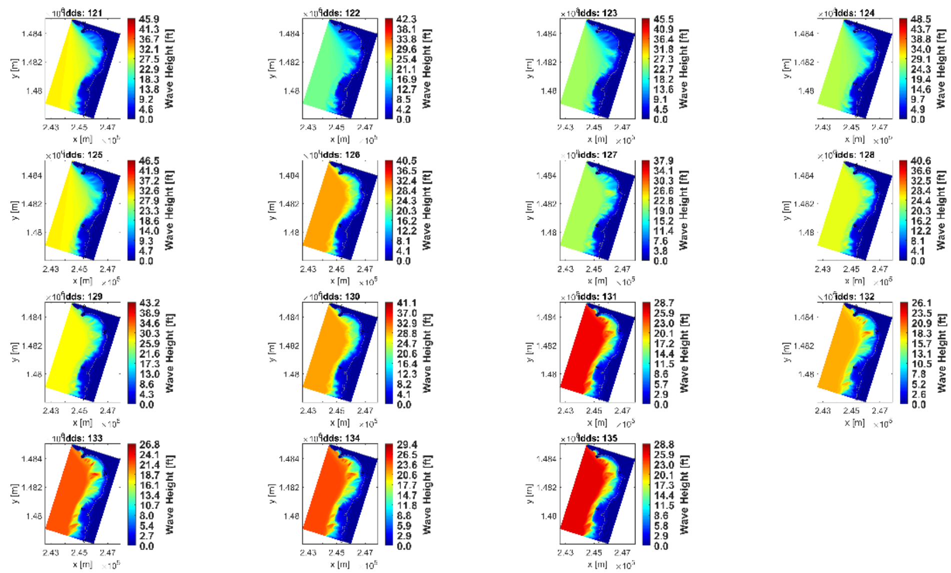

Figure 41. MHHW + 2%AEP + 50highSLC

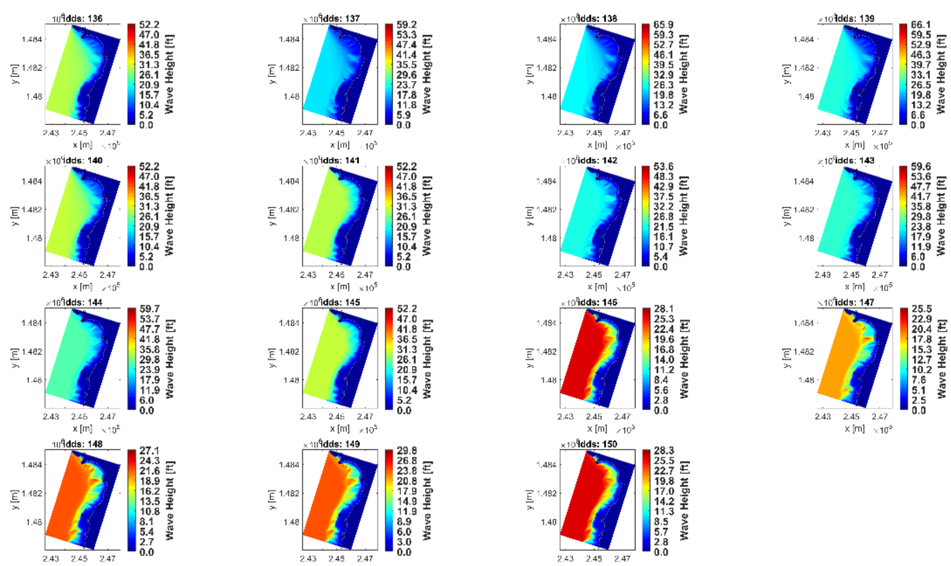

Figure 42. MHHW + 2%AEP+100LowSLC

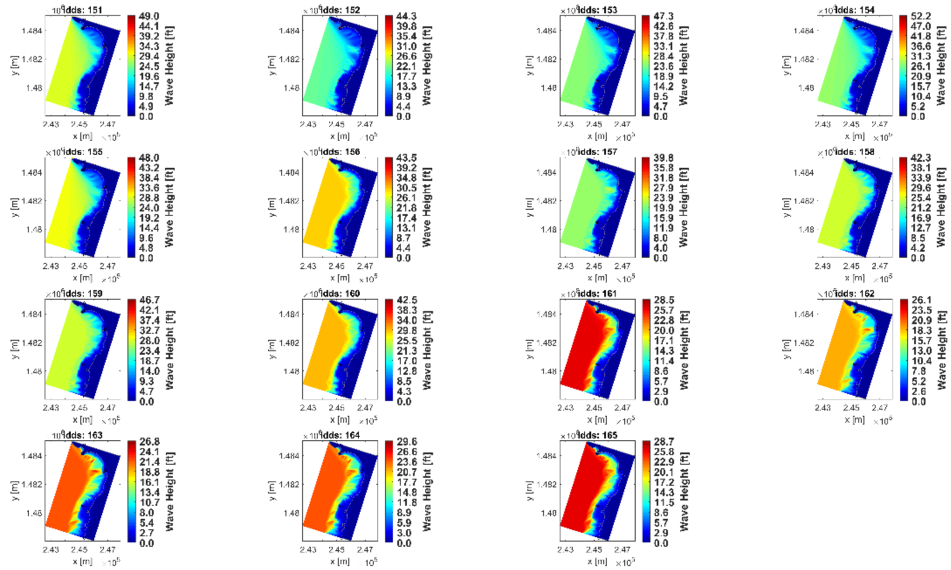

Figure 43. MHHW+2%AEP +100IntermediateSLC

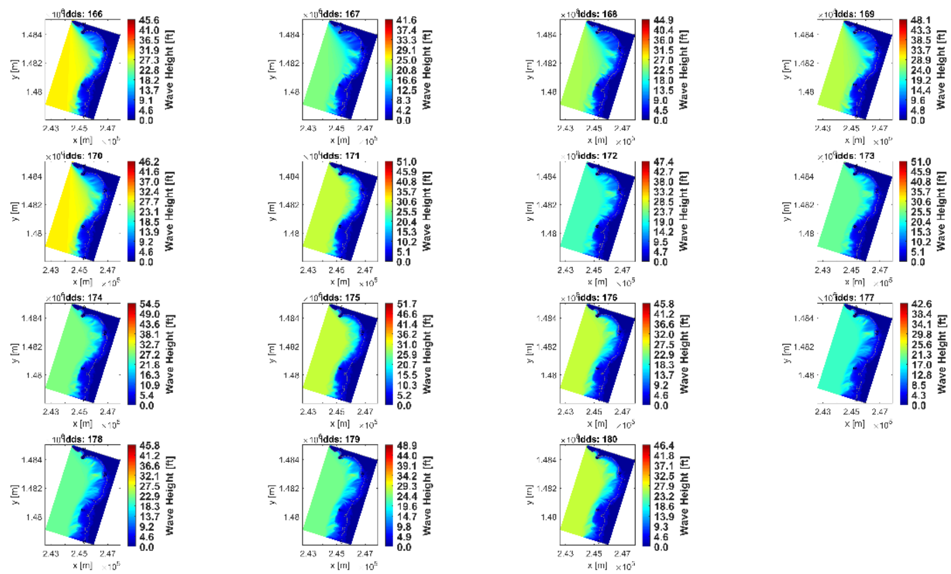

Figure 44. MHHW+2%AEP+100highSLC

Geotechnical Feasibility Appendix

Agat Mayor's Complex Shoreline Protection

Agat, Guam

Alaska District, Pacific Ocean Division

27 August 2024
Status: ATR Backcheck
Submittal

US Army Corps of Engineers
Alaska District

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, ALASKA DISTRICT
P.O. BOX 6898
JBER, AK 99506-0898

CEPOA-ENG-M 27 August 2024

MEMORANDUM FOR

Civil Works Project Management (CEPOH-PPC), Michael Terlaje

SUBJECT: Geotechnical Feasibility Appendix for Agat Shoreline Protection, Guam.

1. Enclosed is the Geotechnical Feasibility Report for Agat Shoreline Protection, Guam. Included with this report is a discussion of coastal revetment options for flood and erosion control.

2. Questions should be addressed to Twain Cacek at 907-753-2784, Justin Miller at 907-753-2577, or Amy Steiner at 907-753-2800.

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Engineering Services Branch
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Table of Contents

List of Tables

List of Figures

1 Introduction

The purpose of this report is to perform a desktop review of historical geotechnical information, document the anticipated subsurface geotechnical conditions, provide analyses of anticipated site conditions as they pertain to the project described herein, and to introduce a preliminary geotechnical design and construction criteria for shoreline protection measures along the Agat Mayor's Complex located in Agat, Guam. Information and assumptions in this report were developed through a site visit conducted in July 2023. The information presented is intended for use by design engineers and planners to evaluate the feasibility of proposed project. Information in this report is not intended for use in construction contract documents. An extensive exploration program and a more detailed engineering analysis are needed before the final geotechnical recommendations for the design and construction of the proposed project can be made.

2 Location and Project Description

Guam is the southernmost and largest of the Mariana Arc Islands and a territory of the United States with an area of 212 square miles and a population of over 168,000. It is approximately 30 miles long and varies in width from 1 to 8 miles. The study area for this analysis is focused on the Agat Mayor's Compound shoreline located in the village of Agat (Figure 2-1). There have been previous geotechnical studies conducted by USACE on the island of Guam, but no federally authorized projects exist in the study area.

Figure 2-1. Project Vicinity in Guam

The emergency shoreline protection measures include four alternatives: no action, a concrete armor unit revetment, an open cell piling seawall, and a secant pile seawall. The action alternatives will include the construction of an approximately 320-foot-long seawall/revetment along the shoreline of the Mayor's Complex. Figure 2-2 shows the approximate location of the proposed seawall/revetment.

Figure 2-2. Proposed Seawall Location along Agat Mayor's Complex Shoreline

2.1 Alternative 1: No Action

Alternative 1 involves no action. The existing seawall will be left in place and no new seawall/revetment will be constructed. The project site will essentially continue in its present state with no intervention. In its present state, with temporary erosion protection measures such as boulders and powerline poles placed on the beach, the seawall is susceptible to failure caused by erosion of the soil that lies below it. If the seawall is undercut and a catasrophic failure occurs, the areas behind the seawall will begin to erode. This erosion will eventually progress inland and may impact the structures of the Agat Mayor's Complex.

2.2 Alternative 2: Concrete Armor Unit Revetment

Alternative 2 involves the removal of the existing seawall and the construction of a new concrete armor unit revetment. The 320-foot-long revetment will have a 30-foot-wide footprint, a 6-foot-wide crest, and a 1V:1.5H side slope. The revetment will be constructed with a 2.7-foot-thick layer of 1-ton armor rock atop a 2.2-foot-thick underlayer stone layer of 100 to 300-pound rock. The base of the revetment will be keyed 2 feet into the hard substrate (the limestone bedrock). Finished crest elevation will be 6 feet above mean sea level (MSL) and will extend down to -6 feet MSL. A preliminary cross section of this alternative can be found in Attachment A.

2.3 Alternative 3: Tentatively Selected Plan (TSP): Open Cell Piling Seawall

Alternative 3 is the tentatively selected plan (TSP) and involves the removal of the existing seawall and the construction of an open cell piling seawall. The 320-foot-long open cell piling seawall will have 1 ft wide vinyl cells filled with reinforced concrete installed to the consolidated limestone shelf. The individual wall panels will be anchored with a 2-inch diameter pin pile installed into the limestone. The seawall will have a 2 ft wide pile cap and a 4 ft wide splash apron. The seawall will be constructed by driving vinyl open cell sheet piling using a vibratory mandrel hammer to the limestone shelf. Following the driving of the vinyl piles, the soils in the annulus will be removed by a water jet method. A 2-inch diameter pin pile will be installed a minimum of 1 foot deep into the limestone bedrock, with an expected embedment depth of 5 feet. The annulus will be back filled with reinforced concrete. The minimum depth of embedment for the pin piles is 1 ft. The seawall will be attached to reinforced concrete deadman anchors using tieback rods at a minimum of 3 ft deep in the backfill. The deadman anchors will be placed every 8 ft for the length of the seawall. The finished seawall will have a top elevation of approximately 6 ft MSL and will extend down to -6 ft MSL. The top of the seawall will be approximately 3 ft above the existing grade of the mayor’s complex. A preliminary cross section of this alternative can be found in Attachment A.

2.4 Alternative 4: Secant Pile Seawall

Alternative 4 involves the removal of the existing seawall and the construction of a secant pile seawall. The 320-foot-long secant pile seawall will have a 2-foot-wide footprint and will be vertical. The secant piles will be anchored 5 feet into the bedrock and will be 2 feet in diameter with a reinforced concrete pile cap at the top of the wall. The finished seawall will have a top elevation of 6 feet MSL and will extend down to -6 feet MSL. A preliminary cross section of this alternative can be found in Attachment A.

3 Geotechnical Investigations

There has been one geotechnical investigation that was performed by USACE in 1981 for the Agat Small Boat Harbor Project Report near Nimitz Beach Park approximately 2 miles south of the project site. This geotechnical investigation consisted of 11 borings that were drilled to depths between 18.4 and 21.3 feet below ground surface (bgs). Subsurface conditions consisted of unconsolidated clastic sediments, coral limestone, and coral limestone breccia that did not have a consistent stratigraphic sequence. Unconsolidated clastic sediments contained material ranging from calcareous clay/silt to freshly broken, angular gravel, cobbles, and boulders. The coral limestone hardness ranged from easily friable (by hand) to hard, with micro to macro scale voids that contribute to a porosity between 16% and 30%. Compressive strength of the harder limestone was estimated to be 300psi or greater. Due to the distance from the project area and difference in observed conditions, a comprehensive geotechnical investigation will still need to be performed during PED. The Agat Small Boat Harbor Project Report can be found in Appendix C.

Other USACE studies conducted (e.g., 1978 Artifact Survey, 1997 Agat Harbor Monitoring Study, 2020 Agat Bay Shoreline Assessment) nearby do not contain geotechnical investigations or sediment sampling that provide useful geotechnical information.

The geotechnical information that will be used to inform the feasibility design was collected during a site visit that took place on July 26 and 27, 2023. Hand augers and soil probes were performed at 6 locations along the seawall (evenly spaced every 64 feet). The soils encountered above the water table were predominately poorly graded medium to fine sands. The soils below the water table are inferred to be similar to those above the water table, but were unable to be sampled due to auger hole cave-in. Soil probes reached refusal between 10 feet and 12 feet bgs, indicating that the limestone bedrock lies 10 feet to 12 feet bgs.

4 Regional Geology

Guam is a volcanic island with a clay-rich limestone plateau overlaying most of the North, and pyroclastic basalt highlands in the South. Project location geology consists of white beach sand and gravel of calcareous remains (Qrb) transitioning to alluvial deposits upland (Qal). The bedrock underlying the quaternary deposits of the project area is inferred to consist of the Alutom formation (Ta) and/or Facpi formation (Tf) (there is a contact between the units that runs through the project area). Nearby borings of the coast of Nimitz Beach (approximately 1.3 miles S-SW) encountered bedrock in all borings, including coral limestone breccia. A geologic map of the project area can be seen in Figure 4-1. The following are a description of relevant geologic units within the project area:

- Beach deposits (Qrb) – beach sand and gravel, beach rock in the intertidal zone and small isolated patches of recently emerged detrital limestone. Sand generally is less than 15 feet above sea level, seldom as much as 30 feet above (Figure 4-1).

- Alluvium (Quaternary) (Qal) – alluvial clay deposits, mostly 30-100 feet thick, muck and clay in marshy estuarine deposits on the west coast, scatted sand and gravel bars within deposits near SE river mouths, and clay fill in large sinks in limestone areas (Figure 4-1).

- Alutom formation (Eocene and Oligocene) (Ta) – bedded breccias, conglomerates, sandstone turbidites, sandy limestones, and micritic to bioclastic limestones. Clasts in the breccia and conglomerates generally are two-pyroxene andesites, although rare olivine phyric basalts and hornblende andesite clasts also are present. Estimate thickness of the Alutom formation ranges from 1850 to 2000 feet.

- Facpi formation (Eocene) – basal portion consists of high-Ca boninite pillow lavas interbedded with pillow breccia, hyaloclastites, and sandstones of the same lithology. Least differentiated lavas have olivine, augite, and chromite phenocrysts; more differentiated varieties lack chromite and have plagioclase and orthopyroxene phenocrysts. The upper portion consists of pillow lavas, breccias, bedded breccias, and conglomerates of arc tholeiitic basalt with olivine, augite, and plagioclase phenocrysts. Boninitic and basaltic dikes cut this formation and are particularly abundant in the region od the Facpi peninsula. All portions of this formation have undergone zeolite facies metamorphism, and many areas also have undergone lateritic weathering. Estimate thickness of the Facpi formation ranges from 500 to 800 feet.

- Coral Limestone Breccia – white to tan; angular fragments range from sand and gravel to cobble sizes; calcareous fossilized skeletal parts (polyps, tentacles, columella, tests, spines, shells) cemented sand size pieces both rounded and angular, all in a fine grained cementing matrix of calcium carbonate; secondary growths of calcite and aragonite crystal; white lime secondary coating on walls of voids and cracks; degree of cementation and number of surface cavities (voids) varies and is influenced by weathering, exposure to air, dissolution, precipitation rates of calcium carbonate, etc.

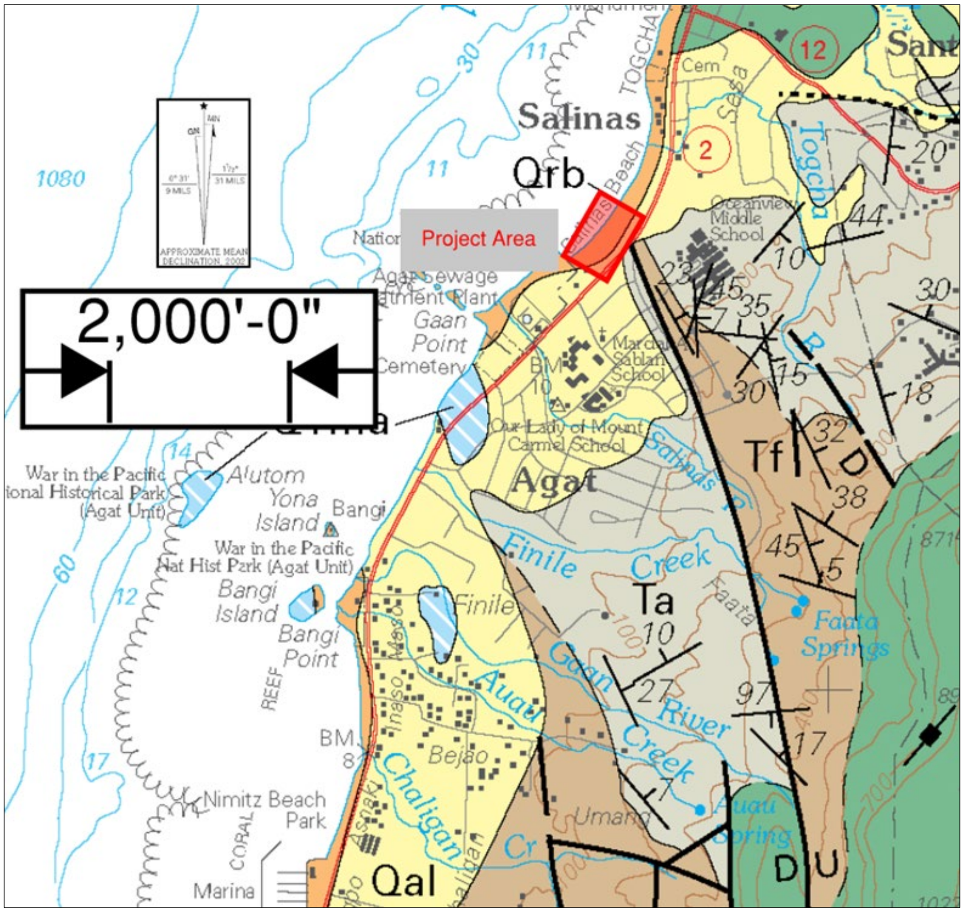

Figure 4-1. Geologic Map of Agat, Guam (Siegrist and Reagan, 2007)

5 Geotechnical Design Considerations for TSP

It is anticipated that an open cell pile wall can be constructed for the planned project. It is important that prudent consideration be given to certain subsurface conditions and construction aspects including deleterious foundation soils and rock, stability, seismic concerns, and settlement. This engineering analysis is based on the site visit that was conducted in July 2023. The following sections are based on anticipated conditions and must be reevaluated following a formal subsurface site investigation.

5.1 Anticipated Soil Profile

Based on the available historical information and the result of the site visit, it is anticipated that the soils in the project area consists of 10 to 12 feet of unconsolidated marine sediments (gravels and sands) overlying limestone bedrock. The anticipated soil profile must be confirmed by a geotechnical drilling program.

5.2 Anticipated In Situ Soil Properties

The soil properties used to design the revetment profile are summarized in Table 5-1. Typical unit weights from Table 5-2 (Coduto, 2001) and effective internal friction angles were estimated in accordance with Table 3-1 of EM 1110-1-1905, *Bearing Capacity of Soils* (1992). The soil properties in Table 5-1 are assumed soil properties and will need to be reevaluated following a formal subsurface site investigation. Parameters for the seawall backfill can be found in Table 5-2. Values shown in Table 5-2 are the assumed minimum values for the proposed TSP.

Table 5-1. Anticipated Design Foundation Soil Properties

Interpreted Geology	Depth (ft)	Physical Properties	Unified Soil Classification Symbol	Dry Unit Weight (pcf)	Internal Friction Angle (degrees)	Cohesion (psf)
Unconsolidated sediment	0-12	Loose to Medium Dense	GW - SW	100 – 120 (115)	29 - 34 (32)	0 - 150 (0)
Limestone	12+	Moderately Weathered	Bedrock	130 – 150 (140)	38 - 55 (43)	2000-10000 (5000)

5.3 Preliminary TSP Cross-Section

The preliminary cross-section for the breakwater is shown in Figure 5-1. During the engineering analyses, each soil layer was assumed to be homogeneous and uniform in composition.

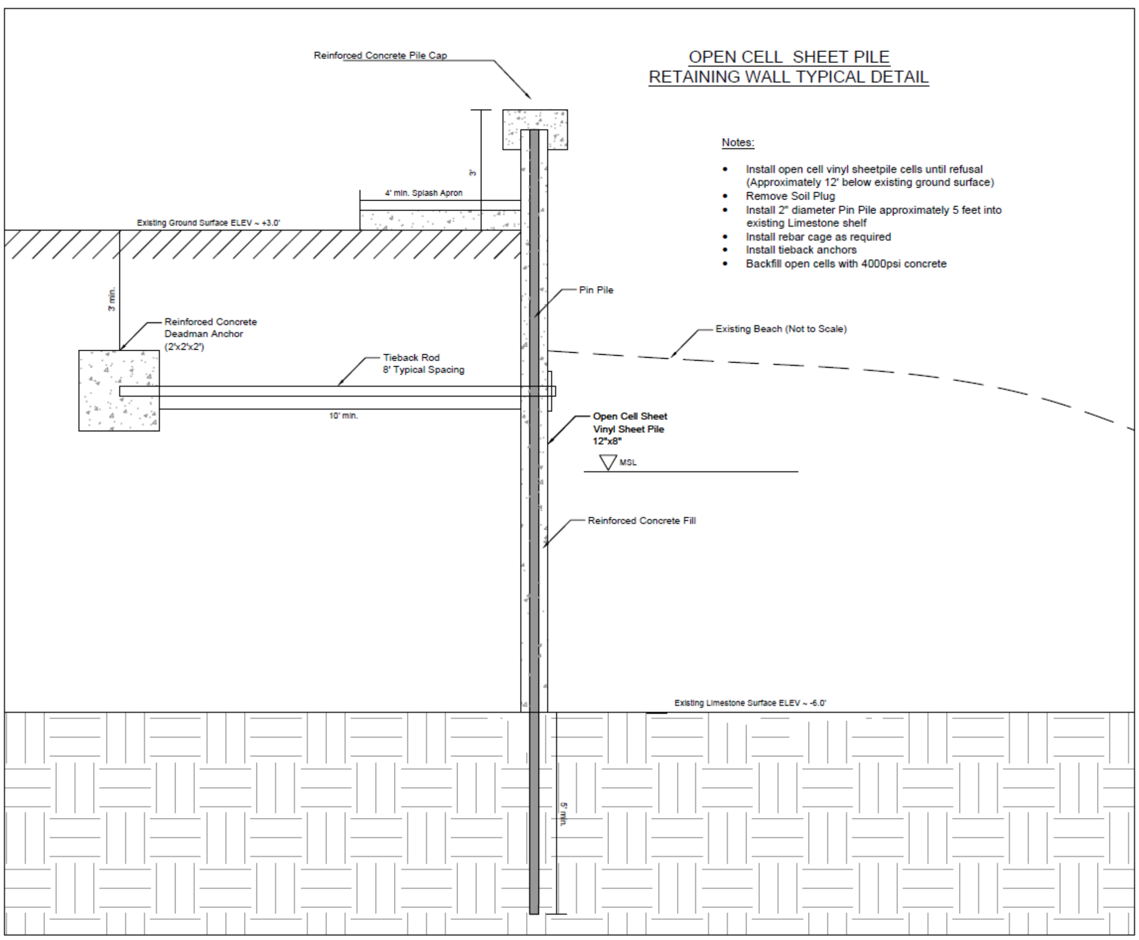

Figure 5-1. Preliminary Seawall Cross-Section

Table 5-2. Seawall Design Parameters

Design Parameter	Drained	Undrained
Friction Angle of Soil Behind Walls, φ'	32	26
At Rest Earth Pressure Coefficient K_o	0.47	0.56
Active Earth Pressure Coefficient, K_a (backfill angle = 0)	0.31	0.39
Passive Earth Pressure Coefficient, K_p (backfill angle = 0)	3.25	2.56

5.4 Design Factors of Safety

Appropriate factors of safety must be to ensure adequate performance of the project throughout its design life. Three important considerations in determining appropriate factors of safety include: uncertainties in the conditions being analyzed, the consequences of failure, and the acceptable performance. Table 5-3 provides applicable factors of safety and source documents, which include procedures for performing the analysis.

Table 5-3. Applicable Factors of Safety

Reference	Analysis Condition	Minimum Factor of Safety
EM 1110-1-1905	Bearing Capacity	2.5
EM-1110-2-1902	Slope Stability, End of Construction	1.3
EM-1110-2-1902	Slope Stability, Long Term	1.5
EM-1110-2-1902	Slope Stability, Earthquake Loading	>1.0

5.5 Tide Conditions

The tides at Agat are generally diurnal with two highs and two lows occurring daily. Tide levels, referenced to Mean Lower Low Water (MLLW), are shown in Table 5-4. Water level data is from the National Oceanic and Atmospheric Administration (NOAA) online database.

Table 5-4. Tidal data for the Agat Shoreline Protection Project Referenced to MLLW

Tide	* Elevation (feet)
Mean Higher High Water (MHHW)	+2.34
Mean High Water (MHW)	+2.22
Mean Tide Level	+1.41
Mean Low Water (MLW)	+0.60
Mean Lower Low Water (MLLW)	0.00
* Source: NOAA National Ocean Surface	

5.6 Seismic Design Parameters

Agat, Guam is in a seismic region of the Southwest Pacific where large magnitude earthquakes occur. Structures shall be designed to meet or exceed seismic requirements in ER 1110-2-1806 "Earthquake Design and Evaluation for Civil Works Projects." It is unnecessary to analyze the liquefaction settlement due to seismicity as the structure will be founded in rock.

The proposed structure is assigned a Seismic Design Category D per Section 11.6-1 of American Society of Civil Engineers (ASCE) 7-22, since the mapped spectral response acceleration parameter at 1-second period, S_1, is less than 0.75 and the short-period response acceleration parameter, S_{Ds}, is greater than 0.50 at the project site. Seismic data for Agat, Guam was determined using the probabilistic seismic hazard maps of Alaska provided by the U.S. Geological

Survey (USGS) and the ASCE 7 Hazard Tool and is shown Table 5-5 using a 2% probability of exceedance in 50 years. The specified design ground motions are for Site Class C. Seismic design ground motion parameters are provided for ASCE 7-22.

Table 5-5. Seismic Design Ground Motion Parameters

Parameter	ASCE 7-22
Site Class	C
Site-Specific PGA_M	0.99
S_1	0.65
S_{D1}	0.62
S_s	3.03
S_{Ds}	2.14

The proposed facility is assigned a Risk Category I in accordance with Table 2-2 of the UFC 3-301-01 Structural Engineering (2023) since the structure poses a low hazard to human life in the event of failure.

6 Preliminary Geotechnical Analysis of TSP

The following sections are based on information gathered during site visits, review of the geophysical survey and historical geotechnical reports, and assumptions on the subsurface conditions. These sections are for the feasibility analysis of alternatives only and are not adequate for a formal design. A formal subsurface site investigation needs to be performed in order to evaluate and validate the assumptions.

6.1 Bearing Capacity Analysis

A preliminary bearing capacity analysis was performed in order to ensure the foundation soil/rock has a bearing capacity that is suitable for the seawall. The allowable bearing pressure for the limestone bedrock was taken from Table 1806.1 from the NYC Building Code (2022). This limestone was assumed to be "soft rock" (a with a maximum allowable pressure of 16 ksf. The seawall loading is calculated as:

$$Q_{seawall} = 150pcf \cdot (12ft) = 1.8ksf$$

Since the seawall is founded in the limestone bedrock, it is assumed that all the load from the seawall will be supported by the limestone. Based on the assumptions above, the maximum allowable pressure of the limestone is greater than the calculated seawall loading pressure, so the seawall is assumed to be stable with respect to bearing capacity.

6.2 Global Slope Stability Analysis

A preliminary slope stability analysis was performed for the open cell pile wall. Geostudio Slope/W was used to determine the global slope stability factor of safety for the open cell piling seawall. The backfill was analyzed using Mohr-Coulomb whereas the limestone bedrock was analyzed as undrained. The undrained assumption is conservative in this case as it ignores any residual strength that the limestone bedrock has. Only circular slip surfaces were considered for this analysis. The model also assumed that all the sand on the beach would be eroded away (and would not provide passive pressure). This model is very conservative as it is essentially the worst case scenario. The calculated factor of safety for the Slope/W model was 14.4 which well exceeds the required factors of safety per EM 1110-2-1902. Model results can be found in Appendix D.

6.2.1 Seismic Stability Analysis

Seismic stability of the seawall will be accounted for and designed during the preconstruction engineering and design phase. It is recommended that a liquefaction analysis also be performed in conjunction with the seismic stability analysis. Data collected during future geotechnical investigations will help to determine the materials parameters to be used in the seismic stability and liquefaction analyses. Ground motion parameters to be used during PED can be found in Attachment B.

6.3 Settlement Analysis

The seawall will be founded in competent rock, so settlement is not expected and is not necessary to be evaluated.

7 Future Geotechnical Site Investigation Recommendations

It is recommended that a geotechnical site investigation consisting of a geophysical survey and geotechnical drilling be conducted during the preconstruction engineering and design (PED) phase of the project. The geophysical survey should include techniques to map the top of bedrock and to correlate the rock quality parameters. The geotechnical drilling program will include drilling between 5 and 10 test borings along the centerline of the proposed seawall a minimum of 10 feet into the limestone bedrock. Laboratory testing of the sediment material will consist of gradations, Atterberg limits, moisture contents, and direct shear tests. Laboratory testing of the encountered rock include recovery, rock quality designation (RQD), unit weight, unconfined compression test (USC), tensile testing, Mohs hardness, and CERCHAR Abrasively Index (CAI). It is also recommended that a geophysical survey (e.g., seismic refraction) be conducted to map the top of bedrock, as the depth to bedrock may not be consistent/planar across the entire site. Seismic wave velocities from the geophysical surveys may also be used to infer bedrock ripability for pile driving and/or excavation. The main goal of a geotechnical site investigation and geophysical survey would be to properly characterize proposed foundation material and identify any geological conditions that would require special considerations during PED. Geotechnical and geophysical information would also be used to establish accurate cost estimates.

8 References

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Coduto, Donald P, Kitch, William A, Yeung, Man-Chu R. (2001). *Foundation Design: Principles and Practices – Third Edition, ISBN: 978-0-13-341189-8*.

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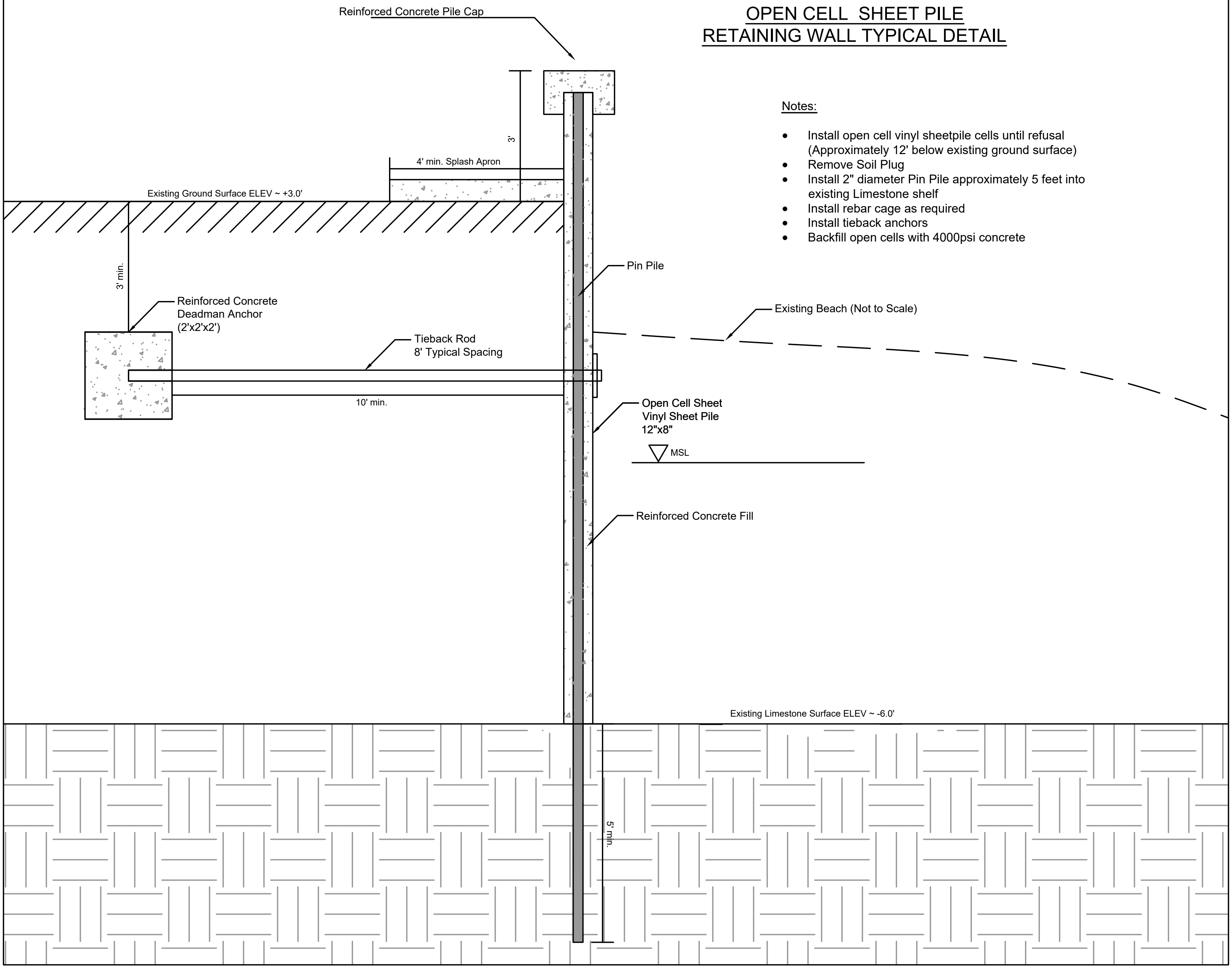
ATTACHMENT A

ALTERNATIVES DESIGN CROSS SECTIONS

OPEN CELL SHEET PILE RETAINING WALL TYPICAL DETAIL

Notes:

- Install open cell vinyl sheetpile cells until refusal (Approximately 12' below existing ground surface)
- Remove Soil Plug
- Install 2" diameter Pin Pile approximately 5 feet into existing Limestone shelf
- Install rebar cage as required
- Install tieback anchors
- Backfill open cells with 4000psi concrete



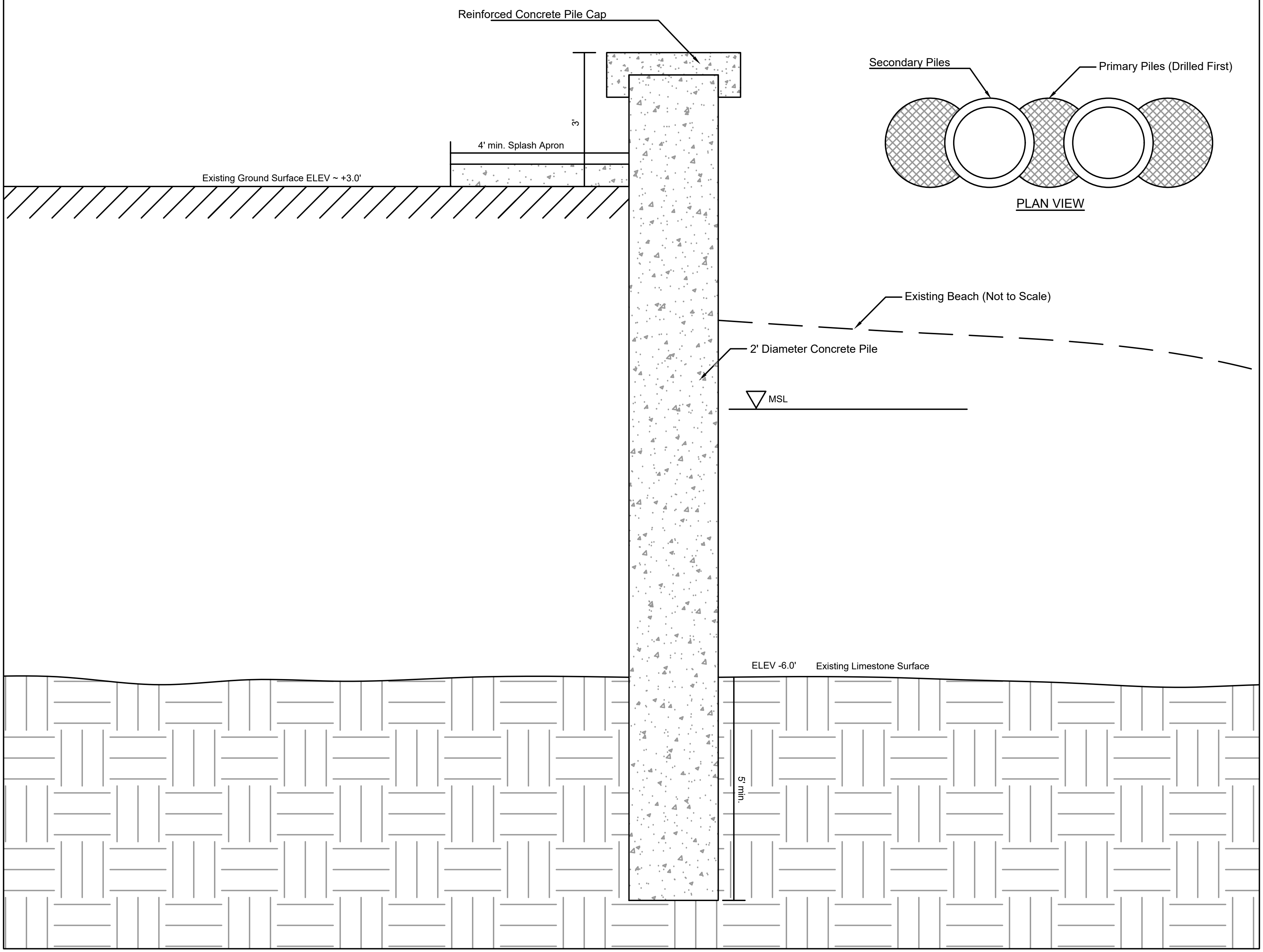
SCALE: NTS
DATE: OCT 2023
DRAWN/RVW: JJM/ALS
FIGURE: 1 of 2

VINYL CELL RETAINING WALL TYPICAL DETAIL
Agat Mayors Complex
Agat, Guam

ALASKA DISTRICT
CORPS OF ENGINEERS
Geotechnical and Materials

U.S. ARMY
CORPS OF ENGINEERS

SECANT PILE WALL
TYPICAL DETAIL



U.S. ARMY
CORPS OF ENGINEERS

SCALE: NTS
DATE: OCT 2023
DRAWN/RVW: JJM/ALS
FIGURE: 2 of 2

SECANT PILE WALL TYPICAL DETAIL
Agat Mayors Complex
Agat, Guam

ALASKA DISTRICT
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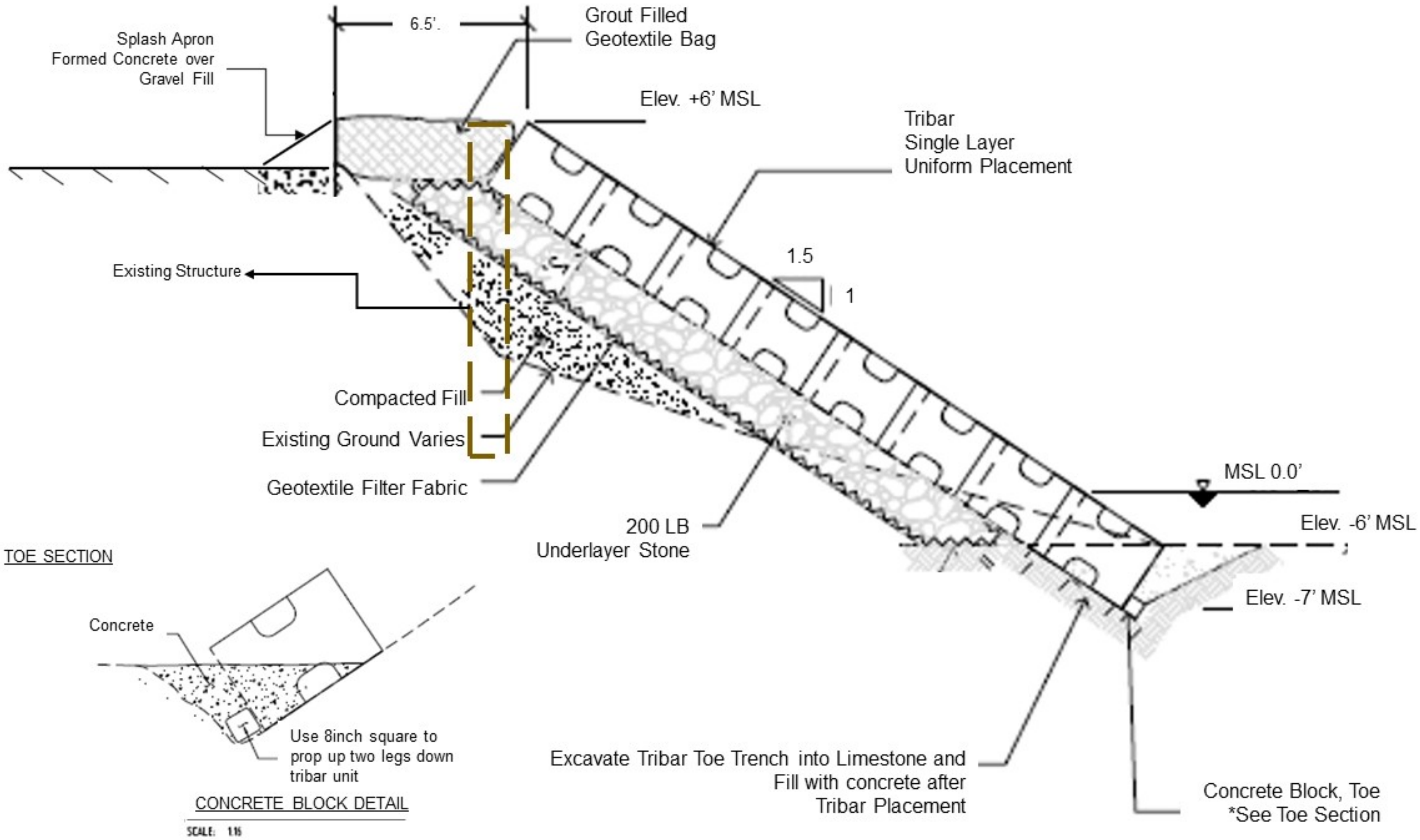

SCALE: NTS
DATE: OCT 2023
DRAWN/RVW: JJM/ALS
FIGURE: 3 of 3

CONCRETE TRIBAR REVETMENT TYPICAL DETAIL
Agat Mayor Complex
Agat Guam

ALASKA DISTRICT
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Geotechnical and Materials

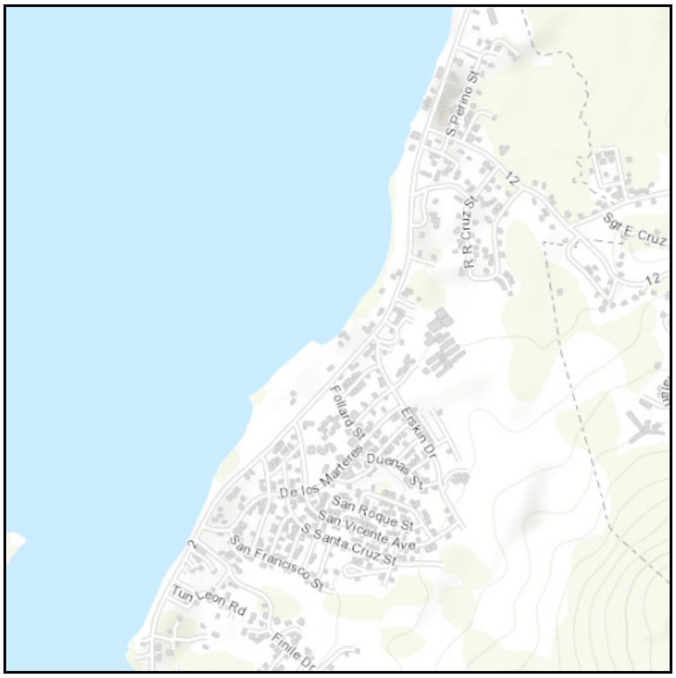
ATTACHMENT B

SEISMIC DESIGN PARAMETERS

ASCE Hazards Report

Address:
No Address at This Location

Standard:	ASCE/SEI 7-22	**Latitude:**	13.388132
Risk Category:	I	**Longitude:**	144.659088
Soil Class:	C - Very Dense Soil and Soft Rock	**Elevation:**	5.37961543133404 ft (NAVD 88)



Seismic

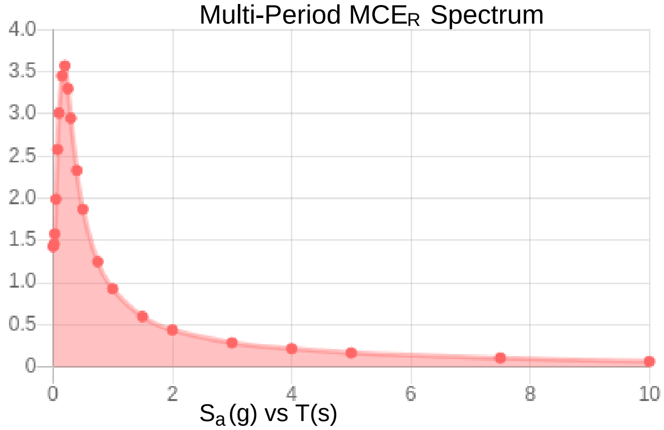
Site Soil Class: C - Very Dense Soil and Soft Rock

Results:

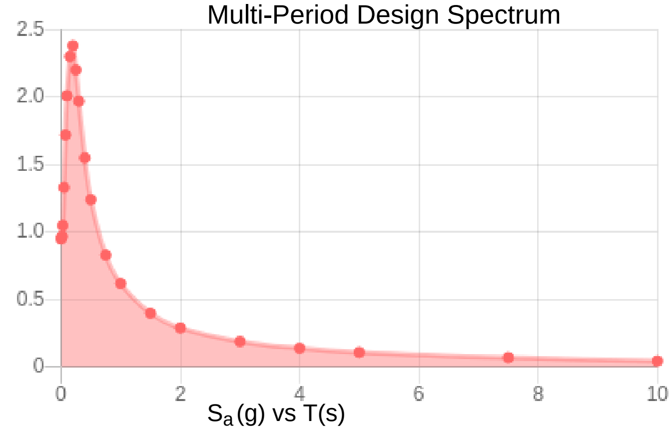
PGA_M :	0.99	T_L :	12
S_{MS} :	3.21	S_S :	3.03
S_{M1} :	0.93	S_1 :	0.65
S_{DS} :	2.14	V_{S30} :	530
S_{D1} :	0.62		

Seismic Design Category: D

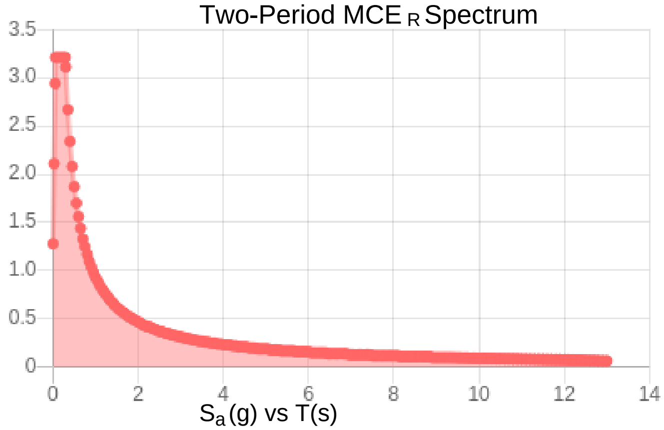
Multi-Period MCE_R Spectrum



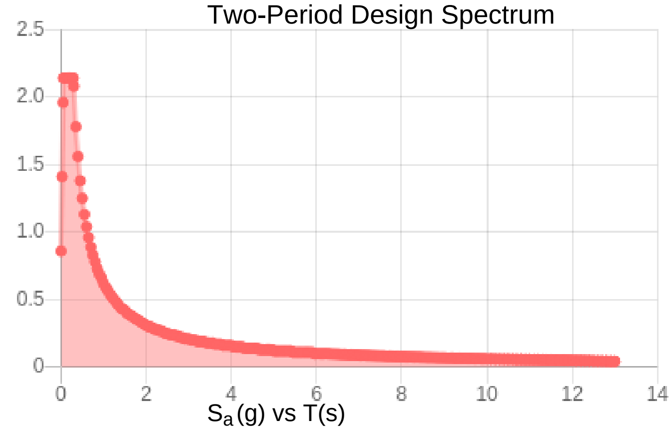
Multi-Period Design Spectrum



Two-Period MCE_R Spectrum



Two-Period Design Spectrum



MCE_R Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Design Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Data Accessed: **Thu Feb 29 2024**

Date Source:

USGS Seismic Design Maps based on ASCE/SEI 7-22 and ASCE/SEI 7-22 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-22 Ch. 21 are available from USGS.

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ATTACHMENT C

1981 AGAT SMALL BOAT HARBOR PROJECT REPORT

FINAL DETAILED PROJECT REPORT AND ENVIRONMENTAL STATEMENT

AGAT SMALL BOAT HARBOR
Territory of Guam

US Army Corps of Engineers
Honolulu District

MAY 1981

FINAL DETAILED PROJECT REPORT AND ENVIRONMENTAL STATEMENT

AGAT SMALL BOAT HARBOR

AGAT, TERRITORY OF GUAM

US Army Engineer District
Honolulu
Building 230
Fort Shafter, Hawaii 96858
May 1981

ERRATA SHEET

Agat Small Boat Harbor

Page 33, Figure 8 (Plan 5): Add Note #4. For boring logs, see Figure E-13 on page E-32.

Page E-31, Figure E-12 (Boring Location Plan): Note #4 should refer to Figure E-13 and not Figure E-12.

Page E-32, Figure E-13 (Boring Logs): Note #6 should refer to Figure E-12 and not Figure E-11.

AGAT SMALL BOAT HARBOR
AT NIMITZ BEACH, GUAM

FINAL

DETAILED PROJECT REPORT
AND
ENVIRONMENTAL STATEMENT

TABLE OF CONTENTS

(Rev May 82)

APPENDICES

LIST OF FIGURES

LIST OF TABLES

LIST OF TABLES (Cont)

AGAT SMALL BOAT HARBOR

AGAT, TERRITORY OF GUAM

MAIN REPORT

I. INTRODUCTION

1. PURPOSE AND AUTHORITY

The purposes of this study are to determine the feasibility of providing a small boat harbor in the area of Agat, Territory of Guam, to serve the needs of local commercial and recreational boaters and to determine the extent to which the Federal Government can participate in the construction of a potential solution.

The study was initially started in April 1973 when the Governor of the Territory of Guam requested the US Army Corps of Engineers to study the feasibility of constructing a small boat harbor in the Agat area. However, the study was terminated at the request of the Government of Guam in 1973. On 24 July 1975, the Governor requested that the reconnaissance study be reopened with special emphasis on the Taleyfac Bay area, and a reconnaissance report recommending detailed studies was completed in April 1976. Preparation of a Detailed Project Report was approved in May 1976.

The study and report were accomplished under the authority of Section 107 of the River and Harbor Act of 1960 (Public Law 84-645), as amended. Pertinent paragraphs of the authority are included in Appendix A.

2. SCOPE OF THE STUDY

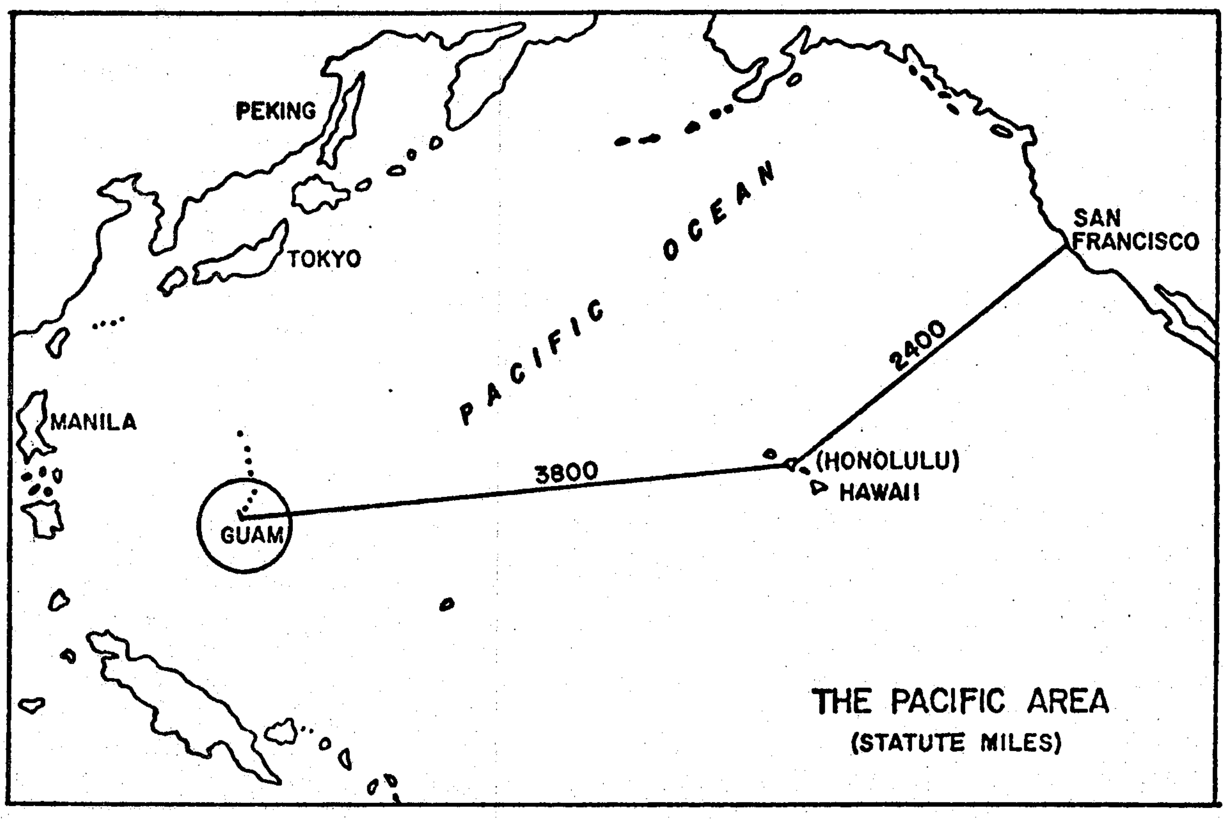
The study focused on the identification and evaluation of the problems and needs associated with recreational boating in the Agat coastal area. The problem and needs were summarized in planning and design considerations and an array of planning objectives which were used to develop alternative improvement plans. The costs, benefits and environmental impacts associated with implementing the alternative plans were determined, and the plans were evaluated to determine which one would best meet the planning objectives as well as being compatible with the overall needs and resources of the study area. The study area included the coastline between Agat Bay south to Taleyfac Bay, a distance of about 4 miles (Figure 2).

Studies conducted during the preparation of this report include detailed site investigations, topographic and bathymetric surveys, oceanographic analysis to determine the design criteria, engineering and design, economic evaluations, and environmental assessment. A marine ecology survey and cultural reconnaissance of land and offshore areas were accomplished to aid in the impact assessment and evaluation and the preparation of an environmental statement.

The study was conducted in sufficient depth and detail to define navigation needs and the planning objectives, and to develop and assess alternative plans for public review and comment. A final selected plan was recommended following a review of the Draft Detailed Project Report (DPR), environmental statement, and a formal public meeting held in Agat, Guam on January 21, 1981.

The Detailed Project Report (DPR) constitutes the authorizing document for construction for the US Army Corps of Engineers' continuing small projects authorities program. Construction plans and specifications can be initiated after approval of the DPR by the Chief of Engineers and receipt of local assurances.

FIGURE I. PROJECT STUDY AREA



3. STUDY PARTICIPANTS AND COORDINATION

The US Army Corps of Engineers, Honolulu District was responsible for conducting and coordinating the overall study and preparing the report. The studies and investigations were conducted in cooperation with the Guam Department of Public Works. Considerable assistance was received from the office of the Governor of Guam, the Department of Parks and Recreation, the Guam Environmental Protection Agency, and the University of Guam. In addition, information and comments received from the following agencies and the private sector during study coordination were considered in identification of study concerns and development of alternative plans:

a. Federal Agencies:

Advisory Council on Historic Preservation
US Navy
US Coast Guard
US Environmental Protection Agency
US Fish and Wildlife Service
National Parks Service

b. Government of Guam:

Department of Parks and Recretion
Department of Land Management
Department of Commerce
Department of Agriculture
Department of Public Health and Social Services
University of Guam
Bureau of Planning
Guam Environmental Protection Agency

c. Others:

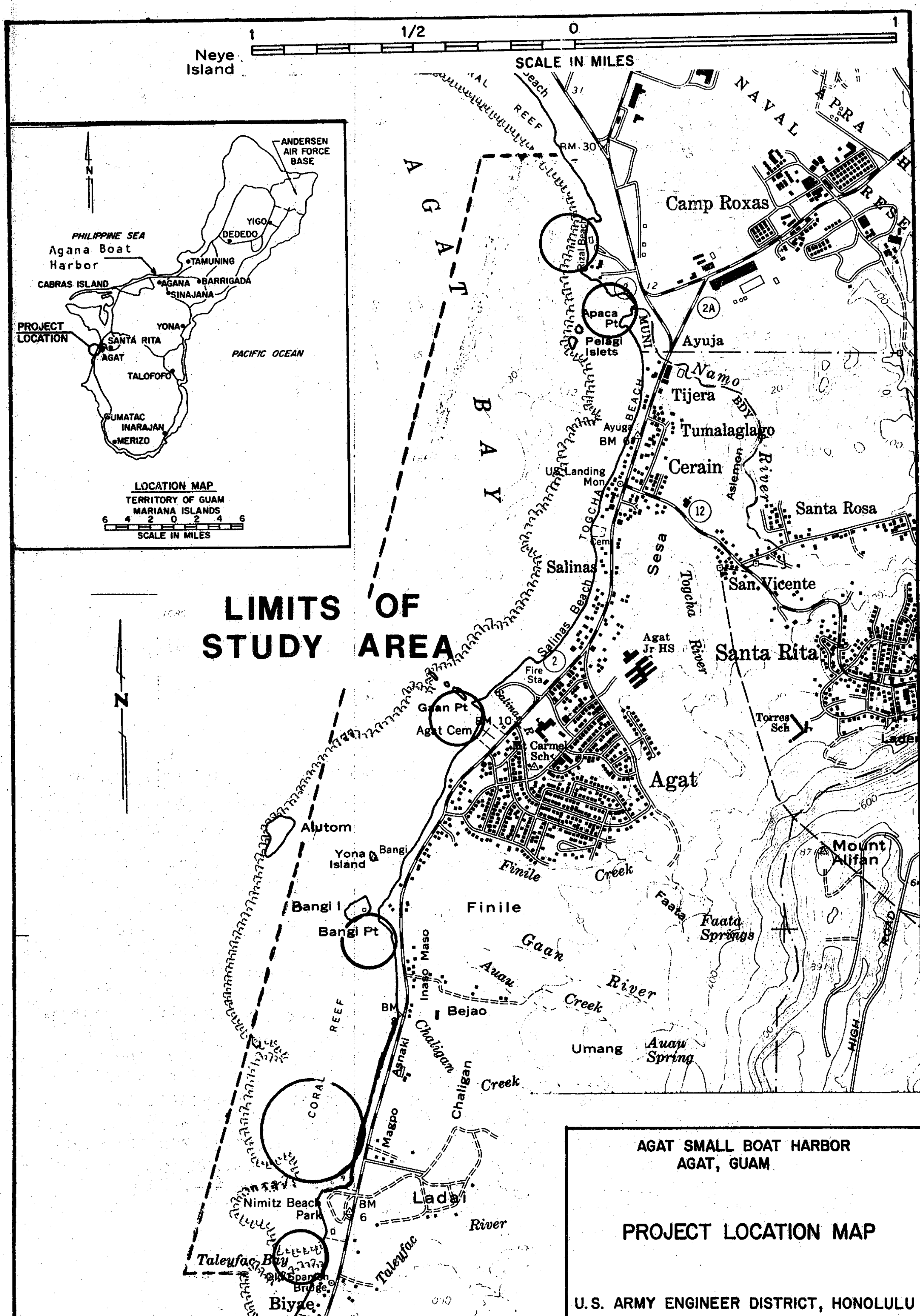
Commissioner, Agat
Assistant Commissioner, Agat
Guam Farmers' Cooperation Association
Fishermen

Details of the public involvement program are presented in Appendix B.

4. STUDY HISTORY

A reconnaissance report, completed in April 1976, recommended that a detailed study be undertaken to determine the need and feasibility of providing a small boat harbor in the Agat area. As a result, this detailed study was authorized in May 1976.

Six alternative harbor sites in the study area were considered and evaluated: Rizal Beach, Namo River, Gaan Point, Bangi Point, Nimitz Beach, and Taleyfac Bay. The sites are shown on figure 2, and a summary of significant site considerations is presented in table 1. Illustrative harbor plans were developed for each of the sites, and the harbor plans and site evaluations were presented to the public and Government of Guam agencies at a workshop held in July 1977. Of the six sites presented, Rizal Beach and Bangi Point received no support. In addition, these sites were the most costly to develop as harbor sites. Rizal Beach lacks a shallow reef to provide natural wave protection, and Bangi Point requires realigning the Auau Creek. Of the four remaining sites, the majority of the public favored the Gaan Point site. The Agat village residents envision this area as the center of recreational activity, as well as other community activities. Following the workshop, the Government of Guam requested that detailed planning be accomplished for the Gaan Point site. Guam government agencies involved in selecting this site included the departments of: Public Works, Parks and Recreation, Land Management, and Agriculture, the Bureau of Planning, and the Guam Environmental Protection Agency.



SCALE IN MILES
Neye Island
LOCATION MAP
TERRITORY OF GUAM
MARIANA ISLANDS
SCALE IN MILES
ANDERSEN AIR FORCE BASE
PHILIPPINE SEA
Agana Boat Harbor
CABRAS ISLAND
PROJECT LOCATION
PACIFIC OCEAN
YIGO
DEDEDO
TAMUNING
AGANA
BARRIGADA
SINAJANA
YONA
SANTA RITA
AGAT
TALOFOFO
UMATAC
INARAJAN
MERIZO
LIMITS OF STUDY AREA
AGAT BAY
NAVAL
Camp Roxas
Apaca Pt
Pelagi Islets
Ayuja
Tijera
Tumalaglago
Cerain
Santa Rosa
Salinas
San Vicente
Santa Rita
Agat Jr HS
Fire Sta
Gaan Pt
Agat Cem
Carmel Sch
Agat
Torres Sch
Mount Alifan
Alutom
Yona Island
Bangi
Bangi I
Bangi Pt
Finile
Finile Creek
Faata Springs
Gaan River
Auau Creek
Bejao
Umang
Auau Spring
Chaligan Creek
Magpo
Nimitz Beach Park
Ladeí
Taleyfac Bay
Old Spanish Bridge
Taleyfac River
Biyae
REEF
CORAL
HIGH ROAD
AGAT SMALL BOAT HARBOR
AGAT, GUAM
PROJECT LOCATION MAP
U.S. ARMY ENGINEER DISTRICT, HONOLULU

FIGURE 2

TABLE I . SIGNIFICANT ALTERNATIVE SITE CONSIDERATIONS

CONSIDERATION	RIZAL BEACH	NAMO RIVER	GAAN POINT	BANGI POINT	NIMITZ BEACH	TALEYFAC BAY
HARBOR CONSTRUCTION AND NAVIGATION	Relatively narrow reef flat provides no natural protection, hense, very costly protective structures required.	Would be constructed on the reef flat thus minimizing protective structure requirements. Possible sedimentation problem from adjacent Namo River.	Existing natural channel adjacent to man-made peninsula affords storm refuge for boaters. Reef flat provides natural protection.	Reef flat provides natural protection. Would require realignment of Auau Creek	Existing natural channel; wide reef flat provides natural protection.	Existing natural channel; narrow reef flat limits natural protection; possible sedimentation problem from Taleyfac River.
MARINE RESOURCES	Many massive pocillopra coral colonies and rich algal growth.	Reef flat populated by limpets, gastropods, molluscs, and crabs. Some scattered coral.	Diverse population of gastropods and echinoderms.	Abundant zostera and seagrass; 15% coral coverage.	Extensive coral coverage on sides of existing channel and along reef margin; extensive seagrass habitat on reef flat.	Large coral colonies would have to be removed from natural channel.
TERRESTRIAL RESOURCES	Woodland and marsh wetland habitat.	Woodland and riverine wetland habitat.	Highly altered area; no significant terrestrial resources.	Primarily agriculture lands; no significant terrestrial resources.	No significant terrestrial resources.	Woodland habitat.
HISTORIC RESOURCES	No significant historic resources.	Inside the War-in-the-Pacific Park area, would conflict with planned interpretive outlook on Rizal Point.	Inside the War-in-the Pacific Park area, would conflict with planned interpretive outlook.	Southern boundary of the War-in-the Pacific Park.	No significant historic resources.	Adjacent to the historic Spanish bridge, a site on the National Register of Historic Places.
LAND USE	Adjacent land controlled by US Navy. Area is also point of pipeline entry for proposed Guam oil refinery offshore tanker mooring facility.	Within US Navy controlled land; surrounding land outside Navy area zoned commercial and industrial.	Adjacent to 1.5 acre cemetary with additional 4.3 acres in reserve for cemetary use. Public land available for shoreside facilities.	Fronts private land primarily in agriculture use. Might require relocations.	Fronts US Dept of Interior lands. Adjacent to public Nimitz Beach Park. Land landward of coastal highway in residential and agricultural use.	No significant recreationd resources.
SOCIAL CONCERNS AND PUBLIC VIEWS	Conflicts with existing beach park. No public support for this site.	No public support for this site; opposed by US Navy.	Man-made intrusiveness lessened by existing sewer outfall. Centrally located close to Agat commercial and population center which benefits boaters and businesses. Site unattractive for tourist related commercial activities.	No public support for this site.	Man-made structures would include in natural seascape. Possible conflicts with beach park, however, families can picnic and swim at park while husbands fish. Potential for adverse circulation, water quality, and shoreline erosion impacts to the park.	Visual intrusion for adjacent residents, may require relocation of up to 8 homes, strongly opposed by residents.

Detailed alternative harbor plans were developed for the Gaan Point site, and a draft Detailed Project Report and Environmental Statement which discussed plan formulation as well as assessment and evaluation of the alternative plans was circulated in November 1977 for public and agency review and comment. In addition, the plans were presented at a public meeting in Agat on 18 November 1977. Based on review comments and testimony at the public meeting, the most acceptable plan was for a 250-boat harbor to be located on the south side of the existing Gaan Point sewer outfall peninsula. This harbor size and location was considered to have the least visual impact on the planned National Historical Park, the least shoaling and sedimentation problems, and would minimize impacts to the marine environment.

Following the public meeting, several meetings were held with the Hawaii State Office of the National Park Service, who also has responsibility for Guam. Their primary concern over a small boat harbor was that it would visually intrude on the historic setting of the area. However, because of the existing manmade-peninsula, it was mutually agreed that a harbor located to the south of this peninsula would not substantially add to the adverse impacts already created by the existence of the peninsula. For a harbor located south of the peninsula to have the least adverse impact on their park, the National Park Service recommended that the breakwater structures should be maintained at the lowest profile possible. From the standpoint of available shoreside lands to serve both park and boat harbor uses in the area, the National Park Service representative recommended that a minimal size harbor be provided. In view of this, the Government of Guam requested additional analysis be made of a smaller scope project that would be more compatible with the park. A range of possible solutions having capacities of less than 250 boats were presented to the Government of Guam prior to their making a recommendation. The final decision rendered by the Government of Guam was a preference for a 125-boat harbor. The rationale being that this size harbor and the proposed park would be compatible with each other.

Because the project area was within a National Historic Site area, the requirements of Section 106 of the National Historic Preservation Act of 1966 were followed during plan formulation in order to attempt to work out a plan by which the proposed harbor would be compatible with the proposed historic park. However, when Congress authorized the National Park Service to develop the War-in-the-Pacific National Historical Park along Agat Beach in 1978, the National Park Service and the US Department of the Interior took the position that the proposed harbor at Gaan Point was totally unacceptable because it would introduce an incompatible use, constitute a severe visual intrusion to the historical scene, and grossly damage the integrity of the invasion beach and reef area. They also stated that no mitigating measures relating to design, size, or alternate location elsewhere within the park would be acceptable.

A public information meeting was conducted on 20 July 1979 by the US Advisory Council on Historic Preservation in accordance with Section 106 procedures. Position statements by the Advisory Council, the National Park Service, and the Corps of Engineers concluded that the Gaan Point site was not feasible due to conflicts with the Historic Park. As alternatives, the Corps discussed the feasibility of constructing the proposed harbor at Nimitz Beach or Taleyfac Bay. Statements made by local officials and residents of the area reinforced their strong desire for a harbor and for action to expedite its planning and construction. It was the consensus of those attending the meeting that the Nimitz Beach location was the preferred alternative site. By letter dated 5 September 1979 the Governor of Guam requested that the Corps continue detailed planning for a harbor at Nimitz Beach.

5. THE REPORT

This document consists of a main report and a series of appendices. The main report is a self-contained document which summarizes the planning process and includes the environmental statement. The appendices contain technical and detailed information and background data to support the information contained in the main report.

Appendix A, Plan Formulation, contains specific information regarding the study authority, legislative requirements, planning criteria and constraints, and local cooperation requirements that contribute to the plan formulation process of the study. Also included in this appendix are the evaluation reports required by Executive Order 11988 and Section 404 of the Clean Water Act.

Appendix B, Public Involvement, describes the public involvement program.

Appendix C, Cultural and Social Resources, contains information on the recreational, social, and cultural-archaeological resources within the study area.

Appendix D, Natural Resources and Fish and Wildlife Coordination, contains information on natural resources within the study area and the US Fish and Wildlife Service Final 2(b) report.

Appendix E, Engineering Investigations and Design Analysis, contains the engineering analyses and data relative to the design of the general navigation improvements.

Appendix F, Economic Analysis, contains the economic background information, data, and analyses for determining the project benefits and costs.

6. PRIOR STUDIES

The U.S. Army Corps of Engineers, Honolulu District completed an economic base study of the Territory of Guam in May 1973. This study was updated by a supplement in March 1977 and again in 1980. The economic projections developed by the base study and supplement were used in the economic analysis of alternative plans.

II. PROBLEM IDENTIFICATION

1. PURPOSE

The purpose of Problem Identification is to define the study area and the problems to be addressed in the study. This includes describing the base conditions, identifying public concerns, establishing planning criteria, and analyzing the problems. Public concerns which relate to water and related land resource problems are identified and then refined based on national and local policies.

National planning policies are prescribed by the Water Resources Council's Principles and Standards (44 FR 72978), the National Environmental Policy Act of 1969 (PL 91-190), Section 122 of the River and Harbor and Flood Control Act of 1970 (PL 91-611), the Water Resources Development Act of 1974 (PL 93-251), the Clean Water Act of 1977 (PL 95-217), and the Corps of Engineers' policy guidelines (ER's).

To help determine the resource management1/ problems, the base condition of the study area is first defined. The base condition is the existing economic, social, and environmental characteristics of the area. Future conditions are then projected and analyzed to determine the "most probable future"2/ which would prevail over the area without any changes to existing resource management plans. This analysis describes the "without condition" criterion. Planning objectives3/ are then formulated based on the problems and needs of the area related to the "without condition" criterion.

2. NATIONAL OBJECTIVES

The Principles and Standards (P&S) for planning water and related land resources define the national objectives of national economic development and environmental quality. National objectives are a means of measuring the effectiveness of possible solutions. The national economic development (NED) objective is achieved by increasing the value of the nation's output of goods and services and improving national economic efficiency. The environmental quality (EQ) objective provides for the management, conservation, preservation, or improvement of the quality of certain natural and cultural resources and ecological systems in the study area.

1/ "Resources management" involves the development, conservation, enhancement, preservation and maintenance of water and related land resources to achieve the goals of society expressed nationally and locally.

2/ "Most probable future" is the projection of basic demographic, economic, social, and environmental parameters, which is used as the basis for defining the "without condition" and the planning objectives for a particular study.

3/ "Planning objectives" are the national, state, and local water and related land resource management needs (opportunities and problems) specific to a given study area that can be addressed to enhance National Economic Development or Environmental Quality.

During the formulation of alternative plans the NED and EQ contributions are evaluated on an equal basis. For any plan to be considered for implementation, the total beneficial contributions accruing from the project must exceed the total adverse impacts of the project. P&S also requires that the impacts of a proposed action be measured in terms of Regional Development (RD) and Social Well Being (SWB). Contributions to the RD account are determined by establishing a proposal's effects on a region's income, employment, population, economic base, environment, and social development. Contributions to the SWB account are determined by establishing a proposal's effect on real income, security of life, health and safety, education, cultural and recreational opportunities, and emergency preparedness.

3. PROFILE OF EXISTING BASE CONDITIONS

The cultural, physical, environmental, and economic characteristics of Guam are briefly described. The appendices contain more detailed description relevant to the planning and design of general navigation improvements.

a. History and Culture

According to radiocarbon dating studies, the Mariana Islands including Guam were inhabited by 1327 B.C. The original inhabitants, subsequently called Chamorro, were probably seafarers of Asian origin who brought with them the technologies of rice cultivation, pottery making, fishing and canoe building. Spanish control of Guam in the centuries following its discovery by Magellan in 1521, resulted in a gradual loss of canoe-building lore. Under U.S. Navy influence between 1898 and 1950, Chamorro society became increasingly dependent upon a monetary economy.

Although subsistence fishing is not as prevalent in Guam as it once was, it can be said with some certainty that the majority of fish caught by local fishermen does not enter the monetary market. For large segments of the population (48 percent Chamorro), the sharing of food derived from subsistence fishing, farming, animal husbandry, hunting and <u>tuba</u> making at fiestas and social gatherings to celebrate baptisms, marriages and funerals is one of the most important means of repaying one's social, economic, and political obligations. Subsistence activities are thus culturally-generated behavioral patterns which, although they cut across socio-economic levels, also provide a means to supplement household income (to support conspicuous expenditures) and family nutrition as well as providing "recreational" outlet.

b. Physical and Environmental Setting

(1) Physical Features. Guam is the southernmost major island in the Marianas chain, a 500-mile-long archipelago in the Western Pacific. It is approximately 30 miles long, ranges from 4 to 8.5 miles in width and has a land area of about 209 square miles. The island is approximately 3,800 statute miles west of Hawaii.

The study area extends from Rizal Beach to Taleyfac Bay, a distance of about 4 miles on the southwestern coast of Guam. The Agat coastline is fringed by a coral limestone reef platform varying in width from 170 feet to 2,680 feet. A low coastal plain, generally less than 20 feet in elevation bounds this coastline area. Principal developments in the study area are the US Navy reservation, and the communities of Santa Rita and Agat. The study area is shown on Figure 2.

(2) Winds. The predominant winds on Guam are the easterly tradewinds which occur over 70 percent of the time. The tradewinds are strongest and most constant between November to June, when wind speeds of 15 to 25 mph are common. During the main typhoon season, from July through October, the tradewinds are often absent and wind direction and velocity are variable. Figure 3 shows wind data from Agana which is considered characteristic of the winds in the study area.

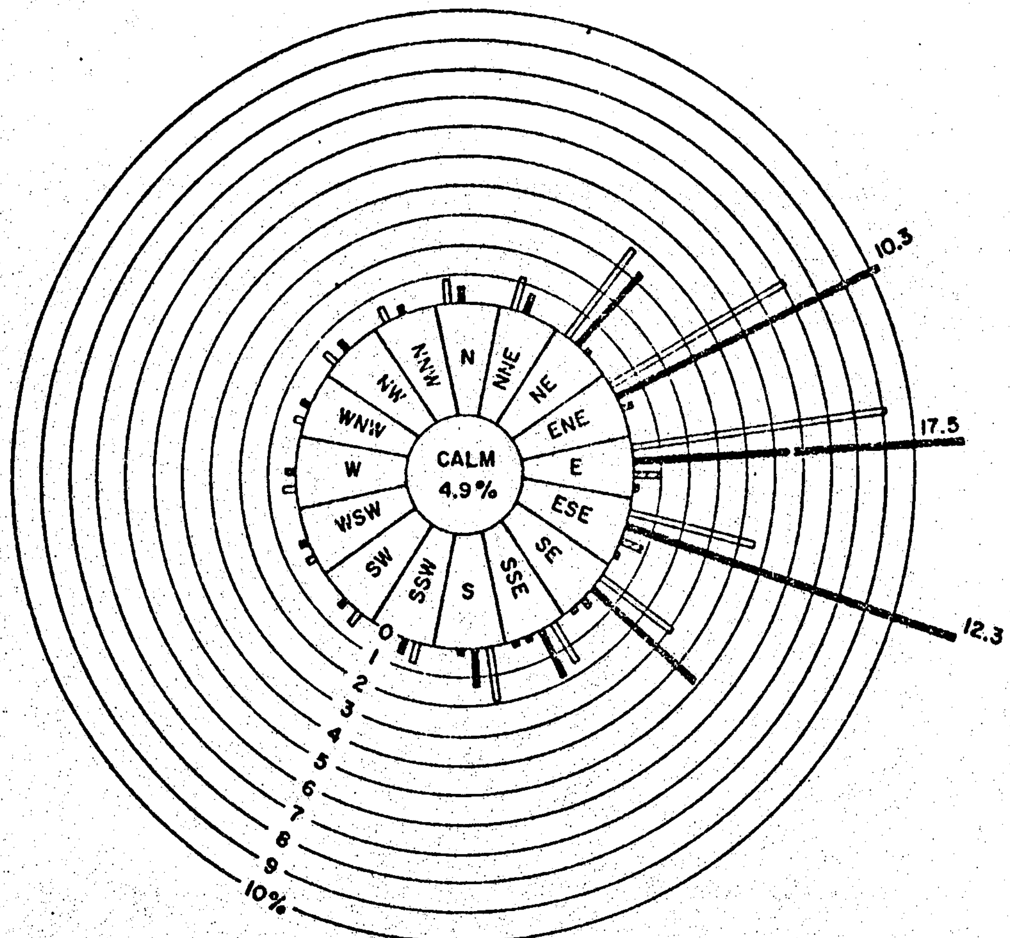
Small craft warnings are issued when wind speeds exceed 18 knots. Based on information from "Climatological Data," prepared by the US Fleet Weather Central, Joint Typhoon Warning Center, Guam, M.I., from September 1945 to July 1967, small craft warnings are issued for about 50 days (normally during afternoon hours) a year.

(3) Storms and Typhoons. Guam is subject to strong winds and rain associated with tropical storms and typhoons. Due to its proximity to typhoon breeding grounds the island is threatened year round with the passage of developing typhoons, and on occasion one of full strength. Typhoons are defined as storms with sustained wind speeds equal to or greater than 64 knots, while tropical storms are defined as having sustained wind speeds between 34 and 63 knots. Based on information from the US Fleet Weather Central, Guam, on the average at least 19 typhoons occur annually across the western North Pacific and South China Sea. Of these, several, in various stages of development, threaten the Mariana Islands each year.

Typhoon data for Guam and the Western Pacific area were obtained from the US Fleet Weather Central, Joint Typhoon Warning Center, Guam, M.I. From 1946 to 1976, Guam has experienced the effects of 14 typhoons. The closest points of approach of these typhoons range from 0 to 230 nautical miles. In terms of monetary damage, the most devastating typhoon to hit Guam was typhoon "Pamela" which occurred on 21 May 1976 with sustained winds of 120 knots.

(4) Waves. The island of Guam is exposed to two distinct wave types: (a) waves generated by the prevailing local winds; and (b) sea and swell from local and distant storms and typhoons. Deepwater wave statistics for the study are contained in the "Summary of Synoptic Meteorological Observations" (SSMO) prepared by the US Naval Weather Service Command. This data shows that the preponderance of waves affecting Guam are easterly tradewind generated waves. Deepwater tradewind wave heights are generally 2 to 6 feet with periods of 6 to 12 seconds. However, the study area is well protected from tradewind generated waves by the island itself and is primarily affected by waves from the south clockwise to the north. Local wind wave heights exceeding 4 feet occur from these directions about 8 percent of the time. The study area is also affected by long period swell generated by distant tropical storms and typhoons, which can have a significant effect on the study area. Hindcasts of tropical storms and typhoons in the western North Pacific from 1975 through 1979 indicates that deepwater swell with heights exceeding 4 feet occurs about 24 percent of the time in the study area. The wave period from the local wind waves is characteristically about 8 seconds, and for long period swell about 12 seconds.

SURFACE WIND DIAGRAM
AGANA FIELD FLEET WEATHER CENTRAL
GUAM, MARIANA ISLANDS



LEGEND
1-6 KNOTS
7-16 KNOTS
17-21 KNOTS
OVER 21 KNOTS

CONVERSION: 1 KNOT = 1.1516 MPH

10% = TOTAL % OF THE YEAR

PERIOD OF RECORD
1945-1967

SOURCE
NATIONAL WEATHER SERVICE
HONOLULU, HAWAII
DATA COMPILED BY U.S. AIR FORCE
ENVIRONMENTAL TECHNICAL
APPLICATION CENTER,
ASHEVILLE, N.C.

FIGURE 3

(5) Tides. The tides in Guam are semi-diurnal with pronounced diurnal inequalities. Tide data from the US Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Survey, shows that the mean tide range is 1.7 feet and the diurnal (spring tide) range is 2.4 feet. The nearest tide gage to the study area is at Apra Harbor, Guam, and the data from this gage is considered reasonably applicable to the study area. Tidal data for the 19-year period between 1949-1967 at Apra Harbor is as follows:

	Feet
Highest tide observed	3.3
Mean higher high water	2.4
Mean high water	2.3
Mean tide level	1.45
Mean sea level	1.4
Mean low water	-0.6
Mean lower low water	-0.0
Lowest tide observed	-1.9

All elevations in this report are referenced to mean lower low water (MLLW) datum.

(6) Currents. The prevailing offshore currents generally set toward the southwest. The varying direction of the tradewinds during the seasonal changes affects the currents. Winter currents tend to show a net westerly movement, and summer currents a northwest to southeast movement. Current studies conducted by the US Navy near Alutom Island and Nimitz Beach indicate a slow southerly drift off the reef margin. Studies conducted by the University of Guam Marine Laboratory in the area of Nimitz Beach reveal the nearshore current regime during typical tradewind conditions was dominated by reversing tidal currents on the reef flat, flowing northeasterly during flood tide and southwesterly during ebb tide with speeds of 9.8 feet per minute. Local residents report strong wave induced currents in the Nimitz Beach area during storm periods.

(7) Climate. The climate of Guam is uniformly warm and humid throughout the year. Afternoon temperatures are typically in the middle or high eighties and nighttime temperatures typically fall to the low seventies or high sixties. Relative humidity commonly ranges between 65 and 75 percent in the afternoon and 85 to over 90 percent at night. Since the temperature and humidity remain nearly constant throughout the year, the seasons are defined by the variations in wind and rainfall. Guam has two primary and two secondary seasons. The primary seasons are the 4-month dry season, between January and April, and the 4-month rainy season, from mid-July to mid-November. The secondary seasons are May to mid-July and mid-November through December. These secondary seasons are transitional periods and may be either rainy or dry depending upon the nature of any particular year. The mean annual rainfall on Guam varies from less than 90 inches near Agat to over 110 inches on the higher mountain areas.

(8) Geology. The islands of the Marianas chain are the high points of submarine ridges of volcanic origin with the island of Guam being the largest. Its geologic and topographic features essentially divide the island into a northern and southern section. The northern section is composed of a broad undulating limestone plateau which is fringed by steep coastal cliffs. The soil on the northern limestone plateau is highly permeable. Streams are

absent as rainfall drains downward to numerous sinkholes and fissures forming a basal fresh water lens. The southern section of the island is mountainous with broad, relatively impervious areas of volcanic rock marked by deeply incised valley perimeters and floors.

The coastal land in the study area consists of low limestone plateau land along the northern border and alluvial lowland interspersed with some higher limestone ridges and knobs along the central and southern regions. About a mile inland, the coastal embayment slopes sharply upward to the north-south trending, volcanic mountain crest of central and southern Guam which reach elevations of 287 meters at Mount Alifan and 335 meters at Mount Tenjo, just inland of Agat Bay. Loamy sand, sandy loam or limesand Shioya soils overlay most of the coast in the study area except for a patch of Saipan-Yona-Chacha clays found just south of the Catholic cemetery at Gaan Point. The shoreline in the Nimitz Beach area is composed of medium to fine calcareous sand and alluvial sediments. The entire shoreline in the study area is bordered by a continuous fringing reef flat ranging between 170 feet and 2,680 feet wide. Many irregularities along the reef margin are caused by rock limestone projections and islands, and by channels cut by the many small streams that empty into the sea.

(9) Water Quality. Guam's 1975 Water Quality Standards designated the waters in the study area as class "A" for general use, into which discharge of pollutants must be controlled to protect uses such as recreation, aesthetic enjoyment, propagation of aquatic wildlife, and commercial, industrial, and navigation activities. Water quality standards are usually met in the study area. Pollution levels in the Nimitz Beach Park area are low (0 to 74 fecal coliforms/100 ml) primarily due to occasional runoff from the nearby chicken farm during heavy rains. Waters on the reef flat and in Nimitz Channel often appear to be turbid.

(10) Marine Resources. Four main biotopes comprise the nearshore marine environment in the study area; the reef flat platform, reef margin, reef front, and upper seaward slope. Extensive exposure of the reef flat during low tide inhibits coral growth on the reef platform. The greatest coral species diversity and coverage is found in the reef front biotope, especially along the sides and fronts of channels and cuts in the reef face. The coral growth along the Nimitz Channel/reef front is abundant and diverse. US Fish and Wildlife Service investigations showed 110 species of coral and 100 percent coverage in some areas near the channel, with less diversity and abundance on the reef front moving north toward Bangi Point. Seagrasses are found on most of the reef flat platform and may serve as fish nursery areas. An extensive bed of <u>Enhalus acoroides</u> extends from the Nimitz Channel to Bangi Point. The Nimitz Beach area contains a sizeable and diverse clam population. Over 200 species of fish and 40 families were found in investigations between Bangi Point and Taleyfac Bay.

(11) Terrestrial Setting. The dominant coastal plant species in the study area consist of perennial grasses and shrubs including ironwood, tangentangen, limon de China, wild hibiscus, and beach morning glory. Birds, including the Eurasian Tree Sparrow, Pacific Golden Plover, Black Drongo, and Wandering Tattler, and the Reef Egret are found in the nearby trees and areas of exposed reef-flat platforms and beach deposits. Using rock or structures on the shoreline for perching or feeding may be the Common Noddy, and White Tern. Of these species, the Reef Egret and White Tern have been proposed for

Guam's endangered and threatened species list. Although rare on Guam, these species have wide distribution in the tropical Pacific.

c. Human Resources.

(1) Population. Guam's population since the official census began in 1901 is shown in table 2.

Table 2. HISTORICAL POPULATION OF GUAM

Year	Total Population
1901	9,676
1910	11,806
1920	13,275
1930	18,509
1940	22,290
1950	59,498
1960	67,044
1970	84,996
1980	105,816

Source: US Department of Commerce, Bureau of Census and the Guam Department of Commerce.

Projections for Guam envisage a continued growth for the foreseeable future. Revised projections by the Guam Department of Commerce estimates the population to expand from 105,800 in 1980 to 136,200 by the year 2000. An extension to the year 2030 assumes a 1/4 of one percent annual growth. The total population projection assumes a constant of 5,000 for non-immigrant aliens and 18,500 for military personnel and dependents. Population projections for Guam are shown in table 3.

Table 3. GUAM POPULATION PROJECTION

Year	Civilian Population1/	Total Population Projection
1990	95,000	119,000
2000	113,000	136,000
2010	116,000	139,000
2020	118,000	142,000
2030	122,000	145,000

1/ All persons except visitors and other specified categories, i.e., military, civilians living on military bases, and non-immigrant aliens.

The 1970 Census reported a resident population of 4,308 for Agat Election District, up 39 percent from 1960. In contrast, the population of Santa Rita fell 33 percent, to 8,109 . At present (1980), Agat is estimated to have 3,979 residents, down about 8 percent from 1970, and Santa Rita is estimated to have increased to 10,908 residents. By the year 2000, it has been projected that the population of the district of Agat could reach 6,900 for a

29 percent increase over the 1980 estimate. The population of the Santa Rita district is projected to increase to 12,990, also up 29 percent. The district-level population projections however need revision in light of reduced 1980 census levels. Population expansion in these communities may involve conversion of considerable farm and open land to residential use. In Agat, one major expansion of residential area will occur in a planned urban development project at Pagachao, located inland of Nimitz Beach, where housing units for about 1,000 people are planned.

d. Cultural and Archaeological Resources. A cultural reconnaissance survey of the Agat shoreline was completed in 1977. No significant evidence of prehistoric or early historic occupation was found. Prehistoric pottery fragments found near Nimitz Beach are believed to have washed down from hilly areas east of the beach. The Taleyfac Spanish Bridge (Site 66-02-1071) is located about 2,000 feet south of the proposed harbor site at Taleyfac River. This historic site is listed on the National Register of Historic Places.

In August 1978, the US Department of the Interior National Park Service was authorized to develop the War-in-the-Pacific National Historic Park along Agat Beach. The boundaries of the new park are from the southern side of Bangi Point and Bangi Islands to Rizal Point. Tentative plans call for interpretive centers and picnic areas at Rizal Point, on the southern side of Bangi Point, and along Gaan Point.

e. Recreation Resources. The Agat study area is a popular, local recreational area for boat-fishing, water skiing, diving, and picnicking. The principal recreational facilities along Agat Bay consist of the improved territorial beach parks of Nimitz Beach (7 acres) and Aflleje Park at Rizal Beach (1 acre). Swimming, scuba diving, picnicking, and camping are permitted at each park. Other recreation resources are the historic Spanish Bridge at Taleyfac River and the Agat Invasion Beach Memorial Marker, 4,000 feet northeast of Gaan Point. According to local sources, the most popular water-skiing area is between outer Alutom Island and Bangi Point. Diving is popular off Nimitz Beach in the deep channel area, notable for its coral beauty. According to the Guam Comprehensive Outdoor Recreation Plan for 1980, there are surfing sites located just south of Bangi Point at Alutom Island, and two sites off Anae Island. The Guam National/Territorial Seashore Park was also established in 1978, encompassing most of southwest Guam. The northern most port consists of Anae Island which lies 2,000 feet southwest of Nimitz Beach Park.

f. Economic Development. Statistics on gross island product are not available for Guam. The gross business receipts, an indicator of gross island product, show a remarkable average increase of 21 percent per annum from 1963 ($82.9 million) to 1973 ($563 million). This trend was hampered in 1975 and 1976 by the world recession and typhoon disasters. In 1977 the increase was only 6 percent. By 1978 the increase had climbed to 17 percent per annum. Once, mostly dependent on the military, local government, and the construction industry, the emergence of the tourist industry and related activities has broadened Guam's economic base for future growth. Table 4 shows the growth rate of major industries on Guam between 1970 and 1978.

Table 4. GROWTH RATE OF MAJOR INDUSTRIES ON GUAM, 1970-1978

Category	1970 Earnings or Value ($ Millions)	1978 Earnings or Value ($ Millions)	1970 - 1978 Average Annual Growth (Percent)
Gross Sales			
Retail	91.1	259.2	14.0
Wholesale	29.8	54.1	7.7
Manufacturing	6.3	187.5	52.8
Agriculture	N/A	2.9	-
Services	26.7	85.7	15.7
Transportation	0.1	16.7	89.6
Insurance, Real Estate, Finance	19.7	69.2	17.0
Foreign Trade			
Exports	5.8	34.2	24.8
Imports	96.4	272.0	13.8
Construction	53.1	111.2	9.7
Government			
Local			
Revenue	57.7	104.6	7.7
Expenditure	48.9	120.4	11.9

Source: Guam Annual Economic Review 1979, Department of Commerce, Government of Guam.

Guam experienced a high level of employment since World War II and had no unemployment problems until recently. However, increasing immigration and dependence on relatively cheap imported (alien) labor are changing the employment picture and may cast the island into a situation of severe unemployment in the future. Trends toward unemployment are revealed in total employment increases of 15 percent in 1972 and again in 1973 but only 2 percent in 1974. The May 1975 unemployment statistics show a rate of 8.3 percent and increased a year later to 13.3 percent in May 1976. Following this period the disaster of typhoon Pamela raised the unemployment significantly. Total paid employment on the payrolls of all licensed business establishments and governmental agencies during first quarters of March 1975, 1976, and 1977 indicates a drop and then a minor increase in March 1977 with a 1977 total of 30,816. Table 5 summarizes employment by industries.

Table 5. EMPLOYMENT BY INDUSTRIES AND PERCENT DISTRIBUTION (MARCH 1975, 1976, 1977)

Industry	Total Employment 1975	1976	1977	Percent Distribution 1977
Agriculture	111	131	147	.48
Construction	5,388	3,319	4,019	13.04
Manufacturing	1,211	1,045	977	3.17
Transportation & Public Utilities	1,587	1,417	1,476	4.80
Wholesale & Retail Trade	5,541	4,872	5,411	17.56
Finance, Insurance & Real Estate	1,363	1,295	1,268	4.11
Service	4,040	3,536	3,603	11.69
Government				
Federal	6,681	6,014	6,318	20.50
Local	9,016	8,431	7,596	24.65
Totals	34,938	30,060	30,816	100.00

Source: Annual Economic Review (Statistical Abstract), Guam 1979 Economic Research Center, Department of Commerce, Government of Guam, August 1979.

Government, construction and wholesale and retail trade employ about 75 percent of the total labor force. Government is the largest employer on the island and will continue to be a major factor in the economy of Guam. Employment by the local government is expected to increase with population and needs of an expanding economy.

The construction industry employed more than 13 percent of the island's labor force in 1977. Of the 4,019 persons employed by the construction industry, 85 percent are alien workers on contract, an indication of a critical shortage of skilled labor on Guam.

The wholesale and retail trade industry employs more than 17 percent of the island's labor force. Guam's natural resources for industrial development are limited, thereby making the economy service-oriented. This service is expanding to accommodate the influx of visitors and is evident by the growing number of new businesses.

The phenomenal growth of the visitor industry since 1970 as shown in table 6 is attributed to the rising Japanese investment in Guam. In 1976 over 69 percent of all visitors were from Japan. To accommodate the visitors, hotels, especially around the Tumon Bay area, were constructed at an accelerated rate, with capital provided primarily by Japanese investors. The number of visitors to Guam is expected to grow. The growth, as estimated by the Government is shown on table 7. Continued development of the visitor industry will have a definite impact on related services, both in the private and public sector. This industry appears to have the greatest potential for growth.

Table 6. TOURIST AND VISITOR ARRIVALS AND ESTIMATED EXPENDITURES (1960-1978)

Year	Tourist 1/	Visitor 1/	Estimated Expenditure
1960	200	3,500	--
1965	500	3,000	$600,000
1970	46,581	73,723	15,000,000
1971	84,885	119,174	30,000,000
1972	139,833	185,399	50,000,000
1973	187,471	241,146	90,000,000
1974	233,909	260,568	130,000,000
1975	128,241 2/	239,695 2/	180,000,000
1976	105,954	201,344	102,000,000
1977	150,118	240,467	120,000,000
1978	148,523	231,975	116,000,000

Source: Economic Research Center, Department of Commerce, Government of Guam; Guam Visitors Bureau (GVB).

1/ Tourists are travelers arriving for pleasure. Visitors are all people entering Guam whose permanent address is outside of Guam.

2/ Data not available from September to December 1975.

Table 7. PROJECTED VISITORS

Year	Projected Visitors
1981	321,000
1982	343,500
1983	367,500

Source: Guam Visitors Bureau, June 8, 1978.

g. Land Use.

The US Navy, which controls 50 percent of the land in the Agat District and 77 percent in the Santa Rita District, dominates land use in these two districts. Urbanized areas comprise only 4.8 percent and 3.9 percent of the total area in the Agat and Santa Rita District, respectively. The US Navy, Japanese interests and other aliens control 29 percent of urban and agricultural lands in Agat District. All of the Agat Bay shoreline is presently zoned for agricultural use. The Agat shoreline is also designated as a Conservation District, designed to preserve scenic and historic areas, provide parklands and beaches, and conserve indigenous plants, fish and wildlife.

The Agat-Santa Rita area is largely undeveloped land, much of which is in US Navy reservations. Santa Rita is a rural residential community, and Agat, is primarily residential with some agriculture. Commercial developments are limited to a few small businesses concentrated along the coastal areas. The Nimitz Beach area is currently rural with the C & H Chicken Farm located about 1600 feet northwest of Nimitz Beach Park, scattered residences inland of Highway 2 and a cluster of residences at Biyae, just south of Taleyfac Bay. All the area inland of Highway 2 is zoned low density urban residential focusing on the large planned urban development of Pagachao, immediately inland of the proposed harbor area. All lands shoreward of Highway 2 are zoned either Open Space or Recreation.

4. BOATING PROBLEMS AND NEEDS

a. General Boating Activity.

Two of Guam's natural assets, the sea and reef areas, cannot be fully enjoyed without adequate facilities provided by shoreside improvements. The lack of adequate harbor facilities impedes the full utilization of the sea as a recreational asset and discourages the purchase of boats necessary to enhance the "subsistence" type of fishing prevalent on Guam. The population of Guam is projected to increase at a steady rate for the foreseeable future. This upward trend in population is expected to add pressure to the demand for boating facilities. Without adequate harbor facilities, Guam's boating potential will not be realized. The following analysis projects the boating needs of Guam to the year 2030.

The analysis of existing and future boating needs of the territory of Guam is based on data from two reports entitled, "Outdoor Recreation on Guam." The first report relies on data compiled by the Outdoor Recreation Resources Review Commission (ORRRC) in 1962 and is supplemented by an independent survey to determine the interest in outdoor recreation on Guam. The second report, published by the Guam Departments of Commerce and Land Management, dated 24 October 1973, presents the 1973 Guam Outdoor Recreation Plan which is an updating of the 1966 plan, "Outdoor Recreation on Guam," and the 1971 Revision of the 1966 plan. Data used from both of the above reports were updated and verified by field investigations and interviews made by Corps personnel and supplemented with data from "Boating Activity in the Territory of Guam 1974," a study made for the Corps of Engineers. The updated data on boating activity was used in the derivation of future boating needs.

b. Existing Fishing Activity

Small-boat fishing is the most productive form of commercial fishing at present on Guam. It is additionally an important form of recreation and source of food for home consumption. The fledgeling charterboat fishing industry on Guam has potential for expansion and may, in time, prove to be an important part of Guam's tourism industry. The small-boat fleet on Guam consists of boats in the 15-40 foot range, operated by one to three fishermen. Surface trolling for tunas, billfish, mahimahi, and other pelagic species is the principal type of small-boat fishing, although bottomfishing for snappers and other demersal species is becoming increasingly important. Night handlining for atulai (big eye scad) is also a productive type of small boat fishing. Trapping for deepwater shrimps (*Heterocarpus*) has been successful and may have potential for expansion, along with trapping for other resource species.

c. Existing Boating

In 1974, the Department of Public Safety (Government of Guam) registration records showed a total of 598 registered craft in the Territory of Guam. In addition, the Marianas Yacht Club listed 173 unpowered sailing craft. Listed in table 8 are the number of registered boats excluding craft under 10 horsepower and unpowered sailboats.

Table 8. EXISTING REGISTERED BOATS (1974)

	Type of Boat				
Length in Feet	Outboard 1/	Inboard 2/	Auxiliary Sail 3/	Totals 4/	Percent Distribution
Under 16	221	-	-	231	39%
16 to 25	215	50	24	289	48%
26 to 39	-	37	18	55	9%
Over 39	-	15	8	23	4%
Totals	446	102	50	598	100%
Percent Distribution	75%	17%	8%	100%	

Source: Department of Public Safety, Government of Guam.

1/ All non-sail boats powered by outboard motors greater than 10 horsepower

2/ Primarily cruisers

3/ Boats with sail and motors greater than 10 horsepower

4/ In addition, 44 sailboats, 6 auxiliary sail under 10 horsepower, and 6 auxiliary over 10 horsepower were not listed in the 1974 survey because they were unregistered.

Prior to 1977, the only boating facility owned by the Guam Government was the Agana Boat Harbor which has one ramp and 32 slips, all in poor condition. This harbor was recently renovated and enlarged to provide a berthing area for 300 craft. The construction of piers and other marina facilities including a launch ramp are being phased according to the Government of Guam's ability to finance development. Private piers and facilities are located at the village of Merizo within the protecting coral reef and are in fairly good condition. A mooring area also exists at the US Coast Guard seaplane ramp area just west of the Port of Guam at Apra Harbor.

The "Outdoor Recreation on Guam 1973" report indicated that 306 boating slips and eight launching ramps were required in 1973 to satisfy the needs of recreational boating enthusiasts on Guam. In 1973 there were only 74 mooring slips and four launching ramps, which indicates a need of 232 mooring slips and four launching ramps in that year. That report also projected 1978 needs of 571 mooring slips and 11 launching ramps.

In 1970, there were 256 boats registered with the US Coast Guard and based on the 1970 population of 84,996, there was a ratio of 3.0 boats per thousand population. In 1974, there were 598 boats registered with the Department of Public Safety and based on a 1974 population of 98,000, the ratio was 6.1 boats per thousand population which doubles that of 1970. In comparison, based on 5,116,671 registered boats in the United States, as summarized in the Coast Guard Report CG-357, "Boating Statistics 1970", and the 1970 Census population of 200,255,151, the national registered boats per thousand is 25.6 which includes boats used in freshwater. When compared to the national average, Guam lags behind by a wide margin. This can be partly attributed to a lack of small boat facilities, storm damages to small craft, and low income of Guam residents when compared with the national average.

An independent survey for the Government of Guam revealed that 27 percent of the people of Guam have an interest in boating as compared with the US average of 34 percent. This survey used these percentage rates which were adjusted for climatic and seasonal differences between Guam and the United States, and a projected population of 128,400 by 1985, in projecting a potential of 1,920 boats on Guam by 1985. If 25 percent of the projected boats require berthing, 480 slips and 26 launching ramps will be needed (based on 40 launchings per day for each ramp). These needs were based on a historical fleet indicating 60 percent of the boats under 16 feet, 35 percent 16 to 26 feet, and 5 percent over 26 feet. Boats under 16 feet were assumed to be trailer-mounted, those between 16 and 26 feet were equally divided between trailer-mounted and boats requiring berthing space, and all boats longer than 25 feet were assumed to be permanently berthed.

d. Future Boating.

In projecting the future boating activity on Guam, the following were considered:

(1) In 1974 there was a ratio of 6.1 boats per thousand people. If further harbor facilities are not available, the ratio is likely to remain static to the year 2030. If additional harbor facilities are available, the ratio is expected to gradually increase to 13.8 by the year 1990 because of increasing income. The rate of increase from 1974 to 1990 is expected to follow Guam's projected per capita income rate of growth. The projected per capita income used is contained in the Corps, "Economic Base Study for Guam," dated May 1973. The ratio of 13.8 compares with current conditions on the island of Oahu in Hawaii with a per capita income of $6,658 and a ratio of 13.8 boats per thousand people. The projected 1990 per capita income for Guam is $6,731. The ratio of 13.8 boats per thousand was held constant throughout the remaining life of the project. Factors such as competing recreational opportunities should stabilize boat ownership at this ratio for both Guam and Hawaii. The boat projections for the Territory of Guam as shown on table 9 are based on registered boats, number of boats per thousand people, and per capita income increases.

Table 9. BOAT PROJECTIONS (EXCLUDING UNREGISTERED BOATS) TERRITORY OF GUAM

Year	Population (Civilian & Military)	Per Capita Income $	Assuming Facilities Are Available: Boats/Thousand	Assuming Facilities Are Available: Boats
1974	98,000	3,400	6.1	598
1980	105,800	4,334	7.8	825
1990	119,000	6,731	13.8	1,640
2000	136,000	9,962	13.8	1,880
2030	145,000	22,371	13.8	2,000

(2) In checking the accuracy of registered boats to the actual existing number, a field census was taken at the village of Merizo by a private consultant. Registration records for Merizo showed 68 crafts and the field census showed 69. It was assumed that the Department of Public Safety registration records were sufficiently accurate. Projections were based on registered boats only.

(3) In 1966, 60 percent of the boats were under 16 feet in length. In 1974, less than 39 percent were under 16 feet. This indicates that people are obtaining larger and more expensive boats to allow traveling further to new fishing areas. With improved harbor conditions, boats under 16 feet in length should reduce to 20 percent of the total fleet by the year 2000. The bulk of the fleet is expected to be in the 16- to 39-foot length.

(4) Over 50 percent of the fishermen interviewed indicated that if harbor facilities were available, those with trailer mounted boats would prefer to change to larger boats and moor their boats. The 1974 records from the Department of Public Safety indicate that 75 percent of the registered boats are trailer-mounted. This percentage has remained the same since 1966. With improved harbor facilities, the percentage is expected to decrease by the year 2000 to 50 percent and then remain constant over the economic life of the project. Without improvements, the percentage is expected to remain at 75 percent of the fleet.

(5) There were 15 charter craft operating on Guam in 1973, eight at Agana Harbor and seven at Merizo. Assuming a 4.5 percent annual increase if facilities were available, there would be 24 charter craft in 1980 and 43 charter craft by the year 2000. No records of past or future desire for charter craft mooring within the Agat area are avilable. If improved harbor facilities are provided, at least one charter craft may be moored within the Agat area in the initial year. Based on the 4.5 percent annual increase the number will grow to three craft by the year 2000.

Tables 9 and 10 show the boat projections and mooring requirements for the island to the year 2030. The projections are for the Territory of Guam and show a need which could be satisfied in part by a harbor at Agat. The trailered boats are launched at Merizo, Agana, and other areas. The southern third of the island, which has approximately 10 percent of the population, has boats moored at Umatac and Merizo. Boats moored in these areas are expected to remain, regardless of improvements at Agat. Agana will have 300 mooring spaces when the facility is completed. Projected demand indicates that these spaces will be filled immediately. The trailered boats are not heavily influenced by the availability of an improved harbor, but by location and availability of launching ramps. Seventy-five percent of the trailered boats would use Agana and Agat and 25 percent would use Merizo. The same distribution is assumed for the projected moored craft.

Table 10. MOORING REQUIREMENTS - TERRITORY OF GUAM

	With Improvements			
Year	Total Boats	% Trailer Mounted	Trailer Mounted	Moored
1974	598	75	446	152
1980	825	65	535	290
1990	1,640	65	1,070	570
2000	1,880	50	940	940
2030	2,000	50	1,000	1,000

Table 11 shows the projected mooring and trailer launched boat needs, including charter and transit boats, for the Territory of Guam. About 25 percent of the trailer boats projected in table 10 are in the Merizo area. In addition, 200 equivalent moored trailered boats will use facilities that will be available at Agana Harbor. From the mooring requirements projected, the existing 30 moored boats in Merizo will remain in Merizo and another 300 boats will be moored in Agana Harbor when facilities are completed. There are no improved mooring facilities nor launching facilities at Agat.

Travel time to different parts of the island from the proposed harbor site is not very significant with no place being more than 18 miles from the harbor. Most of the population is within 8 miles of the site. Demand computed for the island of Guam is synonymous for specific locations such as Agat.

Table 11. PROJECTED SMALL CRAFT NEEDS - TERRITORY OF GUAM

(Moor & Trailer Launched)

	Year	Projected Needs	Satisfied Needs Existing	Scheduled 1/	Remaining Needs
Mooring					
	1990	570	30	240	300
	2000	940	30	300	610
	2030	1,000	30	300	670
Trailers Launched					
	1990	1,070	320	200	550
	2000	940	410	200	330
	2030	1,000	440	200	360
Total Moored and Trailer Launched					
	1990	1,640	350	440	850
	2000	1,880	440	500	940
	2030	2,000	470	500	1,030

1/ Based on needs to be satisfied published in DPR Agana Harbor Feb 1973 Table 16 to maximum of 300.

In projecting the berthing requirements, boats under 16 feet in length would comprise 20 percent of the fleet by the year 2030, the bulk shifting to the 16- to 39-foot class. Also, 60 percent of future boats will be in the 16- to 25-foot class, the remainder added to the larger class. The projected percentage distribution by length is shown in table 12.

Table 12. PERCENT BOAT DISTRIBUTION: BY LENGTH (In Feet)

Year	Under 16	16-25	26-39	40-60
1980	35.1	51.4	9.7	3.8
1990	27.5	56.1	11.6	4.8
2000	20.0	60.4	13.5	6.1
2030	20.0	60.0	14.0	6.0

Table 13 shows the projected distribution by type of craft. The percent distribution of existing registered boats was used (table 8). The distribution was made exclusive of the projected charter boats.

Table 13. PROJECTED BOATING NEEDS BY TYPE
TERRITORY OF GUAM

	Moored								
Year	Out-Board	In-Board	Auxiliary Sail	Charter	Sub-Total	Transient	Trailer Mounted	Totals
1990	225	50	23	2	300	2	550	852
2000	460	97	50	3	610	3	330	943
2030	500	111	55	4	670	4	360	1,034

e. Desired Improvements.

The Government of Guam desires that a small boat harbor be built in the Agat area to accommodate local fishermen, boat owners, and divers. Currently, no boating facilities exist between Apra Harbor and Umatac. The Government of Guam feels that a small boat harbor would encourage development of boating and tourist-related industries in the Agat area and generally promote economic growth. Desire and strong support for the harbor project has been expressed by the Governor, the Legislature, local community groups, local residents, and Guam boaters.

5. "WITHOUT" CONDITION PROFILE

If no Federal action is taken to provide navigation improvements, the lack of adequate harbor facilities will continue to constrain full use of the ocean's resources in the study area for subsistence and commercial fishing, commercial charter boat operation, and boating related recreation. The lack of harbor facilities may stifle economic growth in the study area. Agat boaters and all tourist related services will continue to utilize Agana Small Boat Harbor, the only public small boat facility on Guam, in lieu of facilities in the Agat area. On-going improvements to Agana Harbor will be fully utilized when completed and demand for boating facilities continues to exceed supply.

The resident population and small business activity will continue to grow in the study area. Completion of the War-in-the-Pacific National Historical Park will increase the desire for tourist related activities, including charter fishing and dining tours and boat tours of the park shoreline. Continued population growth will also place greater demands on the sea as a subsistence food source. It is anticipated that fishing activity will increase in proportion to the increasing population. Further discussion of the "without" condition is found on page EIS-9.

6. DEVELOPMENT GOALS

The Territory of Guam Fisheries Development and Management Plan, prepared for the Guam Marine Fisheries Advisory Council in September 1980, lists the following overall development goals by small-boat fishing: To increase the supply and quality of seafood for local consumption and to decrease Guam's dependence on imported fishery products; to increase employment and investment opportunities in commercial fishing; to supplement family real income through the harvesting of seafood for home consumption; to enhance recreational fishing opportunities for sport fishermen; to supplement Guam's attractiveness to tourists by providing charterboat fishing opportunities for visiting sport fishermen; and to improve the safety of small-boat fishing in general.

7. PLANNING OBJECTIVES

The planning objectives for navigation improvements in the area of Agat, Guam, is based on the analysis and identification of boating problems and needs as well as environmental and human resources. The following planning objectives were adopted to guide the formulation and evaluation of alternative project plans:

a. Improve commercial and recreational boating facilities for Agat, Guam, during the 1985-2035 period of analysis.

b. Improve the socioeconomic opportunities for the people of Guam.

c. Minimize alteration to the reef marine environment.

III. FORMULATION OF ALTERNATIVE PLANS

1. FORMULATION AND EVALUATION CONCEPTS

The formulation and analysis of alternative solutions to achieve the planning objectives were based on the Water Resources Council's Principles and Standards for Planning Water and Related Land Resources (P&S). The evaluation and assessment of economic, social, and environmental effects also followed the guidelines of Section 122 of the River and Harbor Act of 1970 (Public Law 91-611) and the National Environmental Policy Act of 1969 (NEPA), as well as pertinent Corps of Engineers regulations and guidelines. The formulation and evaluation of alternative plans of improvement was guided by the following technical, economic, and environmental criteria.

a. Technical Criteria.

(1) The entrance channel should provide for two-way traffic and be navigable during all weather and sea conditions except during periods of severe storms, and the berthing area should be protected from storm waves during all conditions including severe storms.

(2) The plan of improvement should include a turning basin adequate for maneuvering of the design vessel and provisions for berthing and shoreside facilities.

(3) Protective structures should be designed to withstand a severe combination of meteorological and oceanographic conditions that are characteristic of the study area (i.e., typhoon conditions).

(4) The improvement design should limit wave heights in the berthing area to less than 2 feet.

(5) The plan of improvement should be designed to accommodate a design vessel with 60-foot length, 15-foot beam, and 6-foot draft. This is representative of a large commercial charter boat or sailboat which is the largest vessel anticipated to be a regular user of the harbor.

b. Economic Criteria.

(1) Improvement plans recommended for implementation should have net positive NED benefits and as far as practicable, should be maximized.

(2) The benefits and costs should be expressed in comparable quantitative economic terms to the fullest extent possible. Annual costs should be based on a 50-year amortization period and a 7-3/8 percent interest rate, and include the annual maintenance cost.

c. Environmental and Social Criteria.

(1) Identify, assess, and evaluate all forms of fish and wildlife which may be affected.

(2) Surface areas of offshore harbor structures should be limited to water dependent uses to minimize the use of natural resources and minimize dredging and filling of live coral reef area.

(3) Offshore harbor structures should be as open and segmented as technically feasible to minimize long-term disturbances or changes in the physical environment, e.g., water circulation and coastal processes.

(4) Avoid severe dislocation and adverse social, health, and safety impacts.

(5) Harbor siting and design should minimize potential conflicts between boating and beach use, recreational swimming and diving, picnicking and cultural resources.

(6) Evaluate the potential environmental and social effects on an equal basis with the technical and economic considerations.

2. ALTERNATIVE HARBOR PLANS

Based on the identified problems and needs, the planning objectives, and the formulation and evaluation concepts, four alternative harbor plans for the Nimitz Beach site were originally developed in detail and evaluated with respect to their contribution to navigation improvements, their beneficial and adverse impacts, and their benefits and costs. A fifth alternative (Plan 5), which received no support at the last public workshop held on 23 July 1980, was not included in the draft detailed project report. After re-examining the array of alternatives, it was decided that Plan 5, although receiving no support at the public workshop, should be reconsidered because of favorable construction costs, an ideal location based on detailed wave climate studies, and comparatively minimal environmental impacts to the project area. This plan along with the four other alternatives was presented at the public meeting held on Guam on 21 January 1981.

Four of the alternative plans would accommodate approximately 150 berthed vessels, and one plan is designed for approximately 80 berths. The existing and projected berthing requirements in the study area exceed 150 berths, however, based on the expressed desire by the local interests to minimize costs and impacts to the harbor site, 150 berths have been selected as the maximum acceptable harbor size. All of the plans were developed with the idea of minimizing or reducing construction on and filling of the reef flat to the maximum extent practicable while still providing for an adequate facility. Vehicular access to the berthing area is considered necessary, however, car parking stalls were limited to approximately 50% of the number of berths. All of the plans incorporate space for a two-lane launch ramp, but car/trailer parking was limited to 15-20 stalls. All of the plans also incorporate space for a comfort station, fuel dock, and ice house in the immediate harbor area. Approximately 3.6 acres of buffer zone across the highway between Pagachao Road and the C&H Farms are available to accommodate additional parking areas and harbor related facilities. These facilities would be developed by local interests.

a. Description

(1) Plan 1: Plan 1 consists of dredging a 940-foot long, 120- to 150-foot wide, and 14-foot deep entrance channel; a 150-foot square, 11-foot deep turning basin, and a 380-foot long, 75-foot wide, 9-foot deep main access channel;

constructing a 500-foot long main breakwater with a +13-foot crest elevation and a 300-foot long detached breakwater with a +9-foot crest elevation; and constructing a revetted mole 1,160 feet long with a crest elevation of +10 to +13 feet. The harbor would be constructed offshore on the reef flat, approximately 1,200 feet north of Nimitz Beach Park, with access via a 450-foot long revetted accessway. Plan 1 is shown on Figure 4. This plan would provide berthing space for approximately 150 boats and the revetted mole would accommodate access to the berths, a two-lane launch ramp, and minimal shoreside facilities including parking for approximately 75 cars and 20 cars with boat trailers. Culverts would be provided through the revetted accessway for water circulation.

(2) Plan 2. Plan 2 consists of dredging a 1,600-foot long, 150-foot wide, and 14-foot deep entrance channel, a 150-foot square and 11-foot deep turning basin, and a 500-foot long, 75-foot wide, and 9-foot deep main access channel; and constructing an 800-foot long main breakwater with a +13-foot crest elevation, an 80-foot long stub breakwater with a +10-foot crest elevation and a 100-foot long stub breakwater with a +8-foot crest elevation, and a 420-foot long revetted mole with a crest elevation of +10 feet. This plan would be constructed contiguous to the existing shoreline approximately 1,200 feet north of Nimitz Beach Park. The plan is shown on Figure 5. The majority of harbor and shoreside facilities would be constructed on existing fast land above the MLLW line. The long entrance channel through the shallow reef would require a 150-foot width for its entire length in order to facilitate safe navigation under possible adverse wind and current conditions. This plan would provide berthing space for approximately 150 boats, a two-lane launch ramp and parking and shoreside area for 75 cars, 20 cars with trailers and shoreside facilities.

(3) Plan 3. Plan 3 consists of a 550-foot long, 120- to 150-foot wide, and 14-foot deep entrance channel; a 150-foot square, 11-foot deep turning basin; a 380-foot long, 75-foot wide, and 9-foot deep main access channel; a 460-foot long breakwater with a +13-foot crest elevation; and a 1,400-foot long revetted mole with a crest elevation of +10- to +13 feet. The harbor would be constructed offshore on the reef flat approximately 800 feet north of Nimitz Beach Park, with access via a 200-foot long revetted accessway. The entrance channel would be dredged as an extension of the existing Nimitz Channel. Plan 3 is shown on Figure 6. This plan would provide berthing space for approximately 150 boats and the revetted mole would accommodate access to the berths, a two-lane launch ramp, and minimal shoreside facilities including parking for approximately 75 cars and 20 cars with boat trailers. A culvert through the revetted accessway would be provided for water circulation.

(4) Plan 4. Plan 4 consists of a 620-foot long, 120- to 150-foot wide, and 14-foot deep entrance channel; a 150-foot square, 11-foot deep turning basin; a 310-foot long, 75-foot wide, and 9-foot deep main access channel; a 1,000-foot long breakwater with a +13-foot crest elevation; and a 900-foot long revetted mole with a +10-foot crest elevation. The harbor would be constructed offshore similarly to Plan 3, with access via a 400-foot long revetted accessway. The entrance channel would be dredged, also as in Plan 3, as an extension of the existing Nimitz Channel. The harbor plan is shown on Figure 7. This plan would provide berthing space for approximately 80 boats and the revetted mole would provide access to the berths, a two-lane launch ramp, and parking for approximately 40 cars and 15 cars with trailers. Culverts would be provided through the revetted accessway for water circulation.

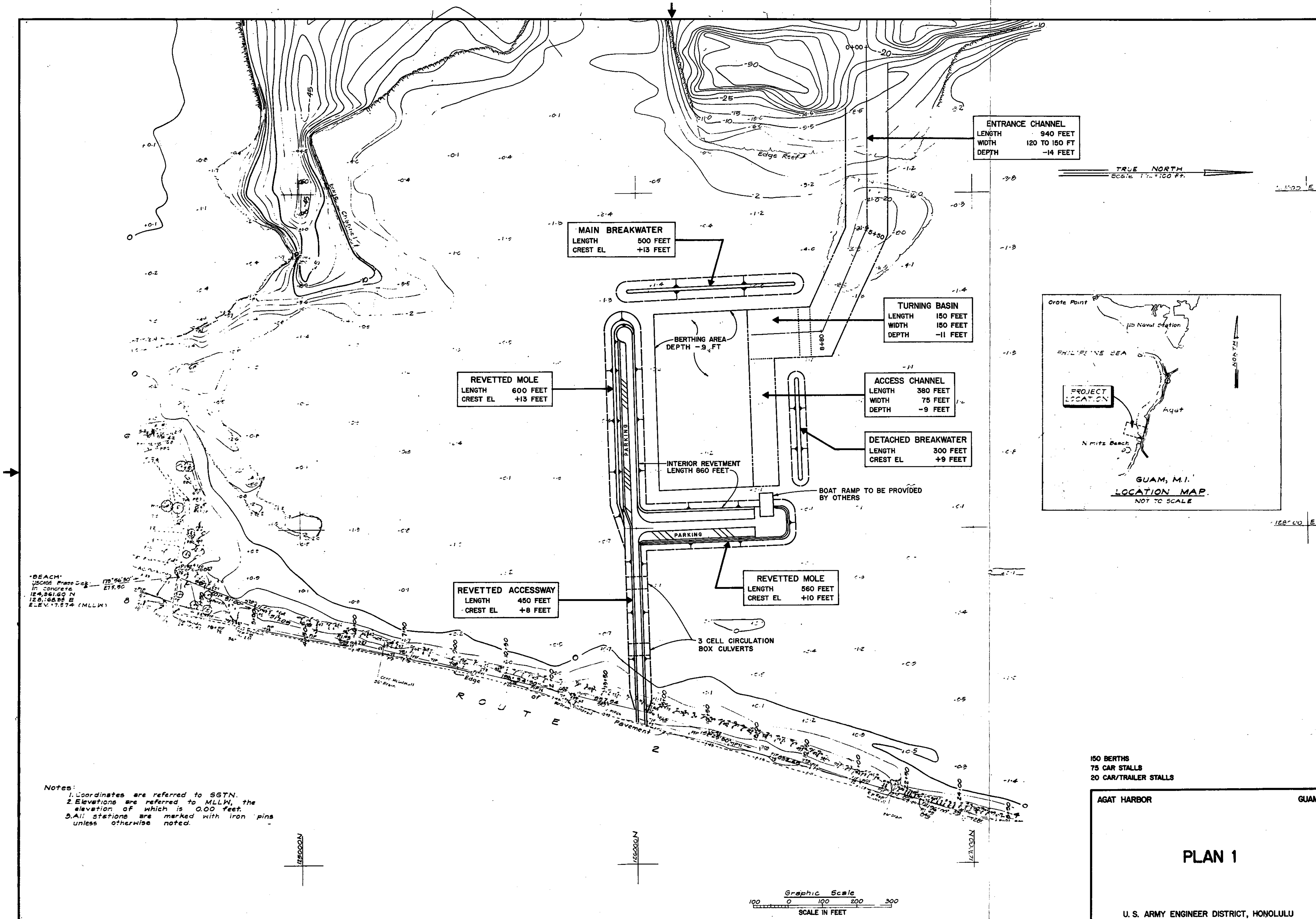

ENTRANCE CHANNEL
LENGTH 940 FEET
WIDTH 120 TO 150 FT
DEPTH -14 FEET
TRUE NORTH
MAIN BREAKWATER
LENGTH 500 FEET
CREST EL +13 FEET
TURNING BASIN
LENGTH 150 FEET
WIDTH 150 FEET
DEPTH -11 FEET
BERTHING AREA
DEPTH -9 FT
REVETTED MOLE
LENGTH 600 FEET
CREST EL +13 FEET
ACCESS CHANNEL
LENGTH 380 FEET
WIDTH 75 FEET
DEPTH -9 FEET
DETACHED BREAKWATER
LENGTH 300 FEET
CREST EL +9 FEET
PARKING
INTERIOR REVETMENT
LENGTH 860 FEET
BOAT RAMP TO BE PROVIDED BY OTHERS
PARKING
REVETTED MOLE
LENGTH 560 FEET
CREST EL +10 FEET
REVETTED ACCESSWAY
LENGTH 450 FEET
CREST EL +8 FEET
3 CELL CIRCULATION BOX CULVERTS
Edge Reef
ROUTE 2
Edge of Pavement
Orote Point
US Naval Station
PHILIPPINE SEA
PROJECT LOCATION
Agat
Nimitz Beach
NORTH
GUAM, M.I.
LOCATION MAP
NOT TO SCALE
Notes:
1. Coordinates are referred to SGTN.
2. Elevations are referred to MLLW, the elevation of which is 0.00 feet.
3. All stations are marked with iron pins unless otherwise noted.
125000N
126000N
127000N
Graphic Scale
100 0 100 200 300
SCALE IN FEET
150 BERTHS
75 CAR STALLS
20 CAR/TRAILER STALLS
AGAT HARBOR
GUAM
PLAN 1
U. S. ARMY ENGINEER DISTRICT, HONOLULU

FIGURE 4

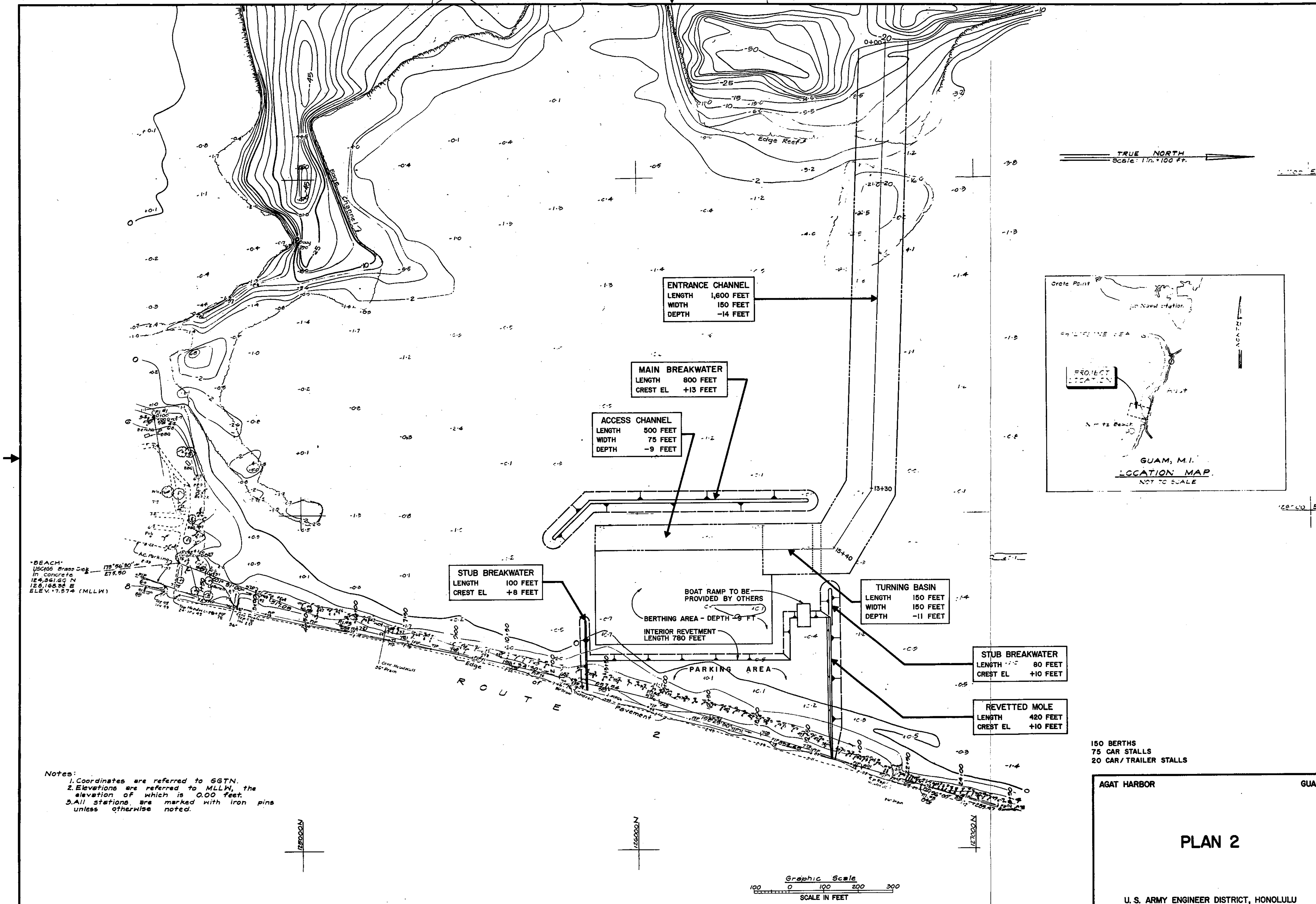

ENTRANCE CHANNEL
LENGTH 1,600 FEET
WIDTH 150 FEET
DEPTH -14 FEET
MAIN BREAKWATER
LENGTH 800 FEET
CREST EL +13 FEET
ACCESS CHANNEL
LENGTH 500 FEET
WIDTH 75 FEET
DEPTH -9 FEET
STUB BREAKWATER
LENGTH 100 FEET
CREST EL +8 FEET
BOAT RAMP TO BE PROVIDED BY OTHERS
BERTHING AREA - DEPTH -9 FT
INTERIOR REVETMENT LENGTH 780 FEET
PARKING AREA
TURNING BASIN
LENGTH 150 FEET
WIDTH 150 FEET
DEPTH -11 FEET
STUB BREAKWATER
LENGTH 80 FEET
CREST EL +10 FEET
REVETTED MOLE
LENGTH 420 FEET
CREST EL +10 FEET
ROUTE 2
Edge of Pavement
Edge Reef
TRUE NORTH
Scale: 1 In. = 100 Ft.
GUAM, M.I.
LOCATION MAP
NOT TO SCALE
PROJECT LOCATION
150 BERTHS
75 CAR STALLS
20 CAR/TRAILER STALLS
"BEACH"
USC&GS Brass Disk in concrete
124,861.66 N
126,168.86 E
ELEV. +7.574 (MLLW)
Notes:
1. Coordinates are referred to GGTN.
2. Elevations are referred to MLLW, the elevation of which is 0.00 feet.
3. All stations are marked with iron pins unless otherwise noted.
Graphic Scale
100 0 100 200 300
SCALE IN FEET
AGAT HARBOR
GUAM
PLAN 2
U. S. ARMY ENGINEER DISTRICT, HONOLULU

FIGURE 5

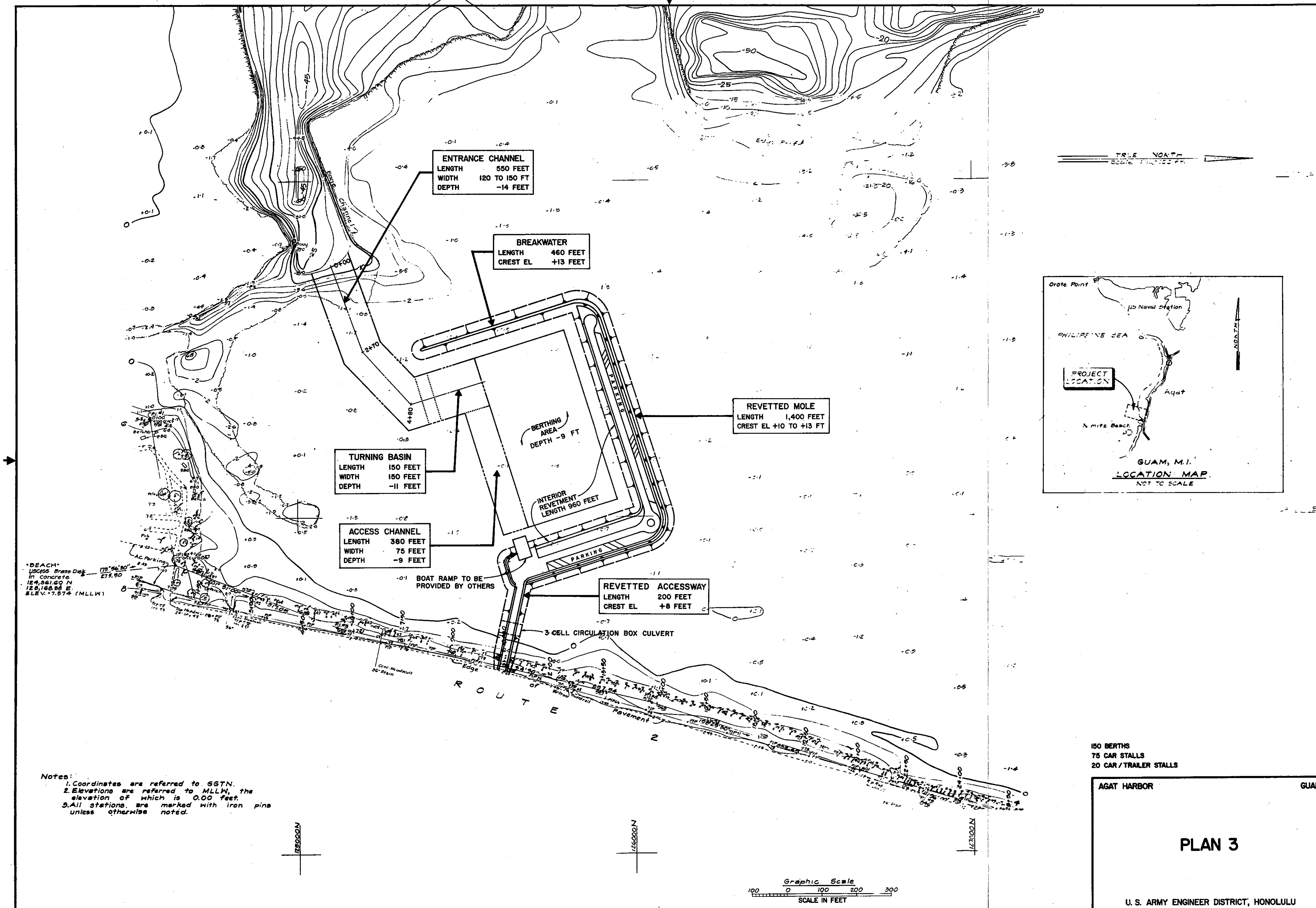
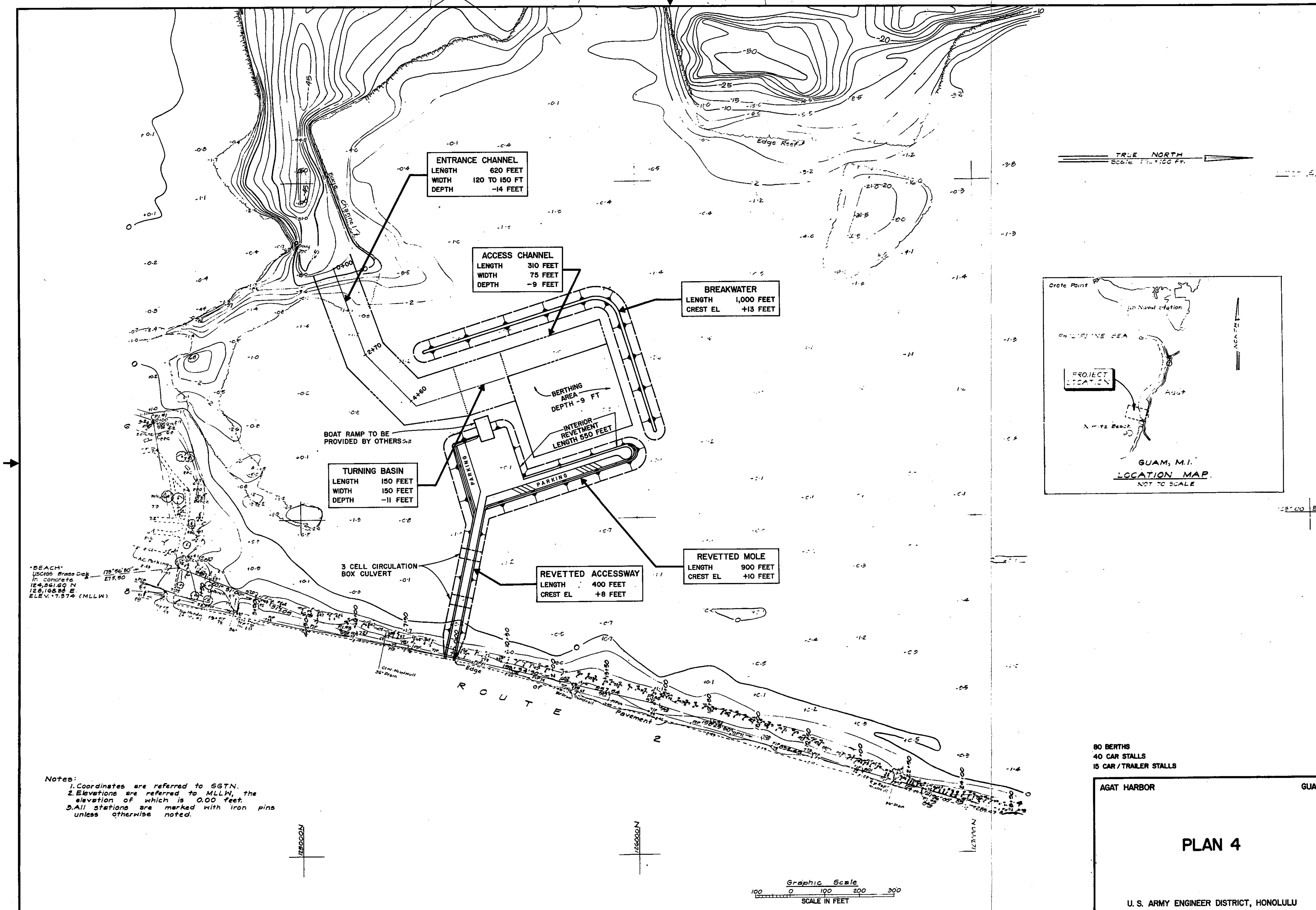

ENTRANCE CHANNEL
LENGTH 550 FEET
WIDTH 120 TO 150 FT
DEPTH -14 FEET
BREAKWATER
LENGTH 460 FEET
CREST EL +13 FEET
REVETTED MOLE
LENGTH 1,400 FEET
CREST EL +10 TO +13 FT
TURNING BASIN
LENGTH 150 FEET
WIDTH 150 FEET
DEPTH -11 FEET
ACCESS CHANNEL
LENGTH 380 FEET
WIDTH 75 FEET
DEPTH -9 FEET
BERTHING AREA DEPTH -9 FT
INTERIOR REVETMENT LENGTH 960 FEET
PARKING
BOAT RAMP TO BE PROVIDED BY OTHERS
REVETTED ACCESSWAY
LENGTH 200 FEET
CREST EL +8 FEET
3-CELL CIRCULATION BOX CULVERT
ROUTE 2
Edge of Pavement
"BEACH"
USC&GS Brass Disk in concrete
124,561.60 N
126,168.88 E
ELEV. +7.574 (MLLW)
TRUE NORTH
Orote Point
US Naval Station
PHILIPPINE SEA
PROJECT LOCATION
Agat
Nimitz Beach
NORTH
GUAM, M.I.
LOCATION MAP
NOT TO SCALE
Notes:
1. Coordinates are referred to GGTN.
2. Elevations are referred to MLLW, the elevation of which is 0.00 feet.
3. All stations are marked with iron pins unless otherwise noted.
126000N
127000N
Graphic Scale
100 0 100 200 300
SCALE IN FEET
150 BERTHS
75 CAR STALLS
20 CAR / TRAILER STALLS
AGAT HARBOR
GUAM
PLAN 3
U. S. ARMY ENGINEER DISTRICT, HONOLULU

FIGURE 6



AGAT HARBOR GUAM

PLAN 4

U. S. ARMY ENGINEER DISTRICT, HONOLULU

FIGURE 7

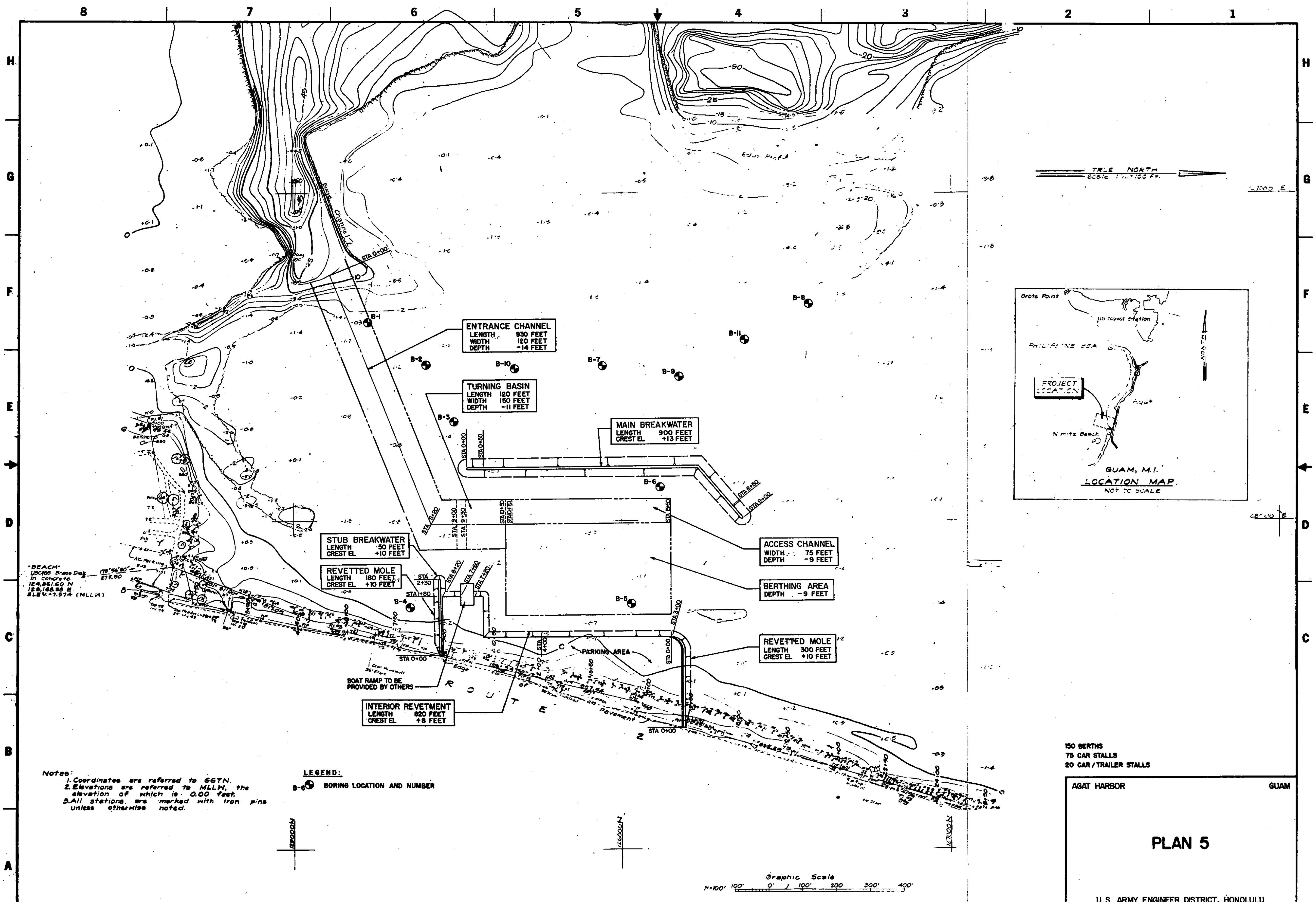
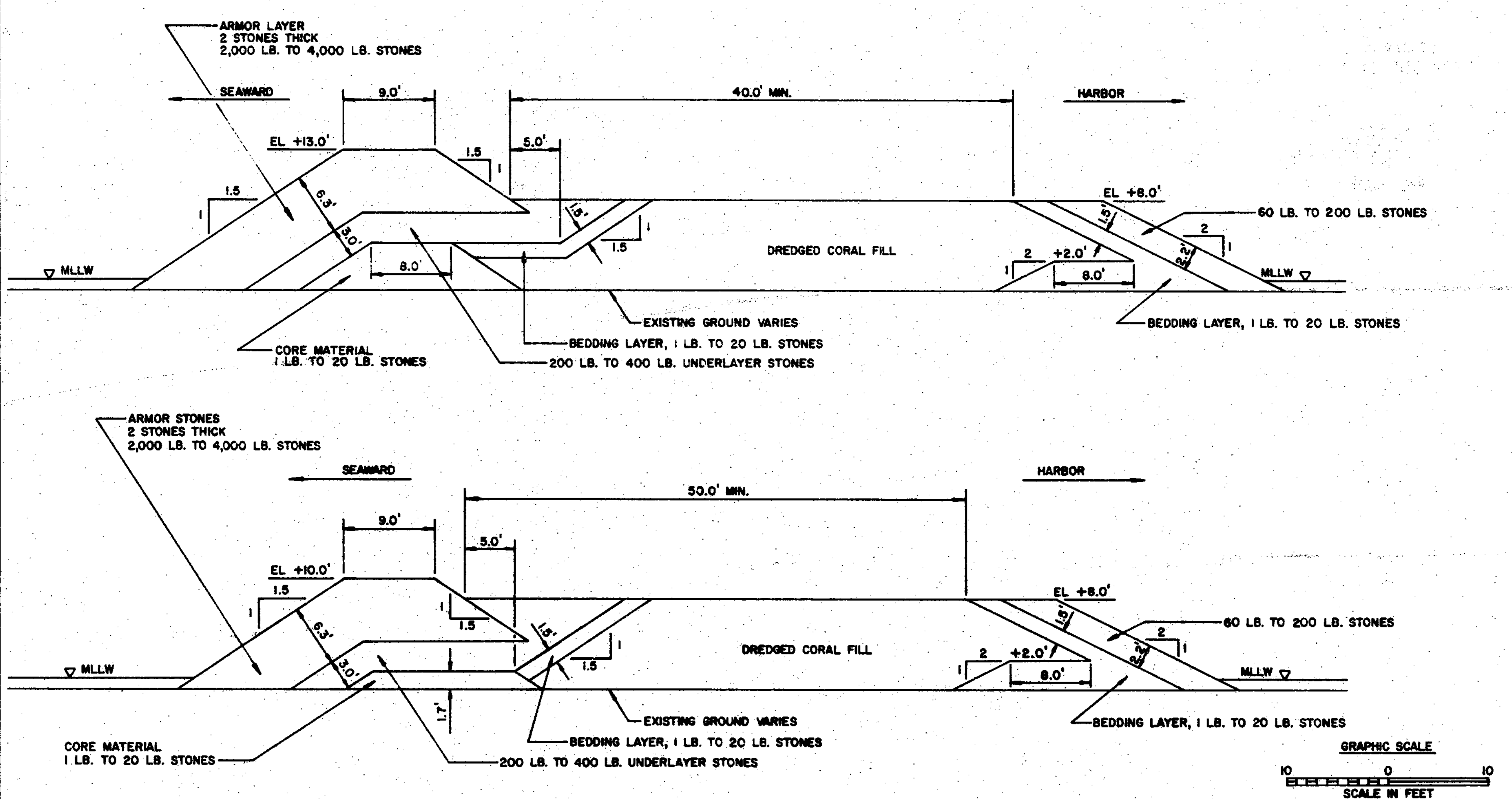

ENTRANCE CHANNEL
LENGTH 930 FEET
WIDTH 120 FEET
DEPTH -14 FEET
TURNING BASIN
LENGTH 120 FEET
WIDTH 150 FEET
DEPTH -11 FEET
MAIN BREAKWATER
LENGTH 900 FEET
CREST EL +13 FEET
ACCESS CHANNEL
WIDTH 75 FEET
DEPTH -9 FEET
BERTHING AREA
DEPTH -9 FEET
REVETTED MOLE
LENGTH 300 FEET
CREST EL +10 FEET
STUB BREAKWATER
LENGTH 50 FEET
CREST EL +10 FEET
REVETTED MOLE
LENGTH 180 FEET
CREST EL +10 FEET
INTERIOR REVETMENT
LENGTH 820 FEET
CREST EL +8 FEET
BOAT RAMP TO BE PROVIDED BY OTHERS
PARKING AREA
ROUTE 2
Edge of Pavement
TRUE NORTH
GUAM, M.I.
LOCATION MAP
NOT TO SCALE
PROJECT LOCATION
PHILIPPINE SEA
Orote Point
US Naval Station
Agat
Nimitz Beach
Notes:
1. Coordinates are referred to GGTN.
2. Elevations are referred to MLLW, the elevation of which is 0.00 feet.
3. All stations are marked with iron pins unless otherwise noted.
LEGEND:
B-6 BORING LOCATION AND NUMBER
Graphic Scale
1"=100' 100' 0' 100' 200 300' 400'
150 BERTHS
75 CAR STALLS
20 CAR/TRAILER STALLS
AGAT HARBOR
GUAM
PLAN 5
U. S. ARMY ENGINEER DISTRICT, HONOLULU

FIGURE 8

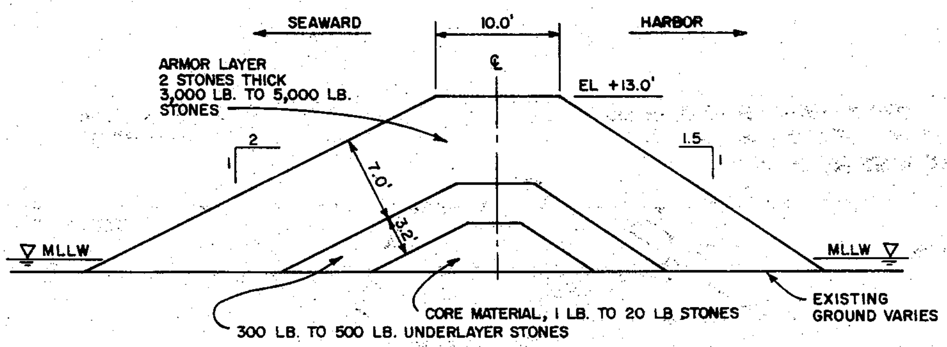


AGAT HARBOR GUAM

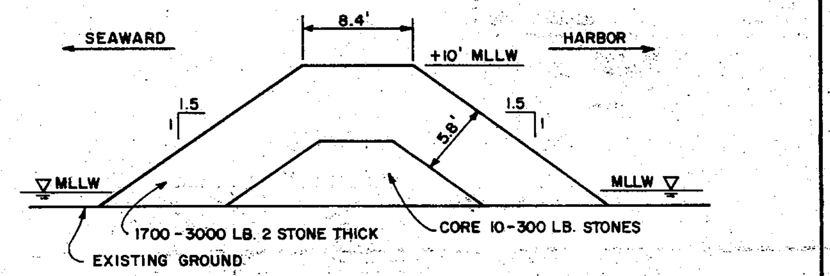
TYPICAL MOLE SECTIONS
(PLAN 1 TO 4)

U.S. ARMY ENGINEER DISTRICT, HONOLULU

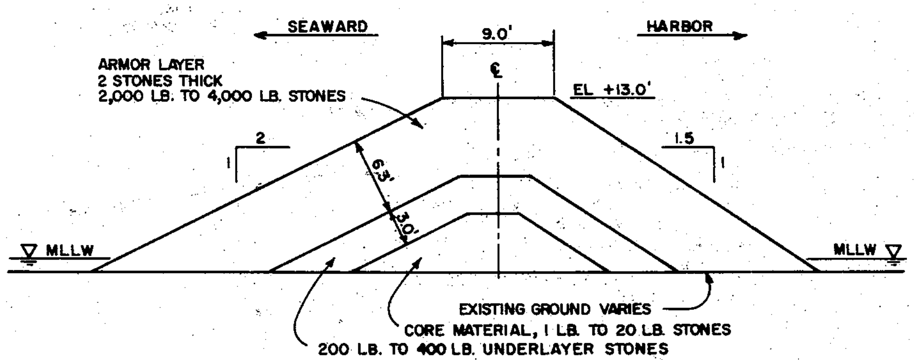
FIGURE 10



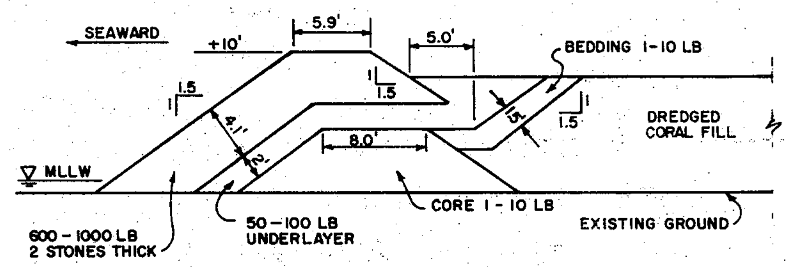
TYPICAL MAIN BREAKWATER HEAD SECTION
STA 0+00 TO 0+50
STA 8+50 TO 9+00



TYPICAL STUB BREAKWATER SECTION
STA 1+80 TO 2+30



TYPICAL MAIN BREAKWATER TRUNK SECTION
STA 0+50 TO 8+50



TYPICAL NORTH REVETTED MOLE SECTION
STA 0+00 TO 3+00

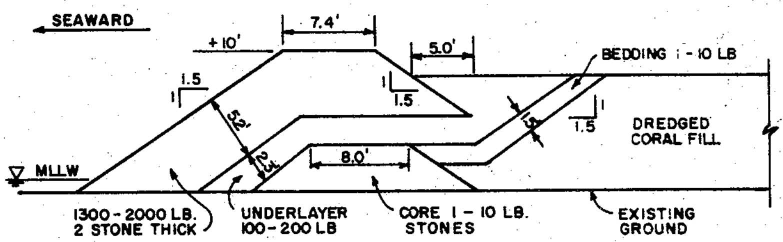
GRAPHIC SCALE
10 0 10
SCALE IN FEET

AGAT HARBOR GUAM

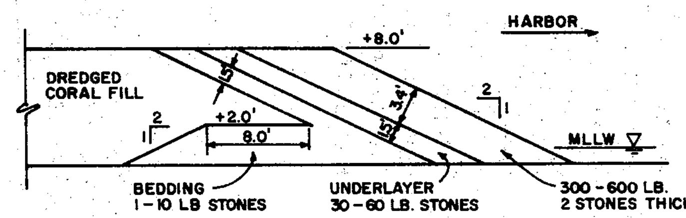
TYPICAL SECTIONS
(PLAN 5)

U.S. ARMY ENGINEER DISTRICT, HONOLULU.

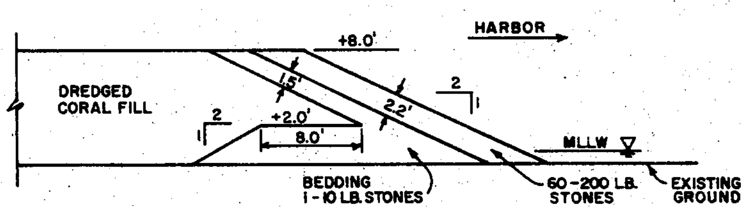
FIGURE 11



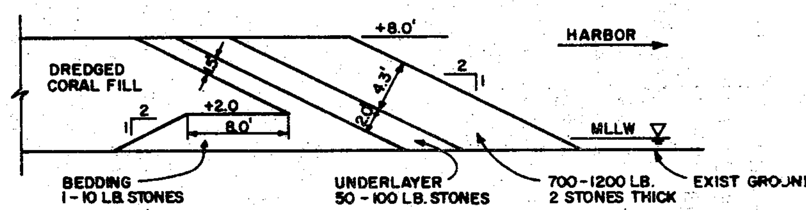
TYPICAL SOUTH REVETTED MOLE SECTION
STA 0+00 TO 1+80



TYPICAL INTERIOR REVETMENT SECTION
STA 4+00 TO 7+20

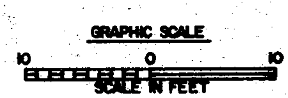


TYPICAL INTERIOR REVETMENT SECTION
STA 0+00 TO 4+00



TYPICAL INTERIOR REVETMENT SECTION
STA 7+60 TO 8+20

N O T E :
WHEN EXISTING GRADE IS OTHER THAN CORAL REEF ROCK, EXTEND TOE OF STRUCTURE 3 FEET BELOW GRADE OR TO CORAL REEF ROCK, WHICHEVER IS LESS. SEE SPECIAL TOE DESIGN FOR TYPICAL TOE SECTION. (REF. FIGURE 9)



AGAT HARBOR GUAM

TYPICAL SECTIONS
(PLAN 5)

U.S. ARMY ENGINEER DISTRICT, HONOLULU

FIGURE 12

(5) Plan 5. Plan 5 consists of dredging a 900-foot long, 120-foot wide, and 14-foot deep entrance channel; a 150-foot wide, 120-foot long and 11-foot deep turning basin, and a 500-foot long, 75-foot wide, and 9-foot deep main access channel; and constructing a 900-foot long main breakwater with a +13-foot crest elevation, a 50-foot long stub breakwater with a +10-foot crest elevation, and a 180-foot long revetted mole with a crest elevation of +10 feet and a 300-foot long revetted mole with a crest elevation of +10 feet. This plan would be constructed contiguous to the existing shoreline approximately 800 feet north of Nimitz Beach Park. The plan is shown on Figure 8. The majority of harbor and shoreside facilities would be constructed on existing fastland above the MLLW line. The entrance channel would be dredged as an extension of the existing Nimitz Channel. This plan would provide berthing space for approximately 150 boats, a two-lane launch ramp and parking and shoreside area for 75 cars, 20 cars with trailers and shoreside facilities.

3. ESTIMATED BENEFITS AND COSTS

a. Benefits

Benefits accruing from each plan were derived from navigation benefits and expected improvements in subsistence fishing and recreational and commercial charter boating operations. Economic evaluations were conducted in accordance with procedures and standards prescribed by the Water Resources Council and Corps of Engineers' policy. Detailed analyses are presented in Appendix F.

b. Costs

Estimated project first costs were developed from April 1981 price levels and assumptions based on the prevailing physical conditions and construction methods suitable to the project area. The average annual cost for the purposes of the benefits to cost comparisons include interest (7 3/8%) and amortization (50-years) of the project first cost and the estimated annual maintenance costs associated with maintenance dredging, repairs to the breakwater structure and maintenance for aids to navigation. Cost breakdowns and estimating assumptions are provided in Appendix E (Cost Estimation Section of the Engineering Investigations and Design Analysis Appendix).

c. Benefit to Cost Comparison

Table 14 presents a summary of the estimated average annual benefits to average annual costs associated with each plan. This comparison represents the degree of tangible economic justification for each plan.

TABLE 14. COST AND BENEFIT SUMMARY
(Apr 81 Price Levels - $1,000)

Item	PLANS 1	2	3	4	5
Total estimated first cost 1/	$4,487	$4,317	$4,183	$4,516	$3,976
Estimated average annual cost	340	326	315	341	299
Estimated average annual benefit	379	379	379	277	379
Estimated benefit to cost ratio	1.11	1.16	1.20	0.81	1.27

1/ The apportionment of costs does not include other non-federal costs (self-liquidating) associated with the assurances of local cooperation as required in Section 221 of the River and Harbor Act of 1970. Provisions required in the local cooperation agreement are detailed in Appendix A.

d. Apportionment of Costs

The apportionment of costs between federal and non-federal interests corresponds to Section 107 of the River and Harbor Act of 1960, as amended, which prescribes the cost of sharing. This law limits federal participation to a monetary maximum of $2 million (excluding the cost of aids to navigation).

TABLE 15. APPORTIONMENT OF COSTS
($1,000)

	PLANS 1	2	3	4	5
Total Project First Cost	$4,487	$4,317	$4,183	$4,516	$3,976
Corps of Engineers First Cost Share 1/	2,000	2,000	2,000	2,000	2,000
US Coast Guard First Cost Share 2/	80	80	80	80	80
Non-Federal First Cost Share 3/	2,407	2,237	2,103	2,436	1,896

1/ All future maintenance dredging and breakwater repairs are a federal cost.
2/ All future maintenance for aids to navigation is a federal cost.
3/ Does not include the costs of self-liquidating facilities (berthing facilities, dredging of berthing areas, utilities, etc), see Appendix E (cost estimates).

TABLE 16. SUMMARY COMPARISON OF ALTERNATIVE PLANS AND SYSTEMS OF ACCOUNTS

	NO IMPROVEMENT "WITHOUT" CONDITION	PLAN 1
A. PLAN DESCRIPTION	No navigation improvements in Agat area. Closest small-boat harbor is in Agana, approximately 10 miles to the northeast.	Offshore 150-berth harbor with entrance channel 1,200 feet north of Nimitz Beach Park.
B. SIGNIFICANT IMPACTS		
1. Economic		
Local Govt Finance*	No impact on property values. Loss of increased tax base resulting from commercial boating activities.	Would increase property value of public land in the vicinity of harbor. Increased tax base from commercial boating-related business activity.
Land Use	No change.	Public lands along the shoreline in the harbor area would be utilized for harbor and shoreside facilities.
Public Facilities and Services	Continued unmet demand for public boating facilities in the Agat area.	Would provide for safe navigation and the berthing and launch/recovery of boats and would promote the growth of related public services.
Regional Growth*	No significant impact, growth will occur with or without a harbor.	No significant impact, however, the harbor would be an inducement to further growth in the Agat area.
Employment*	No change.	Would increase employment opportunities in commercial charter boating and general boating related services.
Business and Industrial*	Boating-related business activity in the Agat area would remain depressed due to lack of adequate harbor facilities.	Boating-related business activity would be greatly enhanced.
2. Environmental		
a. General		
Marine Environment	No impact to the shallow reef flat environment. Varying bottom substrate - sand, coral, rubble, and reef rock.	Would modify 10.2 acres of reef flat; covering 4.9 acres with protective structures and harbor access and shoreside facilities, and changing 5.3 acres of shallow (1-2') to deeper (9-14') water habitat (1,6,9)
Terrestrial Environment	No change.	Conversion of some natural, vegetated shoreline to shoreside facility use including access roads and parking (1, 5, 9)
Fish & Wildlife	No change to existing conditions. An extensive seagrass bed extends from Nimitz Channel north to Bangi Point. The reef flat supports a sizable and diverse clam population. Coral growth along the Nimitz Channel/reef front complex is abundant and diverse, with 100% coverage in some locations. The reef front north of Nimitz Channel has a higher coral diversity and abundance.	Loss of coral and other sessile organisms. Temporary displacement of motile organisms during construction. Rapid recovery anticipated. (1, 6, 9)
Water Quality*	No change. Presently good shoreline reef flat water quality. Four 36" drainage culverts in project area contribute to significant nearshore turbidity during periods of heavy rainfall.	Temporary turbidity during construction. No significant long-term effect except for impacts associated with boat operation. (1, 6, 9)
Circulation & Flushing	No change from existing conditions. Reversing tidal currents on reef flat, flowing northeasterly during flood tide and southwesterly during ebb tide.	Would impede north-south current flow on the reef flat, however, this would not significantly alter tidal exchange on the reef. Circulation structures would be provided through the revetted accessway. The breakwaters are detached to facilitate flushing of the harbor basin. (1, 5, 9)
Air Quality*	No change.	No impact.

Plan 2	Plan 3	Plan 4	Plan 5
Onshore 150-berth harbor with entrance channel 1,200 feet north of Nimitz Beach Park.	Offshore 150-berth harbor with entrance channel constructed as an extension of the existing Nimitz Channel.	Offshore 80-berth harbor with entrance channel constructed as an extension of the existing Nimitz Channel.	Onshore 150-berth harbor with entrance channel constructed as an extension of the existing Nimitz Channel.
Same as Plan 1.	Same as Plan 1.	Same as Plan 1, however, smaller harbor would decrease the magnitude of commercial activity.	Same as Plan 1.
Same as Plan 1.	Same as Plan 1.	Same as Plan 1.	Same as Plan 1.
Same as Plan 1.	Same as Plan 1.	Same as Plan 1, however, the berth capacity is approximately half of Plans 1-3.	Same as Plan 1.
Same as Plan 1.	Same as Plan 1.	Same as Plan 1.	Same as Plan 1.
Same as Plan 1.	Same as Plan 1.	Same as Plan 1.	Same as Plan 1.
Same as Plan 1.	Same as Plan 1.	Same as Plan 1.	Same as Plan 1.
Would modify 10.6 acres of reef flat; covering 2.4 acres with protective structures and harbor access and shoreside facilities, and changing 8.2 acres of shallow (1-2') to deeper (9-14') water habitat (1, 6, 9).	Would modify 10.0 acres of reef flat; covering 4.2 acres with protective structures and harbor acess and shoreside facilities, and changing 5.8 acres of shallow (1-2') to deeper (9-14') water habitat (1, 6, 9).	Would modify 8.3 acres of reef flat; covering 4.0 acres with protective structures and harbor access and shoreside facilities and changing 4.3 acres of shallow (1-2') to deeper (9-14') water habitat (1, 6, 9).	Would modify 9.6 acres of reef flat; covering 2.2 acres with protective structures and harbor access and shoreside facilities, and changing 7.4 acres of shallow (1-2) to deeper (9-14) water habitat (1, 6, 9).
Conversion of 2.9 acres of natural, vegetated shoreline between existing highway and MLLW to harbor and shoreside facility use (1, 5, 9).	Same as Plan 1.	Same as Plan 1.	Conversion of 2.5 acres of natural, vegetated shoreline between the existing highway and MLLW to harbor and shoreside facility use (1, 5, 9).
Same as Plan 1.	Same as Plan 1, except that the entrance channel would destroy an area of lesser coral diversity and abundance.	Same as Plan 3.	Same as Plan 3.
Same as Plan 1.	Same as Plan 1.	Same as Plan 1.	Same as Plan 1.
"Open" harbor design would not significantly alter existing circulation and flushing characteristics of the reef flat and would result in excellent harbor flushing. The long relatively deep entrance channel will likely generate a strong seaward flowing "rip" current during ebbing tides (1, 5, 9).	Would impede north-south current flow on the reef flat, however, this would not significantly alter tidal exchange on the reef. Circulation structures would be provided through the revetted accessway. The harbor is completely open on the south side and tidal exchange augmented by the prevailing winds will provide excellent flushing (1,5,9).	Would impede north-south current flow on the reef flat, however, this would not significantly alter tidal exchange on the reef. Circulation structures would be provided through the revetted accessway. The breakwater is detached to facilitate harbor flushing (1, 5, 9).	"Open" harbor design would not significantly alter existing circulation and flushing characteristics of the reef flat and would result in excellent harbor flushing (1, 5, 9).
No Impact.	No Impact.	No Impact.	No Impact.

	NO IMPROVEMENT "WITHOUT" CONDITION	PLAN 1
Natural Resources*	Natural, unaltered shoreline and reef flat.	Would commit approximately 10.2 acres of natural reef flat to harbor use, 99,700 cy of dredged materials, and 33,700 cubic yards of quarried stone for protective structures. (1, 6, 9)
Man-Made Resources*	Continued unmet demand for harbor facility.	Completes harbor for save navigation. (1, 6, 9)
b. Environmental Quality Destroyed		
Marine Environment		
Amount of Reef Disturbed	67 acres available.	10.2 acres (1, 6, 9).
Amount of Live Coral Lost	1.5 acres of good coral habitat available along each alignment	Up to 1.4 acres of rich coral habitat (1, 6, 9).
Water Quality - Duration of Turbidity Stress		18 months (1, 6, 9).
Recreation/Subsistence Fishing - Amount of Reef Foraging Area Lost	67 acres available.	15 percent (1, 6, 9).
c. Environmental Quality Enhanced		
Amount of New Intertidal and Rocky Interstitial Marine Habitat Created	None	0.51 acre (1, 2, 6, 9).
Spinning and Pole Fishing Enhanced	No	Yes
3. Social		
Noise*	No change from existing harbor noise.	Temporary increase during construction; no long-term change. (1, 5, 9)
Population*	No impact.	Would enhance population growth. No displacement of people. (1, 2, 6, 9)
Aesthetic Values*	No change.	No change.
Historic, Cultural, and Archaeological Resources	Major visual intrusions.	Affects marginal value early pottery sherds. May stimulate greater participation in culturally-based subsistence fishing activities. (2, 5, 8, 9)
Recreation Opportunities	No change.	Would encourage greater boat ownership, increase opportunities for sports fishing, water skiing, and other water-based activities (1, 5, 10).
Health, Safety, and Community Well-Being	No change.	Would enhance health, safety, and community well-being by providing safe berthing areas for boats and navigation thru reef. (2, 6, 8, 10)
Community Growth and Cohesion*	No change.	Would provide focus for regional and community interaction and encourage community growth by improved recreational activities. Major change in ethnic and income structure of Agat (2, 3, 5, 8, 10).
C. PLAN EVALUATION		
1. Contributions to Planning Objectives		
Improve Subsistence and Small-Scale Commercial Fishing Opportunities and Related Recreational Boating Activities	No change.	Would provide a safe harbor, contribute to the development of boating-related business activities, increase efficiency and opportunities for existing fishing and related recreational boating operations, provide a social and economic commitment on the importance of fishing and related recreational boating activities.
Improve the Socio-Economic Opportunities for the People of Guam	No change.	Would provide employment opportunities, provide diversity to Guam's tax revenue base from commercial boating and boating related business activities. Provide stability of fish supply and prices.

Plan 2	Plan 3	Plan 4	Plan 5
Would commit approximately 10.6 acres of natural reef flat to harbor use, 176,000 cy of dredged material, and 24,700 cy of quarried stone for protective structures. (1, 6, 9)	Would commit approximately 10.0 acres of natural reef flat to harbor use, 119,200 cy of dredged material, and 31,100 cy of quarried stone for protective structures. (1, 6, 9)	Would commit approximately 8.3 acres of natural reef flat to harbor use, 91,800 cy of dredged material, and 33,700 cy of quarried stone for protective structures. (1, 6, 9)	Would commit approximately 9.6 acres of natural reef flat to harbor use, 146,700 cy of dredged material, and 25,200 cy of quarried stone for protective structures. (1, 6, 9)
Same as Plan 1.	Same as Plan 1.	Same as Plan 1	Same as Plan 1.
10.6 acres (1, 6, 9).	10.0 acres (1, 6, 9).	8.3 acres (1, 6, 9).	9.6 acres (1, 6, 9).
Same as Plan 1.	Up to 0.3 acres of moderate coral habitat.	Same as Plan 3.	Same as Plan 3.
18 months (1, 6, 9).	18 months (1, 6, 9).	18 months (1, 6, 9).	18 months (1, 6, 9).
17 percent (1, 6, 9).	15 percent (1, 6, 9).	12 percent (1, 6, 9).	15 percent (1, 6, 9).
0.36 acres (1, 2, 6, 9).	0.43 acres (1, 2, 6,9).	0.48 acres (1, 2, 6, 9).	0.36 acres (1, 2, 6, 9).
Yes	Yes	Yes	Yes
Same as Plan 1.	Same as Plan 1.	Same as Plan 1.	Same as Plan 1.
Same as Plan 1.	Same as Plan 1.	Same as Plan 1.	Same as Plan 1.
Minor visual intrusion.	Major visual intrusion.	Major visual intrusion.	Minor visual intrusion.
Same as Plan 1.	Same as Plan 1.	Same as Plan 1.	Same as Plan 1.
Same as Plan 1.	Same as Plan 1 except for possible conflict w/water-based activities within Nimitz Beach Channel.	Same as Plan 3.	Same as Plan 3.
Same as Plan 1.	Same as Plan 1.	Same as Plan 1.	Same as Plan 1.
Same as Plan 1.	Same as Plan 1.	Same as Plan 1.	Same as Plan 1.
Same as Plan 1.	Same as Plan 1.	Same as Plan 1.	Same as Plan 1.
Same as Plan 1.	Same as Plan 1.	Same as Plan 1.	Same as Plan 1.

	NO IMPROVEMENT "WITHOUT" CONDITION	PLAN I
2. Response to Formulation Criteria		
Technical		
Safe Navigation Conditions; Adequate Basin and Berth	N/A	Would provide adequate channel and basin plus a fully operational berthing area.
Structures Designed for Severe Storm	N/A	Yes
Accommodate Design Vessel	No	Yes
Economic		
Economically Sound	N/A	Yes
Benefit-to-Cost $\geq$ 1	N/A	Yes
Maximize Net Benefits	N/A	No
Environmental		
Minimize Reef Modifications	N/A	No
Minimize Long-Term Effects	No change.	Yes
Confine Work Area	N/A	Yes
3. Relationship to National Accounts		
National Economic Development (NED)		
Average Annual Benefits	N/A	\$379,000
Average Annual Costs	N/A	\$340,000
Net Annual Benefits	N/A	\$ 39,000
Benefit to Cost Ratio (B/C)	N/A	1.11
Environmental Quality	SEE ITEM B.2 ON THIS TABLE.	
Social Well-Being	SEE ITEM B.3 ON THIS TABLE.	
Regional Development	SEE ITEM B.1 ON THIS TABLE.	
4. Response to Associated Evaluation Criteria		
Acceptability	Not Acceptable	High
Completeness	N/A	Complete as described, except for periodic maintenance dredging.
Effectiveness	N/A	Effective
Efficiency	N/A	Efficient
Reversibility	N/A	Irreversible commitment of monetary, rock and environmental resources.
Stability	N/A	Medium
D. IMPLEMENTATION RESPONSIBILITIES		
1. Corps of Engineers		Provide estimated project first cost share of \$2 million; design and construction of the breakwater, entrance and access channel and turning basin.
2. Territory of Guam		Provide estimated local first cost share of \$2.4 million, provide local assurances and cooperation.
3. US Coast Guard		Provide navigation aids and maintenance.

INDEX OF FOOTNOTES:

TIMING.

1. Impact is expected to occur prior to or during implementation of the plan.
2. Impact is expected within 15 years following plan implementation.
3. Impact is expected in a longer time frame (15 or more years following implementation).

UNCERTAINTY

4. The uncertainty associated with impact is 50% or more.
5. The uncertainty is between 10% and 50%.
6. The uncertainty is less than 10%.

Plan 2	Plan 3	Plan 4	Plan 5
Same as Plan 1.	Same as Plan 1.	Same as Plan 1.	Same as Plan 1.
Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes
Yes	Yes	No	Yes
Yes	Yes	No	Yes
Yes	No	No	Yes
No	No	Yes	No
Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes
$379,000	$379,000	$277,000	$379,000
$326,000	$315,000	$341,000	$299,000
$ 53,000	$ 64,000	-$ 64,000	$ 80,000
1.16	1.20	0.81	1.27
Low	Medium	Low	High
Same as Plan 1.	Same as Plan 1.	Same as Plan 1.	Same as Plan 1.
Highly Effective	Effective	Marginally Effective	Highly Effective
Highly Efficient	Efficient	Marginally Efficient	Highly Efficient
Same as Plan 1.	Same as Plan 1.	Same as Plan 1.	Same as Plan 1.
High	High	Medium	High
Same as Plan 1.	Same as Plan 1.	Same as Plan 1.	Same as Plan 1.
Provide estimated local first cost share of $2.2 million, provide local assurances and cooperation.	Provide estimated local cost share of $2.1 million, provide local assurances and cooperation.	Provide estimated local first cost share of $2.4 million, provide local assurances and cooperation.	Provide estimated local first cost share of $1.9 million, provide local assurances and cooperation.
Same as Plan 1.	Same as Plan 1.	Same as Plan 1.	Same as Plan 1.

EXCLUSIVITY
7. Overlapping entry: Fully monetized in NED account.
8. Overlapping entry: Not fully monetized in NED account.

ACTUALITY
9. Impact will occur with implementation.
10. Impact will occur only when specific additional actions are carried out during implementation.
11. Impact will not occur because necessary additional actions are lacking.

(*) Item specifically required in Section 122, Public Law 91-611 and ER 1105-2-240.

4. EVALUATION AND ASSESSMENT OF ALTERNATIVE PLANS

a. Summary Comparison of Alternative Plans

The evaluation of the economic, social, and environmental effects of each alternative plan is displayed in Table 16 (Summary Comparison of Alternative Plans and System of Accounts). This table displays the significant contributions, the beneficial and adverse effects, and the extent to which various planning objectives and evaluation criteria are met by each plan.

b. Compliance Requirements

(1) In accordance with the Council on Environmental Quality Regulations and Procedures, a minimum comment period of forty-five (45) days from the date of the notice of availability published in the Federal Register by the Environmental Protection Agency (EPA) was provided. Copies of the report were circulated to Federal and Government of Guam agencies and interested groups and individuals. Copies were also made available to the residents of Agat, Guam. The mailing list is provided in Appendix B. No administrative action was taken regarding the proposed action for ninety (90) days.

(2) As part of the public involvement program, a public meeting was held on 21 January 1981 at the Agat Community Center in Agat, Guam. Public notices were sent to the general public and media as well as to Federal and Government of Guam elected officials and governmental agencies. The meeting gave the public the opportunity to express their views concerning the proposed alternatives as well as on the effects of "discharge of fill material in the navigable waters of the US" and the "development of Federal activities within the base flood plain" under Section 404 of the Clean Water Act of 1977 and Executive Order 11988 (Flood Plain Management, dated 24 May 1977), respectively. Additional evaluation reports required by these acts were provided in the draft report. A transcript of the public meeting is provided in Appendix B.

(3) In accordance with the Fish and Wildlife Coordination Act of 1958, as amended, the US Fish and Wildlife Service provided a Section 2(b) report. A copy of this report is provided in Appendix D.

(4) The Draft Environmental Impact Statement (DEIS) was filed with the US Environmental Protection Agency (EPA).

(5) The Government of Guam Historic Preservation Officer, the Interagency Archaeological Service of the Heritage Conservation and Recreation Service, U.S. Department of the Interior and the U.S. Advisory Council on Historic Preservation were afforded the opportunity to review the adequacy of our cultural resources study and findings under the National Historic Preservation Act of 1966 and the Archeological Recovery Act of 1960 as amended.

c. Summary of Comments Received

Section V of the Public Involvement Appendix B summarizes all the pertinent comments received regarding the Draft Detailed Project Report and Environmental Statement. Letters received are also reproduced in Appendix B under Pertinent Correspondence. Comments and responses pertaining to the Draft Environmental Impact Statement are also summarized in the Final Environmental Impact Statement.

IV. THE SELECTED PLAN

1. RATIONALE FOR SELECTION

Plan 5 at Nimitz Beach was considered the most suitable harbor layout for subsistence fisherman, recreational boaters, and commercial charter boaters. Plan 5 also received widespread support from Government of Guam agencies. This plan was designated as the National Economic Development (NED) plan because it maximized net benefits and was considered to be the least environmentally damaging plan.

Plan 5, which utilizes onshore parking and the existing Nimitz Channel, would meet the planning objectives at less cost than the other four plans and would:

a. have the least detrimental effects on the extensive reef flats and marine ecology

b. have comparatively little impact on water quality and circulation

c. have probably the least overall adverse environmental effect

Plan 5 could, however, have potentially adverse social impacts on recreational swimming and diving near Nimitz Beach Park.

2. PLAN DESCRIPTION

a. General Plan

The selected plan (Plan 5) provides for dredging of an entrance channel and turning basin and a breakwater structure with onshore parking. The protected basin will provide berthing areas for 150 boats. Specific elements of the plan are shown on Figure 8. A possible berthing plan is shown on Figure 13.

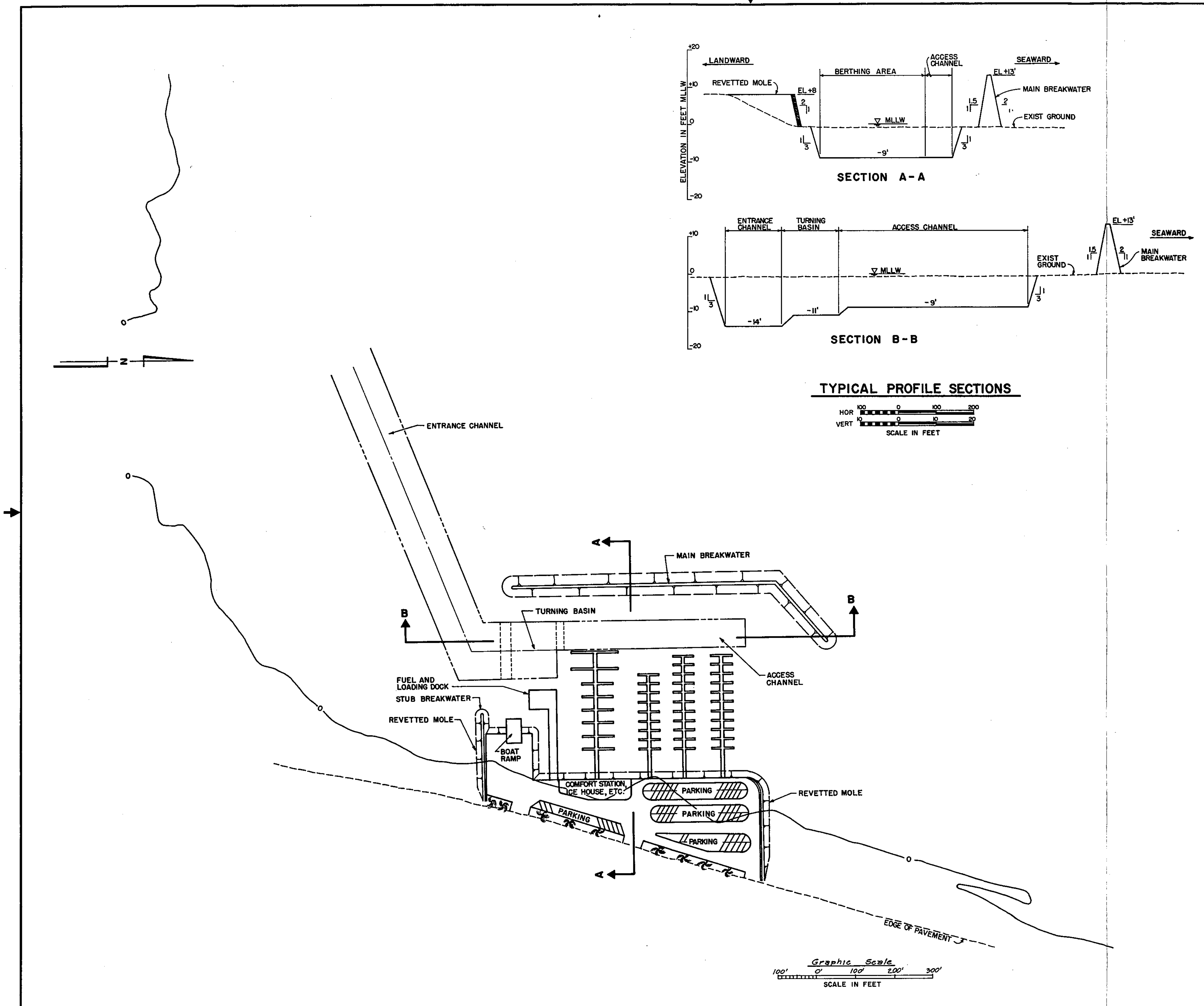
b. Shoreside Facilities

The Government of Guam is responsible for providing all shoreside facilities. Approximately 3.6 acres of land is available directly across the highway between Pagachao Road and the C&H Farms.

c. Dredging Disposal. Dredged material amounting to 27,350 cubic yards would be placed offshore and on the narrow beach to provide fill for the breakwaters and revetted moles. The remaining amount of dredged material ranging from 67,250 cubic yards to 119,350 cubic yards depending upon whether the berthing areas are dredged simultaneously with the Federal project, would be placed near the U.S. Army Corps of Engineers Namo River project site.

d. Aids to Navigation

The proposed plan at the Nimitz Beach site was coordinated with the U.S. Coast Guard. They recommended that navigation aids be placed on the southern tip of the main breakwater and that a range system be established to mark the channel centerline. These unlighted aids would be installed and maintained by the U.S. Coast Guard. The initial cost is estimated at $80,000 with an annual maintenance cost of approximately $500.



AGAT HARBOR GUAM

POSSIBLE BERTHING AND SHORESIDE PLAN

U.S. ARMY ENGINEER DISTRICT, HONOLULU

FIGURE 13

e. Drainage Modification

With the implementation of Plan 5, the Government of Guam will be responsible for rerouting the existing 36" drainage culvert to some other preferred location. (See Figure 8 for location of existing pipe.)

f. Apportionment of Costs

Based on April 1981 price levels, the apportioned costs for the selected plan is shown below:

Apportionment of Costs for the Selected Plan
(April 1981 Price Levels)

Total Project First Cost	$3,976,000
Corps of Engineers First Cost Share1/	2,000,000
U.S. Coast Guard First Cost Share2/	80,000
Non-Federal First Cost Share3/	1,896,000

1/ All future maintenance dredging and breakwater repairs are federal costs.
2/ All future maintenance for aids to navigation is federal costs.
3/ Does not include the costs of self-liquidating facilities (berthing facilities, dredging of berthing areas, utilities, and other on-shore facilities).

f. Plans and Specifications

In the event the Government of Guam wishes to initiate construction of the selected plan at the Nimitz Beach site, plans and specifications will be prepared. During this stage the following will be incorporated:

(1) additional subsurface (borings) investigations

(2) updated site bathymetric and topographic surveys

(3) final design and coordination

(4) construction drawings and plans

(5) real estate permits and rights-of-way

(6) local assurances in accordance with Section 211 of the River and Harbor Act of 1970

(7) compliance documents and certificates as necessary

(8) suitable dredged material disposal site

3. PLAN IMPLEMENTATION

a. Construction Schedule

The work schedule for preparation of plans and specifications is approximately 6 months. Construction would be accomplished by contract and will require approximately 18 months to complete.

b. Operation and Maintenance

The Government of Guam will operate the harbor and maintain the berthing and appurtenant facilities. Maintenance of the general navigation features which include the entrance channel, turning basin, breakwater, and aids to navigation will be accomplished by the Federal Government at Federal expense. The average annual Federal maintenance cost, including aids to navigation is estimated to be $16,600.

c. Environmental Management Considerations

The following environmental management measures are provided as recommendations to the local sponsor to reduce or minimize potential problems relating to water quality degradation and conflicts between boaters and swimmers and divers. These are discussed in detail in Appendices C and D.

i. Minimize boat sewage pollution by requiring compliance with U.S. Coast Guard and Guam Environmental Protection Agency regulations on Marine Sanitation Devices and by providing shoreside restrooms, preferably with pump-out facilities.

ii. Minimize petrochemical pollution by encouraging the use of unleaded marine fuels, the use of oil filtration devices on boat bilge pumps or the use of commercial oil-absorbant pads in the bilges, the use of non-polluting detergents for boat washing, provision by the local sponsor of a dockside waste-oil collection facility, and by extension of the Guam Oil Spill Contingency Plan to the operational harbor.

iii. Minimize the discharge of heavy metals into marina waters from antifouling paints by encouraging boaters not to paint non-boat surfaces and by collecting and removing paint particles from boat scrapings and painting areas.

iv. Minimize boater-swimmer conflicts by clearly marking boat channels through the reef flat, regulating vessel speed through both the entrance channel and Nimitz Channel, establishing a warning system to make individual boaters and swimmers and divers aware of each other's presence in channel areas, and by provision of a life guard to monitor activity within the channel areas.

d. Local Assurances

The Government of Guam must also execute a formal local cooperation agreement prior to construction of any improvements (in accordance with Section 221 of the River and Harbor Act of 1970). A letter supporting the recommended plan has been received from the Government of Guam, and is included in Appendix B, Section VII.

e. Compliance Documents and Certificates

All necessary Federal and local certifications for consistency and conformance to environmental (water quality, discharge, etc.) and land-use regulations must be completed prior to any construction.

f. Federal Funding

The preparation of plans and specifications and the initiation of construction must be approved and authorized by the Chief of Engineers. The U.S. Army Corps of Engineers' priority for funding of construction under the Small Projects authority is based on the needs and merit of similar projects nation-wide and the availability of funds.

V. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The purposes of this report were to identify light-draft navigational users, problems, and needs. Considering the projected needs, local financial constraints and economic priorities of the Territory of Guam, it was felt that the development of a small boat harbor oriented around subsistence and commercial fishing, charter boat operations, and recreational boating would satisfy the immediate socio-economic needs. After extensive discussions with Government of Guam agencies a 150-boat harbor was determined to best satisfy their needs, priorities and constraints.

Recommendations

The District Engineer recommends that plan 5 for Agat Harbor at Nimitz Beach be approved subject to the condition that local interests provide the following assurances:

a. Provide without cost to the United States all lands, easements, and rights-of-way required for construction of the project.

b. Provide without cost to the United States an area suitable to the Chief of Engineers for the disposal of spoils and if necessary, retaining dikes, bulkheads, and embankments or the cost of such work.

c. Provide and maintain without cost to the United States the necessary pier and docking facilities, as well as all appropriate onshore structures, access roadways, utilities, parking areas, restrooms, and launching facilities to insure a complete and adequate project. These facilities must be open to all on equal terms.

d. Accomplish without cost to the United States the necessary alterations and relocations of all utilities as necessary for project purposes.

e. Hold and save the United States free from claims for damages due to the construction work and subsequent maintenance of the project, excluding damages due to fault or negligence of the United States or its contractor.

f. Provide a cash contribution based on a percentage to be determined by final benefit and cost allocation analysis of the total Corps of Engineers first cost of project before apportionment. In addition, local interest must provide all cost in excess of the $2 million statutory federal limitation under Section 103 of the River and harbor Act of 1960, as amended. Formal assurances in accordance with Section 221 of the River and Harbor Act of 1970 will have to be executed prior to commencement of construction.

The recommended plan provides for a 900-foot-long, 120-foot wide, and 14-foot deep entrance channel; a 150-foot wide, 120-foot long, and 11-foot deep turning basin; a 500-foot long, 75-foot wide, and 9-foot deep main access channel; a 900-foot long main breakwater with a +13-foot crest elevation; a 50-foot long stub breakwater with a +10-foot crest elevation, and a 480-foot long revetted mole with a crest elevation of +10 feet.

VI. ENVIRONMENTAL STATEMENT

FINAL ENVIRONMENT IMPACT STATEMENT

AGAT SMALL BOAT HARBOR
AT NIMITZ BEACH
TERRITORY OF GUAM

The responsible lead agency is the U.S. Army Corps of Engineers, Honolulu District.

The responsible cooperating agency is the U.S. Fish and Wildlife Service, Hawaii Region.

ABSTRACT

Studies for the improvement of commercial and recreational light-draft boating facilities at Agat, Guam were conducted by the U.S. Army Corps of Engineers in cooperation with the Guam Department of Public Works under the authority of Section 107 of the River and Harbor Act of 1960 (Public Law 84-645). Based on an assessment of public needs and concerns, four alternative plans of improvement, all north of Nimitz Beach Park, were developed for detailed investigation. Plans 1, 2 and 3 are for 150 berths and Plan 4 is for 80 berths. Plans 1, 3 and 4 provide for offshore harbors with access via revetted moles. Plan 2 is primarily an onshore harbor. The entrance channel for Plans 3 and 4 exits about 1,600 feet north of Nimitz Channel; the entrance channel for Plans 1 and 2 connects to the natural Nimitz Channel. These plans are described in the Main Report and Paragraph 14 of the EIS. A fifth plan (Plan 5) was not described in the Draft EIS, but was presented at the public meeting. It is the selected plan. Plan 5 consists of an onshore harbor for 150 berths with a 900-foot long, 120-foot wide entrance channel connected to Nimitz Channel. The harbor, located about 800 feet north of Nimitz Beach Park, would include a 930-foot long main breakwater and a 820-foot long interior revetment bordered on the north by a 300-foot long revetted mole and on the south by a 180-foot long revetted mole and a 50-foot long stub breakwater. All plans enhance local business activity and community growth. Plans 3, 4 and 5 have conflicts of water use with Nimitz Beach Park. None of the plans affect Taleyfac Spanish Bridge National Register site. All plans destroy, modify and create some marine reef habitat with Plan 5 exhibiting the least adverse effects on the marine environment. Plan 5 is designated the National Economic Development (NED) Plan and also the Least Environmentally-Damaging Plan.

Further technical information concerning the statement may be obtained from:

Dr. James E. Maragos
US Army Engineer District, Honolulu
Building 230
Fort Shafter, Hawaii 96858
Telephone (808) 438-2263/2264

NOTE:. Information, displays, maps, etc., discussed in the main report and appendices are incorporated by reference in the FEIS.

ENVIRONMENTAL IMPACT STATEMENT

AGAT SMALL BOAT HARBOR
AT NIMITZ BEACH
TERRITORY OF GUAM

TABLE OF CONTENTS

TABLE OF CONTENTS (contd)

LIST OF TABLES

LIST OF PREPARERS

The following people were primarily responsible for preparing this Environmental Impact Statement:

Name	Discipline/Expertise	Experience	Role in Preparing EIS
David G. Sox	Social Environmental Specialist/Historical & Cultural Geography	BA, MA, Geography 6 yrs research 6 yrs EIS studies with the US Army Corps of Engineers	Social and Cultural Resource Assessment; EIS Preparer.
William Lennan	Zoology	BA, Zoology, BS, Political Science 1 yr with US Fish & Wildlife Service, HI 2 yrs Post graduate studies in Zoology	Fish and Wildlife Assessment
James E. Maragos	Supervisory Environmental Biologist/ Marine Ecology	BS, Zoology, PhD, Oceanography 2 yrs Post-Doctoral Research; 8 yrs Environmental Consultant 6 yrs EIS studies with the US Army Corps of Engineers	EIS Coordinator
Timothy Young	Hydraulic Engineer/ Civil Engineering & Water Resources Planning	BS, Civil Engineering 3 yrs Civil/Hydraulic Engineering with the US Army Corps of Engineers	Study Manager

SUMMARY

1. Major Conclusions and Findings. All five alternative plans meet the primary planning objectives of contributing to the improvement of commerical and recreational boating facilities for Agat, Guam for the 1985-2035 period of analysis as well as improving socioeconomic opportunities for the people of Guam. On the basis of having the highest net annual benefits of $95,000, Plan 5 was designated the NED Plan. Plan 5 also has the lowest non-federal cost. All plans will require some off-site parking and may generate occasional traffic congestion, but parking inconvenience should be minimized with Plans 2 and 5. Based on minimizing destruction of rich coral and reef-flat marine habitat, creating new deep (-9 to -14 feet, MLLW) habitat, and providing excellent harbor flushing, Plan 5 was designated as the least environmentally-damaging plan. Plan 5's use of Nimitz Channel for an entrance to the harbor was also determined to be most acceptable due to a favorable wave climate there.

2. All plans require the discharge of fill material for breakwater and revetted mole structures. A "Section 404" evaluation (see Appendix A) finds that materials to be used in offshore construction are suitable for discharge into navigable waters. None of the alternatives affect wetland areas, wildlife refuges, federal sanctuaries, or groundwater resources. All five alternatives would occur within the base floodplain limits. Based on an "Executive Order 11988" evaluation (see Appendix A), there is no practicable alternative to locating a harbor in the base floodplain and any harbor will probably stimulate commercial and residential development in the base floodplain, although residential development is already planned for that area. None of the alternative plans is expected to have any effects on nearby Taleyfac Spanish Bridge which is listed on the National Register of Historic Places. All plans are consistent with the Guam Coastal Management Program policies and objectives, except that Plans 1 and 2 achieve better consistency regarding "recreation areas" and Plan 2 and 5 better consistency regarding "visual quality."

3. Areas of Controversy. There have been no clear-cut controversies associated with the present study. The decision to select a plan which utilizes Nimitz Channel for boating may be perceived as controversial by those who regularly use the deeper portions of the channel for diving and recreational swimming. A paragraph on suggested environmental management considerations relative to water quality control and boater-swimmer conflict during operations and maintenance of the project is found in the Main Report.

4. Unresolved Issues. The U.S. Fish and Wildlife Service recommended Plan 2 which does not coincide with the Corps' recommendation for the selected plan. In addition, the Service was concerned about the amount of needed offshore parking on impact to water recreation activities.

5. Relationship to Environmental Requirements. A brief outline of the relationship of the alternative plans to environmental laws and regulations affecting this study are presented in Table EIS-I.

TABLE EIS - I RELATIONSHIP OF PLANS TO ENVIRONMENTAL REQUIREMENTS PROTECTION STATUTES AND OTHER ENVIRONMENTAL REQUIREMENTS

Federal Statutes	Plan 1	Plan 2	Plan 3	Plan 4	Plan 5
Archeological and Historic Preservation Act, as amended, 16 U.S.C. 469 et seq.	PC	PC	PC	PC	
Clean Air Act, as amended, 42 U.S.C. 7401, et seq.	Full	Full	Full	Full	Full
Clean Water Act, as amended (Federal Water Pollution Control Act) 33 U.S.C. 1251 et seq.					
Section 404 - Dredged or fill materials	PC	PC	PC	PC	PC
Section 402 - NDPES Permit	NA	NA	NA	NA	NA
Coastal Zone Management Act, as amended, 16 U.S.C. 1451 et seq.	PC	PC	PC	PC	PC
Endangered Species Act, as amended, 16 U.S.C. 1531 et seq.	Full	Full	Full	Full	Full
Estuary Protection Act, 16 U.S.C. 1221 et seq.	NA	NA	NA	NA	NA
Federal Water Project Recreation Act, as amended, 16 U.S.C. 460-1(12) et seq.	Full	Full	PC	PC	
Fish and Wildlife Coordination Act, as amended, U.S.C. 661 et seq.	Full	Full	Full	Full	Full
Land and Water Conservation Fund Act, as amended, 16 U.S.C. 4601-4601-11 et seq.	Full	Full	Full	Full	Full
Marine Protection, Research and Sanctuaries Act, 22 U.S.C. 1401 et seq.	NA	NA	NA	NA	NA
National Historic Preservation Act, as amended, 16 U.S.C. 470a et seq.	PC	PC	PC	PC	
National Environment Policy Act, as amended, 42 U.S.C. 4321 et seq.	Full	Full	Full	Full	Full
Rivers and Harbors Act, 33 U.S.C. 401 et seq.	NA	NA	NA	NA	NA
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001 et seq.	NA	NA	NA	NA	NA
Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271 et seq.	NA	NA	NA	NA	NA
Guam, Virgin Islands, American Samoa Land Jurisdiction, 88 stat 1210.	Full	Full	Full	Full	Full
Executive Orders, Memoranda, etc.					
Floodplain Management (E.O. 11988)	Full	Full	Full	Full	Full
Protection of Wetlands (E.O. 11990)	NA	NA	NA	NA	NA
Analysis of Impacts on Prime and Unique Farmlands (CEQ Memorandum, 30 Aug 76)	NA	NA	NA	NA	NA
Protection and Enhancement of the Cultural Environment (E.O. 11593)	Full	Full	Full	Full	Full
President's Water Policy Initiatives for Water Conservation	Full	Full	Full	Full	Full
State and Local Policies					
Guam Coastal Management Program (Guam E.O. 78-37)	PC	PC	PC	PC	PC
Guam Water Quality Regulations	PC	PC	PC	PC	PC
Land Use Plans					
Guam Land Use Districts (Guam E.O. 78-23)	Full	Full	Full	Full	Full
Guam Flood Hazard Areas (Guam E.O. 78-20)	Full	Full	Full	Full	Full
Guam Protection of Wetlands (Guam E.O. 78-21)	NA	NA	NA	NA	NA
Required Federal Entitlements					
None					

NOTES: The compliance categories used in this table were assigned based on the following definitions:

1. Full = Full compliance. All requirements of the statute, E.O., or other policy and related regulations have been met.
2. PC = Partial compliance. Some requirements of the statute, E.O., or other policy and related regulations remain to be met.
3. NC = Noncompliance. None of the requirements of the statute, E.O., or other policy and related regulations have been met.
4. NA = Not applicable. Statute, E.O., or other policy not applicable.

NEED FOR AND OBJECTIVES OF THE ACTION

6. Study Authority. Studies for the improvement of commercial and recreational boating for the Agat, Guam area are being conducted under the authority of Section 107 of the River and Harbor Act of 1960 (Public Law 84-645).

7. Public Concerns. This study was originally started in April 1973 when the Governor of the Territory of Guam requested the Corps to study the feasibility and desirability of constructing a small boat harbor for recreational boating in the Agat area. Public interest during that early period focused on the additional benefits that a harbor would have on commercial fishing, scenic boat tours, and boat repair and manufacturing in the Agat area. One local boat manufacturer had begun in the early 1960's to develop a private marina in the Agat area. The Guam Legislature passed a resolution in October 1974 to support an Agat Marina south of Nimitz Beach Park, providing that the Taleyfac Spanish Bridge historic site was preserved. A letter from the Governor of Guam in July 1975 reinitiated the study expressing support for a light-draft vessel marina which would stimulate marina-related businesses. When the decision was made to select Gaan Point as the recommended harbor site in 1977 (see below), 425 Agat residents submitted a petition requesting that the harbor be resited to just north of Nimitz Beach Park, across from Pagachao Subdivision, which is the present site. The Agat citizens then felt that at such a site, marina-related industry would be easier to develop and that a marina there would complement the passive recreational activities practiced at Nimitz Beach Park.

8. The residents of Agat-Santa Rita perceive an Agat Marina as primarily benefitting their local community, but existing and projected demand for wet-storage for boats comes from all over the island, no point which is more than 18 miles from Agat. Most demand will come from population centers north of Agat within 8 miles. By 1990, there is a projected unsatisfied demand for 300 mooring spaces, which more than doubles by the year 2000. Sixty percent of all boats filling a harbor are expected to be used for subsistence fishing. Subsistence fishing for 68 percent of Guam's population (Chamorro and Filipino) is a culturally-defined activity, not necessarily confined to poverty or low income groups. Subsistence activities generate traditional foods which are communally shared and exchanged, often during social gatherings (fiestas, baptisms, marriages and funerals) held in part to repay one's social, political or economic obligations. Harbor facilities are needed to improve the effectiveness of the subsistence fleet and to encourage the development of commercial fishing.

9. Planning Objectives. The planning based on problems and opportunities expressed by the concerned public and governmental officials are to:

a. Contribute to the improvement of commercial and recreational boating facilities for Agat, Guam for the 1985-2035 period of analysis;

b. Improve socioeconomic opportunities for the people of Guam; and

c. Minimize destruction of reef-flat marine habitat.

10. In addition to these three planning objectives, technical, economic and environmental and social criteria were developed to guide the evaluation of alternative plans. The economic and social criteria are as follows:

a. Identify, assess, and evaluate all forms of fish and wildlife which may be affected.

b. Limit surface areas of offshore harbor structures to water-dependent uses in order to minimize the loss of natural resources and to minimize dredging and filling of live coral reef areas.

c. Avoid severe dislocation and adverse social, health, safety impacts.

d. Minimize potential conflicts caused by harbor siting and design between boating and beach use, recreational swimming and diving, picnicking, and cultural resources.

e. Evaluate all potential environmental and social effects on an equal basis with the technical and economic considerations.

ALTERNATIVES

11. Plans Eliminated from Further Study. During earlier detailed project studies, six alternative harbor sites were assessed and evaluated based in part on a public workshop held in July 1977. Harbor sites at Rizal Beach, Namo River, Gaan Point, Nimitz Beach and Taleyfac Bay were assessed in relation to harbor construction and navigation factors, effects on marine, terrestrial, and historic resources, land use, and in relation to social concerns and public views. A detailed discussion of this assessment may be found in the Introduction to the Main Report. The sites at Rizal Beach, Bangi Point, and Taleyfac Bay received no public support and would be costly to develop. The Namo site would have been adversely impacted by the Corps flood control project and was opposed by the U.S. Navy. The Nimitz Beach site at the time of the public workshop received little public support in comparison to a site at Gaan Point which was central to Agat village and appeared to have the least adverse environmental effect. The Gaan Point was selected by the District Engineer in conjunction with Governor of Guam. Six alternative harbor plans and a nonstructural alternative were considered in detailed planning. Six structural plans north and south of Gaan Point were presented in the Draft Environmental Impact Statement and Draft Detailed Project Report which was issued for public comment in November 1977. After a 125-boat harbor was recommended for selection, and Congress authorized the National Park Service to establish the War in the Pacific National Historic Park along Agat Beach in 1978, the National Park Service took the position that no harbor was acceptable within

the Park. At a public information meeting held 20 July 1979 in Agat by the Advisory Council on Historic Preservation in accordance with Section 106 (National Historic Preservation Act of 1966) procedures, the Corps, Advisory Council and Park Service mutually agreed that Gaan Point was no longer a feasible harbor site. Statements made by local officials and residents supported the Corps suggestion that Nimitz Beach Park be considered for additional detailed harbor planning.

12. No nonstructural alternatives were considered during detailed planning for a harbor at Nimitz Beach. Five alternative harbor designs were presented at the public workshop held on 23 July 1980. These resemble the current four plans except that one earlier onshore harbor alternative included an entrance channel connected to Nimitz Channel. Also, there was an additional offshore plan for 80 boats which was designed for expansion to 150 boats in the future. Both harbor designs were connected to Nimitz Channel. Due to the support expressed at the 23 July workshop for harbor alternatives which exited north of Nimitz Channel, the offshore 80-boat plan was eliminated from further study and the onshore plan was modified so that its entrance channel exited 1600 feet north of Nimitz Channel. The latter plan was subsequently reinstated for consideration due to low cost, a favorable wave climate, and relatively fewer environmental impacts.

13. Without Condition. Without Federal construction of a harbor at Agat, it is unlikely that the local Government of Guam would be able to independently fund and construct a small boat harbor. Continued informal use of Nimitz Beach Park and Nimitz Channel as a launch area for small, trailered boats would probably continue with the Government of Guam possibly constructing in the future a formal boat launching ramp adjacent to the park. As the Pagachao Subdivision became fully occupied, it is also likely that privately-owned boats could be moored offshore or along the beach north of Nimitz Beach Park, similar to reef-flat areas north of Gaan Point. Unmet needs for wet-storage facilities at Agat could stimulate public pressure to construct a public small boat facility within Apra Harbor or at Merizo in Southern Guam. Lack of facilities may also depress participation in culturally-based subsistence fishing activities among the predominant Chamorro population.

14. Plans Considered in Detail. All five plans are described in detail with figures in the Main Report. They range from 800 to 1200 feet north of Nimitz Beach Park. All of the five plans incorporate space for a two-lane launch ramp, but car/trailer parking was limited to 15 stalls for the 80-boat harbor and 20 stalls for the four 150-boat harbors. Vehicular access to the offshore harbor alternatives, Plans 1, 3, and 4, is considered necessary; however, in consideration of U.S. Fish and Wildlife Service concerns, car parking stalls were limited to approximately 50 percent of the number of berths. This includes the onshore Plans 2 and 5. All of the plans also incorporate a limited amount of space for a comfort station, fuel dock, and ice house in the immediate harbor area. Approximately 3.6 acres of fast land, designated within a 150-foot side lineal buffer zone landward of Highway 2 and between Pagachao Road and the C&H Chicken Farm are available to accommodate additional parking areas and harbor/maritime-related facilities. These facilities, including the launch ramp and other dock-side facilities would be developed by local interests. A site within the Namo River Flood Control project construction area will be used to stockpile excess dredged material until it could be removed for fill or construction material by local interests.

15. <u>Plan 1 - 150-Boat Capacity (see Figure 4)</u>. This plan provided for construction of an L-shaped, 1160-foot long revetted mole +10 to +13 feet (MLLW) in crest elevation; a detached, 500-foot long main breakwater +13 feet in crest elevation; a 300-foot long detached breakwater +9 feet in crest elevation; and a 400-foot long revetted accessway with two circulation culverts passing through it. Breakwaters are detached from the revetted mole to facilitate water circulation through the harbor. Offshore structures would require approximately 33,700 cubic yards (CY) of quarried rock and 30,800 CY of coral fill, covering 4.9 acres of area. The revetted mole would accommodate 75 car stalls and 20 car/trailer stalls. The dredging of a 940-foot long entrance channel, a turning basin and an access channel of -14, -11, and -9 feet, respectively, would total 5.3 acres of area, generating about 51,200 CY of coralline dredged material. The entrance channel is about 1,600 feet north of Nimitz Channel. Dredging of the 3.3 acre berthing area, which is a local responsibility, would generate an additional 52,300 cubic yards of coral fill material. The completed harbor would inclose a total water area of about 13.9 acres. Total project first cost is $4,487,000 cost-shared between the Federal and Territorial Governments at $2,080,000 federal funds and $2,407,000 local funds.

16. <u>Plan 2 - 150-Boat Capacity (see Figure 5)</u>. This plan provides for construction of an L-shaped, 780-foot long interior revetment which is +10 feet in height and contiguous to the shoreline together with two stub breakwaters, one 100 feet in length and +8 feet in crest elevation and the other 80 feet in length and +10 feet in crest elevation. A detached, 800-foot long main breakwater +13 feet in crest elevation leaves the turning basin and access channel open to longshore currents to improve harbor circulation and flushing. Offshore structures will require approximately 24,700 CY of quarried rock and 38,800 CY of coral fill, covering 2.4 acres of area. The revetted mole will accommodate 75 car stalls and 20 car/trailer stalls. The dredging of a 1600-foot long entrance channel, a turning basin and an access channel of -14, -11, and -9 feet, respectively, will total 8.2 acres of area, generating about 123,400 CY of coralline dredged material. The entrance channel is about 1600 feet north of Nimitz Channel. Dredging of the 3.2 acre berthing area, which is a local responsibility, would generate an additional 52,600 cubic yards of coral fill material. The completed harbor would inclose a total water area of about 15.4 acres. Total project first cost is $4,317,000 cost-shared at $2,080,000 in federal funds and $2,237,000 in local funds.

17. <u>Plan 3 - 150-Boat Capacity (see Figure 6)</u>. This plan provides for construction of an offshore, L-shaped, 1400-foot long revetted mole with a crest elevation ranging from +10 to +13 feet; an attached, 460-foot long breakwater with a crest elevation of +13 feet; and a 200-foot long revetted accessway with one circulation culvert. Offshore structures will require approximately 31,100 CY of quarried rock and 31,000 CY of coral fill, covering 4.2 acres of area. The revetted mole will accommodate 75 car stalls and 20 car/trailer stalls. The dredging of a 550-foot long entrance channel which is connected to Nimitz Channel, a turning basin and an access channel of -14, -11, and -9 feet, respectively, will total 5.8 acres in area and will generate about 61,900 CY of coralline dredged material. Dredging of the 3.3 acre berthing area, which is a local responsibility, would generate an additional 48,500 cubic yards of coral fill material. The completed harbor would inclose a total water area of about 12.8 acres. Total project first cost is $4,183,000 cost-shared at $2,080,000 in federal funds and $2,103,000 in local funds.

18. Plan 4 - 80-Boat Capacity (see Figure 7). This plan provides for construction of an offshore, L-shaped, 900-foot long revetted mole with a crest elevation of +10 feet; a detached, L-shaped main breakwater which is 1000 feet in length with a crest elevation of +13 feet; and a 400-foot long, revetted accessway with two circulation culverts. Offshore structures will require approximately 33,700 CY of quarried rock and 21,700 CY of coral fill, covering 4.0 acres in area. The revetted mole will accommodate 40 car stalls and 15 car/trailer stalls. The dredging of a 620-foot long entrance channel which is connected to Nimitz Channel, a turning basin and an access channel of -14, -11, and -9 feet, respectively, will total 4.3 acres in area and generate 94,600 CY of coralline dredged material. Dredging of the 1.8 acre berthing area, which is a local responsibility, would generate an additional 26,700 cubic yards of coral fill material. The completed harbor would inclose a total water area of about 11.1 acres. Total project first cost is $4,516,000 cost-shared at $2,080,000 in federal funds and $2,436,000 in local funds.

19. Plan 5 - 150-Boat Capacity (See Figure 8). Plan 5 is the National Economic Development (NED) plan, the least environmentally-damaging plan, and the selected plan. This plan provides for construction of an L-shaped, 820-foot long interior revetment contiguous to the shoreline, with a crest elevation of +8 feet (MLLW) bounded on the north by a 300-foot long revetted mole and on the south by a 180-foot long revetted mole and a 50-foot long stub breakwater. The revetted moles and breakwater are 10 feet high. A two-lane boat ramp lies adjacent to the stub breakwater. A detached, 900-foot long main breakwater which is +13 feet in crest elevation leaves the turning basin, access channel and berthing area open to longshore currents to improve harbor circulation and flushing. Offshore and coastal structures will require approximately 25,200 cubic yards of quarried rock and 27,350 cubic yards of coral fill, covering 2.9 acres of area. Most of the shoreside structures will be constructed on fastland above the mean lower low water level. The interior revetment will accommodate 75 car stalls and 20 car trailer stalls as well as a comfort station, fueling dock and ice house. The dredging of a 930-foot long and -14 feet deep entrance channel that connects to Nimitz Channel and a turning basin and access channel totalling 620 feet in length and -11 and -9 feet in depth, respectively, will total about 7.4 acres of area and generate 94,600 cubic yards of dredged material. Dredging of the 3.1 acre berthing area, which is a local responsibility, will generate an additional 52,100 cubic yards of coral fill material. The completed harbor will inclose an area of about 15 acres. Total project first cost (not including the berthing area) is $3,976,000 cost shared at $2,080,000 in federal funds and $1,896,000 is local funds.

20. Comparative Impacts of the Alternatives. Comparative impact of the five plans on the "Significant Resources" are presented in Table EIS-II. Additional comparison of alternative plans is contained in the Summary of Comparison of Alternative Plans and Systems of Accounts (Table 16) in the Main Report.

AFFECTED ENVIRONMENT

21. Environmental Conditions. The harbor study area at Nimitz Beach Park is on the western shoreline of the Island of Guam approximately 11 miles from the capital city of Agana and six miles south of Apra Harbor. Agana is the site of the only publically-owned small boat harbor on Guam. Nimitz Beach Park is on a

TABLE EIS-II. COMPARATIVE IMPACTS OF ALTERNATIVES ON SIGNIFICANT RESOURCES

BASE CONDITION AND ALTERNATIVES	BUSINESS ACTIVITY/ COMMUNITY GROWTH	SEASHORE PARKS	TALEYFAC SPANISH BRIDGE HISTORIC SITE	REEF RESOURCES	PLAN ECONOMICS
Base Conditions	Available: 2 Commercial fishing boats. Informal semi-subsistence fishing. An under-developed Pagachao Subdivision. 1 maritime firm in Agat.	Available: Nimitz Beach Park nearby; Guam National/ Territorial Seashore.	Available: Site on National Register of Historic Places (NRHP) 1,600 feet south of alternative harbor site area.	Available: 67 acres of reef-flat seagrass and reef front/channel habitat with 90-100% coral coverage in outer channel and on reef front.	Not Applicable.
Without Condition (No Action)	Available: See Base Condition. Impact: No change in commercial fishing or informal semi-subsistence economy. Slow development of Pagachao subdivision.	Available: Two beach parks. Impacts: Continued informal use of Nimitz Channel as boat launching channel. Possible conflict w/park.	Available: Site on NRHP Impact: None.	Available: See Base Condition. Impact: No change.	Not Applicable
Plan 1	Available: See Base Condition. Impact: formal semi-subsistence commercial fishing industry with 210 boats and 15 charter boats. Stimulus to development of Pagachao and maritime commerce and industry.	Available: Two beach parks. Impact: No conflict of use w/Nimitz Beach Park. Enhances recreational opportunities within National/Terr. Seashore area.	Available: Site on NRHP Impact: no effect.	Available: See Base Condition. Impact: Destroys: 4.9 acres; Deepens: 5.3 acres; Creates: 0.5 acres	Average Annual Cost: $328,000 Annual Benefit: $359,000 B/C Ratio: 1.09
Plan 2	Available: See Base Condition. Impact: Same as Plan 1 with 210 semi-subsistence/commercial boats and 15 charter boats. Stimulus to development of Pagachao and maritime commerce/industry in Agat-Santa Rita area.	Available: Two beach parks. Impact: No conflict of use w/Nimitz Beach Park. Enhances recreational opportunities within National/Terr. Seashore area.	Available: Site on NRHP Impact: no effect.	Available: See Base Conditon. Impact: Destroys: 2.4 acres; Deepens: 8.2 acres; Creates: 0.4 acres	Average Annual Cost: $317,000 Annual Benefit: $359,000 B/C Ratio: 1.13
Plan 3	Available: See Base Condition. Impact: Same as Plan 1 with 210 semi-subsistence/commercial boats and 15 charter boats. Similar social and economic effects as Plan 1.	Available: Two beach parks. Impacts: Conflict of use in Nimitz Channel w/Nimitz Beach Park. Enhances recreational opportunities within National/Terr. Seashore area.	Available: Site on NRHP Impact: no effect.	Available: See Base Condition. Impact: Destroys: 4.2 acres; Deepens: 5.8 acres; Creates: 0.4 acres	Average Annual Cost: $303,000 Annual Benefit: $359,000 B/C Ratio: 1.18
Plan 4	Available: See Base Condition. Impacts: Same as Plan 1 except about 168 semi-subsistence/ commercial boats and 8 charter boats. Similar social and economic effects as Plan 1.	Available: Two beach parks. Impacts: Conflict of use in Nimitz Channel with Nimitz Beach Park. Enhances recreational opportunities within Nat'l/Terr. Seashore area.	Available: Site on NRHP Impact: no effect.	Available: See Base Condition. Impact: Destroys: 4.0 acres; Deepens: 4.3 acres; Creates: 0.5 acres	Average Annual Cost: $330,000 Annual Benefit: $262,000 B/C Ratio: 0.79
Plan 5	Available: See Base Condition. Impact: Same as Plan 1.	Available: Two beach parks. Impacts: Same as Plan 1.	Available: Site on NRHP. Impact: No effect.	Available: See Base Condition. Impact: Destroys: 2.2 acres; Deepens: 7.4 acres; Creates: 0.4 acres	Average Annual Cost: $299,000 Annual Benefit: $394,000 B/C Ratio: 1.32

NOTES: 1. Base Condition: 1985
2. Period of Analyses: 50 Years

narrow coastal plain which rises to an 800- to 1000-foot mountain range less than a mile east of the shoreline. Urban land uses make up fewer than 5 percent of Agat District grading from the villages of Agat-Santa Rita in the north to scattered residences and small farms to the east and southeast of Nimitz Beach. The park and the narrow fringe of land between Highway 2 and the beach is controlled by the U.S. Department of the Interior and is designated conservation for open space and recreational uses. Lands east of Highway 2 are designated low density Urban Residential and are in private and Government of Guam ownership; the latter principally comprising the large Pagachao Subdivision which is planned for approximately 250 residences.

22. Natural vegetation at the harbor site mainly consists of palm trees lining Marine Drive and iron wood and palms in the wooded Nimitz Beach Park. Seaward of a 35- to 65-foot wide strip of mowed grass beside the highway is a 5- to 10-foot wide strip of Beach Morning Glory, about 15 feet above the beach line. Commonly found endemic and migratory species of sea birds and forest birds feed along the shoreline area and on the emerged coral reef, including the Eurasian Tree Sparrow, Pacific Golden Plover, Wandering Tattler and the Black Drongo.

23. Agat and Taleyfac Bay are fringed by a continuous coral reef platform which ranges between 1800 to 2700 feet offshore at the harbor site area. Marine life on the reef-flat platform is highlighted by dense seagrass beds which stretch northward from Nimitz Channel to Bangi Point and nearly 100 percent live coral coverage near the mouth of Nimitz Channel and along the reef front north of the channel. Recreational and subsistence fishermen are often observed on the reef-flat fishing for common reef fishes and possibly clamming. No endangered or threatened species are reported to feed or reproduce in the study area.

24. The beaches along Agat-Taleyfac Bay are the second most popular beach destination areas in Guam among local residents. The protected waters and modest park facilities of Nimitz Beach Park are a particular favorite spot for picnickers. Taleyfac Spanish Bridge dating to the 18th Century lies about 3500 feet south of the study area and is listed on the National Register of Historic Places. Stretching south from nearby Anae Island to beyond Merizo and Cocos Lagoon is the Guam National and Territorial Seashore Park. Yet to be fully developed is the newly established War in the Pacific National Historic Park, the Agat Unit of which stretches from Bangi Point north to Rizal Point, commemorating the retaking of Guam by American troops in 1944. Scattered prehistoric pottery shards have been found in the beach deposits at Nimitz Beach but are not believed to represent discrete archaeological sites.

25. Agat and Santa Rita are primarily suburban communities for workers at the giant U.S. Naval Station at Apra Harbor, other industrial activities at Apra Harbor and the commercial and administrative zone in Central Guam. Population levels have varied between 1960-1980, due primarily to differing levels of military activity. Agat grew in the first decade but has recently declined; Santa Rita, with a 50 percent military component, contracted between 1960-1970 but expanded in the last decade. Islandwide population levels have steadily risen from 67,044 in 1960 to 105,816 in 1980 at an average annual rate of 2.3 percent.

26. Most commercial fishing enterprise operates out of Agana Small Boat Harbor. In the late 1970's, two commercial fishermen reportedly operated out of Agat. Agat-Taleyfac Bay is a popular fishing area for Guam residents, but particularly local people. Most inshore and much offshore fishing is for subsistence purposes, particularly among the Chamorro, and to a lesser extent, Filipino components of the population. Subsistence food production or collection in the modern Guam economy is not needed to sustain an adequate standard of living, but does supplement household nutrition and income. The extra food needed by Chamorro households is given away to relatives and friends during fiestas and life-cycle events (baptisms, marriages, funerals) to repay social, economic, and political debts according to traditional Chamorro custom. Redistribution of food, including sea products, amongst extended family members, friends, and neighbors tends to reinforce traditional values of family loyalty and reciprocity (cohesion) within the local community as well as playing one role in the strengthening of Chamorro ethnic identity.

AFFECTED ENVIRONMENT

27. Significant Resources. Detailed and technical discussions of all significant and comparatively insignificant resources are found in Appendices C and D, dealing with Cultural and Social Resources, and with Natural Resources and Fish and Wildlife Coordination. Information on site geology is found in Appendix E on Geology, Foundations, and Materials. Information on current and littoral processes is found in Appendix E on Design Analysis. A detailed discussion of regional Guam-wide social and economic statistics is found in the Main Report.

28. Section 122 (Public Law 91-611) Resources. Section 122 of the River and Harbor Act of 1970 supplements the provisions of the National Environmental Policy Act of 1969 requiring that all Corps projects take into consideration all possible, but at least 17 possible adverse economic, social and environmental effects relating to any proposed project, the cost of eliminating or minimizing such adverse effects, and the need for flood control, navigation and associated actions. The minimum list of 17 "effects" are desirable regional growth, employment/labor force, local governmental finance, business and industrial activity, displacement of people or farms, desirable community growth, population, public services, public facilities, aesthetic effects, community cohesion, noise, air pollution, water pollution, natural resources, and man-made resources. The most significant of these considerations are Business Activity/Community Growth which incorporates elements of desirable regional growth, employment/labor force, business and industrial activity, desirable community growth, population and community cohesion; Seashore Parks which incorporates aesthetic effects, natural resources and concerns brought out at public workshops; Taleyfac Spanish Bridge Historic Site which is a man-made resource and of aesthetic value; and Reef Resources which includes water pollution, natural resources and aesthetic values.

29. Business Activity/Community Growth. Business activity in the Agat-Santa Rita area is currently oriented to servicing the local residents with food and gasoline. There are three enterprises oriented to outsiders including tourists: Agat Boat Center located north of New Agat near Naval Station which sells, services and repairs boats and marine engines; International Divers

Association in Agat which provides guided snorkeling and SCUBA tours; and one gift shop. An average ten scuba dive tours a month originate out of the Agat Boat Center, according to official estimates. Much of the current orientation of local business men and officials is toward enhancing Agat's role in tourism. At present, Agat is just a way station through which tourists pass from the hotels in Central Guam to the seashore amenities of Merizo and Cocos Lagoon in the south. The development of the War in the Pacific National Park is viewed by local officials as the first step to establishing Agat on the tourist map. A recent study of cultural resources in southwestern Guam by Jennison-Nolan (1979) indicated that many Agat residents believed that a boat harbor was an absolute necessity for their community to be provided the opportunity to compete in the tourist market.

30. There is no large-scale (vessels exceeding 40 feet in length) commercial fishing in Guam. Small-boat commercial fishing enterprise operates primarily out of Agana Marina (Small Boat Harbor), the Guam Aquatic and Wildlife Resources Division did report an average of two commercial fishing trips out of Agat in the 1977-78 period. Based on a Guam Department of Labor special survey of households islandwide in 1981, 35 percent of the 48 boat owners were Chamorro (see Appendix F). Of the Chamorro and Filipino boat owners, fully 71 percent were subsistence fishermen. Indepth interviews of 27 subsistence fishermen (70 percent Chamorro and 22 percent Filipino) indicate that all shared their catch with family and friends. Fifty-two percent sold no fish. Eighty percent of the Chamorro/Filipino subsistence fishermen sold less than 25 percent of their catch. It is speculated that many of the 236 average weekly boaters, 787 fishermen and some of the 357 divers observed in the Agat area in March 1980 by the Guam Department of Parks and Recreation were engaged in subsistence fishing or collecting activities. About 56 percent of the island's population were classified as Chamorro in 1970 and 48 percent in 1978. Yet in the Agat-Santa Rita area alone, Chamorros (those born in Guam) in 1970 comprised 74.4 percent of the population and Filipinos (those born in the Philippines) accounted for another 16.1 percent, excluding 53 percent of Santa Rita's district population who resided on the U.S. Naval Base. In addition to boat owners, a 1977 Government of Guam survey of 931 households islandwide found that 51 percent of southern Guam (including Agat-Santa Rita) households customarily went fishing (inshore or offshore), but only 29 percent of northern Guam households went fishing.

31. The population of Agat-Santa Rita Districts has varied from 15,233 in 1960, to 12,417 in 1970 to 14,387 in 1980. These variations are due to the large military component of Santa Rita's population which, assuming for statistical purposes it to be all white, comprised 40 to 50 percent of the district population in 1970 (see Table C-2). In the last decade (1970-1980), Agat District declined by an average annual rate of -0.8 percent from 4,308 to 3,979, but Santa Rita District expanded by a rate of +2.5 percent per year from 8,109 to 10,408. Excluding military, it is believed most growth in Santa Rita occurred in the new Hyundai subdivision. The Guam Bureau of Planning has projected non-military population increases by community and existing and planned subdivisions to the year 2000. As explained in Appendix C, these estimates are probably over optimistic. Guam planners project comparatively little growth for Santa Rita District--an increase of almost 60 percent. In contrast Agat District is projected to grow by almost 125 percent (1975-2000). Over half that growth is expected to occur outside of Agat village. The most

dramatic change will occur in the new Pagachao planned urban development which in 1979 had no more than a dozen houses in contrast to the 250 residences planned. Pagachao is located immediately eastward and across Highway 2 from the proposed harbor site. Also affecting population growth in Agat will be planned industrial park on a 300-acre parcel contiguous to and southeast of Pagachao subdivision. One possible reason for the lack of growth in the new (1977) Pagachao subdivision may be the rapid increase of residential construction, which soared from about $46,000 for an average Guam two-bedroom concrete home in 1977 to around $100,000 in 1980. Nevertheless, in the long-term, it is anticipated that Agat will be particularly attractive to intra-island migration. Measures of residential mobility taken from the 1970 Census indicate that Agat had among the highest percentages (26 percent) of residents who had lived elsewhere on Guam in 1965 and higher than the island norm (18 percent) at the same time than its real growth did not compare favorably with the other districts (Dededo, Mangilao and Tamuning) which also showed comparatively high mobility of Guam residents. Notably, the Agat percentage of new residents from off-island was less than half the islandwide average.

32. <u>Seashore Parks</u>. There are three seashore parks in the vicinity of the proposed harbor sites. Contiguous to all of the four alternatives is Nimitz Beach Park, which is a Government of Guam-operated Territorial park comprising 23 acres on land controlled by the U.S. Department of Interior. There is approximately 1,798 linear feet of beach within Nimitz Beach Park and another 1,798 linear feet of privately-owned beach extending northward to Chaligan Stream (see Figure 2, Main Report). Nimitz Beach Park is equipped with a few concrete picnic tables but no operating comfort station. It is one of the most popular beach parks on Guam, particularly on weekends, for picnics, social gatherings, camping, swimming, diving (SCUBA and snorkling), reef fishing and shell collecting. The latter two activities occur equally north of Nimitz Channel as well as south of it. Swimmers have been observed throughout Nimitz Channel but they tend to stay close to shore. There are two surf sites to the north and south of Anae Island, which lies about 3,500 feet to the southwest of the Park. The U.S. Fish and Wildlife Service report that on one weekend (a Saturday in March 1980), there were 32 cars parked at the Park at a particular moment. The Guam Department of Parks and Recreation estimates that up to 1,447 Agat-Santa Rita residents visit the Park for picnicking during an average summer week, with two-thirds that number on the weekend. Swimming is by far the most popular activity (1,528 participants) with fishing, diving and boating amongst the other popular activities (see Table C-4, Appendix C). The parking lot hold spaces for 60 vehicles, some of which utilize the space for attending the Agat Cockpit which recently opened in June 1979. Cockfighting and cockfight gambling is legalized in Guam. The cockpit, which is directly across the highway from the northern portion of the Park, is open only on weekends and holidays and averages about 200 visitors. It is a significant resource to consider along with the Park because of potential for traffic congestion and the concentration of existing or potential recreational facilities in one area.

33. Two additional parks are outside the immediate study area, but merit discussion because of their national significance. The War in the Pacific National Historic Park was established by Congress in August 1978 to commemorate the American invasion of Guam in 1944 to retake it from the Japanese. The

Agat unit of the National Historic Park extends along the seashore from Bangi Point north to Rizal Point (Figure 2). A passive overlook is planned by the National Park Service for eventual construction at Bangi Point, however the view orientation is northward toward the Agat Invasion Beach which is listed on the National Register of Historic Places. In 1978, Congress also directed the National Park Service to revise a plan for the possible establishment of a Guam National Seashore which would encompass the area from Ajayan Bay through Cocos Island to Nimitz Beach including Anae Island. The actual boundaries extend northward to a point about 4,000 feet south of Nimitz Beach but do include Anae Island. The same large area is now managed by the Government of Guam as the Guam Territorial Seashore Park which comprises 8,885 acres of fast land and 6,276 acres of submerged land. The objective of the Park is to preserve the natural and historic resources in the area with carefully managed commercial development to encourge and promote tourism. These two parks are principally significant in relation to a harbor at Nimitz Beach because of the potential for using the harbor as a base for private and commercialized waterborne observation of the natural and historic features some of which can be only fully appreciated from a sea view.

34. Taleyfac Spanish Bridge Historic Site. Based on an analysis of two secondary sources, it is likely that the Spanish Governor Mariano Tobias (1771-1774) constructed the bridge across the Taleyfac River as part of a series of bridges built in association with a highway which connected Merizo to Agana. The bridge may have been repaired or reconstructed during the 19th century governorship of Francisco de Villalobos (1831-1837). The Taleyfac Spanish Bridge (Guam Site 66-02-1071) is located about 1,600 feet south of the proposed harbor site area on the seaward side of the Highway 2 bridge crossing Taleyfac River. The old bridge is 36 feet long and 12 feet wide, double-arched and floored with heavy timber covered with earth. A report prepared for the National Park Service suggests that the stone-slab and mortar constructed bridge may symbolizes more than any other structure on the island, Spanish-era construction. Taleyfac Spanish Bridge is listed on the National Register of Historic Places. There are no other sites listed on the Guam or National Register or determined eligible for listing located in the immediate study area. A cultural resources reconnaissance conducted in the harbor site area in 1977 found only scattered pottery sherds in the beach deposits, probably of prehistoric origin. The report states that it is probable that the pottery sherds eroded out of the hills above Nimitz Beach and do not represent discrete sites or features.

35. Reef Resources and Water Quality. The most significant reef environmental resources in the proposed harbor site are the seagrass (Enhalus acoroides) beds which extend from Nimitz Channel northward to Bangi Point with increasing density (Figure 2, Fish and Wildlife 2(b) Report, Appendix D) and the diverse live corals which line the walls of Nimitz Channel and the reef front north of the channel. The seagrass is found principally in the intermediate moat zone of the reefflat platform where the depth averages only -1.4 feet (MLLW). Within 100 feet of the shoreline, the top two inches of surface materials are soft and silty which becomes suspended at the slightest disturbance. The Enhalus beds provides cover for juvenile parrotfishes (Scarus spp.), rabbitfishes (Signus argenteus and S. spinus), gobies (particularly Ptereliotris microlepis (Bleeker)) and several wrasses (Labridae). An intensive survey conducted to determine whether these seagrass beds were

nursery areas of developing fishes was inconclusive. The survey did show that the seagrass beds near Nimitz Channel were not associated with high densities of fish larvae. The intertidal/subtidal seagrass zone on the reef-flat does not appear rich in epibenthic marine life, but has been shown to support relatively abundant populations of the small, edible bivalve Ctena spp., popular collecting shell Conus quercinus, and possible large populations of the larger bivalve Quidnipagus palatum. The latter was observed in only few numbers on the reef-flat but in the thousands littering the nearby beach north of the beach park.

36. Scattered colonies of the coral Pocillopora damicornis and small micro-atolls of Porites lutea are interspersed among the seagrass beds north of Nimitz Beach, but the most spectacular examples of live corals appears along walls of Nimitz Channel. Coral coverage and species diversity increases offshore toward the mouth of Nimitz Channel were nearly 100 percent coverage is found extending also northward along the reef front toward the point where the entrance channel for Plans 1 and 2 would cut through the reef-flat platform. The dominant species on these walls are the blue coral Heliopora coerulea, large micro-atolls of Porites lutea, the brain coral Platygyra rustica and colonies of Pavona clavus. The most conspicuous coral development along the channel walls is the presence of huge horizontal plates of Pachyseris speciosa and Porites (S.) iwayamaensis. A noted Guam marine biologist has described this area as "one of the most diverse, protected leeward reef assemblages on Guam, an excellent area for SCUBA and snorkeling." Similar species assemblages are believed to be found on the vertical walls of a large, rounded depression about 250 feet in diameter and 20 feet deep located north of Nimitz Channel within the reef-flat platform. The entrance channel for Plans 1 and 2 of the boat harbor would pass through this depression. The complex morphology of Nimitz Channel also provides a varied environment for the 46 algal species recorded there including thick growths of the brown alga Dictyota bartayresii along the lower walls of the inner channel and the red alga Dasyphila plumarioides which is found only in well-shaded caves along the southern wall. This species has been observed to be a food source for the listed, federally threatened green sea turtle (Chelonia mydas) but the latter has not been observed in the project area. The gastropod Trochus niloticus which has been recorded mainly on the outer reef flat, the reef margin, and the reef front terrace is reportedly harvested in the study area. The U.S. Fish and Wildlife Service reports that no listed, federally threatened or endangered species are found in the study area.

37. Guam's 1975 Water Quality Standards designate the waters north of Nimitz Beach Park as class "A" for general use which includes recreation, aesthetic enjoyment, propagation of aquatic and associated wildlife and navigational activities. Recent data from the Guam Environmental Protection Agency indicates that during the period between March 1978 and October 1980, water quality standards were rarely exceeded at a monitoring station immediately offshore from Pagachao Road, approximately in the berthing area of Plan 5. Measurements of fecal coliforms exceeded the thirty-day average standard only once and did not exceed the maximum standard. Turbidity was generally very low, but suspended material did exceed the mean count standard of 20.4 mg/l nearly half the monitoring dates. An inspection of Nimitz Channel in July 1980 by Corps staff found the water very turbid with only about 5 to 10 feet visibility. This high turbidity was not observed during or following a period of rainfall. See Paragraph 17, Appendix D for further information.

38. Business Activity/Community Growth. All alternatives are likely to have similar types of impacts. The initial effects of harbor construction should be felt during and after construction of the federal portion of the harbor project. Unless the local Government dredges the berthing area concurrent to or immediately following the Federal dredging and construction work, the harbor could remain undeveloped for a number of years after the 1985 base period until the Government of Guam's current economic development priorities for constructing marinas at Agana and Merizo are met. Local sports, subsistence and full-time commercial fishing should gradually expand but at a rate unlikely to cause significant singular changes in regional economic conditions. The most visible effect of Federal harbor planning or construction may possibly be a stimulus to residential construction in the Pagachao subdivision or nearby as boat owners and potential boat owners gravitate towards the new "marina" community. The selling of Pagachao subdivision as a "marina community" can be accomplished without having an actually finished marina. The harbor may stimulate faster development of Pagachao and the Agat-Santa Rita area than currently projected without the project. Intra-island migration to Agat between 1960 and 1970 suggests that the new residents will likely be predominated by Chamorros and Filipinos. From 1960 to 1970, the percentage of Chamorros increased by about 3 percent and Filipinos and other non-whites by 4.8 percent. 1980 figures are not yet available. Property values near the harbor may appreciate faster than the average for the rest of the island. No in-migration from outside Guam to specifically reside near the new harbor is anticipated. As the subdivision fills up, additional residential service industries may emerge. This scenario may also be meaningfully affected by a successful development of the newly planned GEDA industrial park at Pagachao.

39. Upon Government of Guam sponsorship of development of a marina at the new Agat Small Boat Harbor, marina-related construction employment will be created. After the construction period, substantial operation, maintenance, and administrative activities will result in more permanent jobs. The new marina will also be an important destination for tourists, as a take-off point for visiting the submerged historic resources of the War in the Pacific National Historic Park at Agat and the marine, terrestrial, and historic resources of the Guam Territorial Seashore Park. Charter tour boats, glass-bottom boats, charter dive, and fishing boat operations should emerge to service these needs. The Guam Department of Parks and Recreation know of at least two operators interested in a tour sightseeing service from Agat to Merizo along the Guam Territorial Seashore Park coastline if a marina is built. They also project an immediate local fishing fleet of 25 boats at a minimum with increases to follow each year. Boat and fishing related shops, restaurants, and boat repair and chandlery firms may also be attracted to the marina. The new GEDA-planned industrial park at Pagachao could serve to collect these industries in one place to isolate them from the urban residential area that is planned to develop there. New additional tax revenues will accrue to the local government as a result of businesses induced into creation by the harbor/marina. Anticipated increased numbers of subsistence fishermen from all over the island, but particularly Central and Northern Guam passing through the marina will also generate business for the marina, its associated enterprises and other Agat community economic enterprises. The emergence of new marina and other types of businesses oriented more to serving visitors than residents will strengthen and give flexibility to the local economy of Agat-Santa Rita.

40. Regional benefits will be incurred by the incremental contribution that part-time or full-time commercial fishermen working out of Agat will make to increasing regional (Guam) fishery production and decreasing imported fish and fish products. Such a trend can also prove beneficial to the tourist industry by providing a better supply of fresh fish for hotels and restaurants. Opportunities for sports fishing as a tourist activity will also improve visitor satisfaction. Regional (islandwide) benefits will also accrue to the large subsistence component of the Chamorro as well as Filipino population by making nearshore and offshore ocean resources more readily available and accessible and probably by reducing the time spent in loading supplies, fuel, equipment, unloading catch and launching and recovering boats.

41. Seashore Parks. There will be both socioeconomic costs and benefits associated with siting a harbor near Nimitz Beach Park. All five plans will encourage greater use of the park by boat users attracted to the passive and active recreational opportunities at the park and by park-users attracted to the boating opportunities at the harbor/marina. Mutual use of Nimitz Channel by park visitors and by boaters under Plans 3, 4 and 5 will conflict and could endanger swimmers and divers. Use of the reef flat north of Nimitz Channel by reef fishermen and shell collectors will be disrupted by Plans 3 and 4. Minimal disruption will be incurred by Plan 5. Under Plans 1 and 2, there will be no competition between boaters and swimmers for use of Nimitz Channel and reef walkers will have the unencumbered use of up to 1,100 linear feet of reef flat north of the park under Plan 1 and 1,800 feet of reef flat under Plan 2, the latter for the area 500 feet offshore where the harbor is located. Much of the reef flat north of the channel will also be still available under Plan 5, but direct access will be impeded by the location of the entrance channel. Plan 1 will use about 50 feet of privately-controlled beach front, Plan 2 will use about 800 feet, Plan 3 will use about 75 feet of Nimitz Beach Park beach front as will Plan 4. Plan 5 will use 500 feet of privately-controlled beach front and 300 feet of undeveloped Nimitz Beach Park area. The latter three plans utilize portions of the park which are undeveloped and about 800 feet north of the main portion of the park. The dredged entrance channels for all projects will be well marked for the safety of reef walkers.

42. There may be traffic congestion problems both during and after construction. Fortunately, the peak-usage period of the Nimitz Beach Park and the Agat Cock Pit will not coincide with normal construction work hours. The U.S. Fish and Wildlife Service has recommended harbor site parking on filled land be eliminated except for about 3 to 5 car/trailer spaces at the launch ramp. The Corps presented a compromise which reduced the parking space to berth ratio from 1:1 to 1:2. If the Nimitz Beach Park parking space is taken for marina use, the capacity of the park will be reduced by 40 to 75 carlods, less the number of people utilizing both facilities. There may also be safety problems for pedestrians walking alongside the highway between the Park and the harbor. If parking spaces are sited across the highway on the buffer zone fronting Pagachao Subdivision, there will be problems with cars and especially pedestrians crossing the highway to and from the harbor. Some mode of traffic control may be required in the future. Local boaters feel that alternative plans (1, 3, and 4) which have a causeway out to the parking area would discourage vandalism and theft of trailers and boats. On the other hand, alternative Plans 2 and 5 would permit more rapid removal of boats to the safety of land during typhoons. There should be only beneficial effects of a harbor at Nimitz Beach on both the War in the Pacific National Historic Park and the Guam Territorial Seashore Park as noted above in Paragraph 38.

43. Taleyfac Spanish Bridge Historic Site. There should be no direct physical or visual effects on the Taleyfac Spanish Bridge which is listed on the National Register of Historic Places. Siting the harbor near Nimitz Beach Park and in the general vicinity of the historic site may encourage greater numbers of visitors to come and appreciate this outstanding example of Spanish-era construction. The State Historic Preservation Officer (SHPO) has recommended further test excavations be performed along the beach and in the nearshore lagoon. Such excavations shall be carried out prior to construction.

44. Reef Resources and Water Quality. Construction of any of the five alternative harbor plans would involve significant modification of the *Enhalus acoroides* seagrass bed and the loss or modification of existing habitat for some popular gastropods and pelecypods (see Table EIS-II). This loss is minimized under Plan 5 to less than 0.5 acres. Loss of this habitat will not totally eliminate the habitat or result in the eventual loss of the entire habitat on the reefflat environment between Bangi Point and Taleyfac Bay. The loss will be localized in its effects. Most fish populations in the area will be temporarily displaced. Many small cryptic fishes like blennies and gobies may be killed during construction, but they should be replenished by colonization from surrounding unaffected habitats. Varying amounts of shallow intertidal reefflat environment will be converted to subtidal habitat between -9 and -14 feet (MLLW), in which new assemblages of fishes will eventually appear together soft-bottom communities. If water quality is maintained in the channel, corals may colonize the channel walls similar to the natural Nimitz Channel. These dredged portions of the reef and the intertidal areas of the offshore structures may possibly be able to serve as eventual spawning and nursery areas by providing a food source for colonizing herbivorous organisms.

45. Dredging for the entrance channel of any of the alternatives will destroy some corals by direct physical disturbance and may cause severe adverse stress to other areas temporarily degrading water quality. The latter effects will be minimized by delaying, if possible, the dredging of the actual entrance point on the reef front until the last phase of harbor dredging. Plans 1 and 2 will cause more direct destruction of corals than Plans 3, 4 and 5 because of dredging through the 250-wide depression or hole in the reef flat. Plan 5, however, would physically destroy the least reef flat habitat (2.2 acres), the least seagrass habitat (0.3 acres), and would convert the second-most shallow water habitat to new more diverse subtidal habitat.

46. Considerable public concern has been raised about water quality both during and after construction (during harbor operation). All the standard U.S. Fish and Wildlife Service conditions noted in their final 2(b) Report (See Appendix D) can be met. By dredging the inner portions of the harbor first, any dredged material accidentally escaping the dredging equipment will probably settle in place due to the very low velocity currents over the reef flat. The Service further recommends that box culverts be installed in all breakwaters and revetted moles, except for Plans 2 and 5, to aid overall circulation in the harbor, assist in flushing, and to help maintain good water quality. The Corps opted to detach breakwaters from revetted moles which will achieve adequate circulation because the reef-flat circulation is wind driven. Thus, open gaps between structures would be more effective in generating movement of

water through the harbor than covered circulation pipes or culverts. For Plans 1, 3, and 4, wave and tidal surge through the entrance channel is believed to be sufficient to satisfactorily flush the harbor. For design of Plan 2, the weak but still existing wind-driven longshore current should be sufficient to offset the loss of tidal surge energy through the long 1,800 foot distance from the open sea and the harbor. Water circulation and harbor flushing for the selected Plan 5 should be excellent given the existing current and tidal regimes operating through Nimitz Channel. Water residence time within the harbor for Plans 1 and 3 based on mean higher high water (MHHW) tidal range was estimated to be 2.4 days, and for mean tidal level (MTL) to be 3.7 days. For Plan 2, these residence time are reduced, respectively, to 2.2 days and 3.4 days. Plan 5 residence times are anticipated to be even lower than Plan 2 due to the shorter length of both the artificial entrance channel and the natural Nimitz Channel.

47. Water quality in the harbor or marina and in the recreational waters of Nimitz Channel and nearby Nimitz Beach Park may be affected by illegal discharge of boat sewage, outboard motor exhaust, and petrochemicals and other substances related to boat maintenance (see Paragraphs 30-34, Appendix D). The most significant effects of the discharge of boat wastes in the Nimitz Beach area would likely be manifested in diseased shellfish, but the probability of such disease transmission can be minimized by strict regulation of U.S. Coast Guard and Guam Environmental Protection Agency controls over installation and use of approved marine sanitation devices on vessels. Local interests should also be encouraged to construct shoreside restrooms as soon as possible after harbor use begins. The good flushing characteristics of Plan 5 should also minimized water quality degradation on both the nearby shellfish beds and the swimming waters adjacent to the Park. Aromatic hydrocarbons suspended in the water at propeller depth from motor exhausts should rapidly evaporate in the tropical environment of Guam. Heavier lubricating oils could conceivably affect shellfish in the moat area of the reef flat, but most oils are more likely to either settle within the dredged harbor area or be flushed out through Nimitz Channel. These impacts are anticipated to be insignificant. Petroleum products introduced into marina waters by disposal of bilge water from boats or runoff from shoreside fuel dock facilities can be controlled by oil-filtration devices on boat bilge pumps, use of oil-absorbant pads placed in the bilge, and by provision by local interests of a dockside waste-oil collection facility. The Guam Oil Spill Contingency Plan should also be extended to the Agat Small Boat Harbor when the harbor becomes operational. Care should be exercised to minimize the discharge of detergents and paint particles into the marina waters from the washing of boats and use of anti-fouling paints, respectively.

48. Section 122 Effects. The following effects have been fully considered with respect to possible adverse economic, social, and environmental effects resulting from implementation of any of the alternatives, including the selected plan:

(1) Desirable Regional Growth: See Paragraphs 29-31 and 38-40 above.

(2) Employment/Labor Force: See Paragraphs 29-30 and 38-40 above.

(3) Public Facilities and Services: Operation of a fully developed harbor/marina will require an average of 0.210 million gallons of water per day (MGD) for Plans 1, 3, 4 and 5 and 0.112 MGD for Plan 2 compared to present-day usage of about 2 MGD for the Agat-Santa Rita region. The present antiquated distribution system which uses US Navy-supplied water is being gradually taken over and modernized by the Government of Guam. By the time a marina at Nimitz Beach is operable, the surrounding harbor area should be fully sewered and sufficient potable water available. Sewer connections are currently available adjacent to the harbor site. Adequate safety services are available from the Gaan Point Fire Station and the US Coast Guard at Apra Harbor.

(4) Business and Industrial Activity (includes Local Government Finance): See Paragraphs 29-31 and 38-40 above.

(5) Displacement of People or Farms (includes Local Government Finance): None of the five alternatives will displace any residences of farms.

(6) Desirable Community Growth (includes Population): See Paragraphs 29-31 and 38-40 above.

(7) Aesthetic Effects. Each of the five alternative is expected to be visual intrusion on the existing seascape, although Plans 2 and 5 would intrude the least. The issue of adverse aesthetic qualities of a harbor at Nimitz Beach has never been raised in any of the public workshops held for this study. The aesthetic effect of the harbor is not expected to be a significant nor controversial issue.

(8) Community Cohesion: See Paragraphs 29-30 and 38-40 above.

(9) Air and Noise Pollution: Adverse impacts to ambient air and noise conditions in the project area would be temporary and intermittent during construction of the harbor. All equipment will comply with applicable federal and local regulations, government air and noise pollution. Shaped explosive charges will be used, if possible, to reduce the impulse noise coming from the blasting that will be required for the harbor dredging. Disturbing noise from the operating harbor should be minimal and should be anticipated by many of those who are expected to move to the Pagachao Subdivision because of the proximity of a marina.

(10) Water Pollution: See Paragraphs 43 and 44 above.

(11) Natural Resources: See Paragraphs 34-35 and 42-44 above.

(12) Man-Made Resources: See Paragraphs 31-33 and 39-41 above.

PUBLIC INVOLVEMENT

49. Public Involvement Program. Coordination for this Nimitz Beach phase of the overall Agat Small Boat Harbor study actually began at the public meetng held on 20 July 1979 to discuss the previous recommended plan at Gaan Point. Following official initiation of the Nimitz Beach site study in February 1980, two public workshops were held on 17 March and 23 July 1980 accompanied each

by informal coordination by Corps staff with local government agencies (see Appendix B). No formal scoping meeting was held for the project. The last public meeting to present the alternative plans for public consideration was held on 21 January 1981 at the Agat Community Center. Public comments included siting the harbor away from the Nimitz Beach Park to avoid possible conflicts with recreational uses of the park and utilizing the extensive reef flats for a new entrance channel.

50. Required Coordination Coordination was initiated with the U.S. Fish and Wildlife Service at the inception of the study to fulfill the requirements of the Fish and Wildlife Coordination Act. A preliminary report was submitted by FWS describing fish and wildlife in the project area, and was utilized as a planning aid during the study. The final FWS 2(b) Report discusses potential project impacts and recommends appropriate mitigation measures. The final report is included in Appendix D. Endangered species coordination with the U.S. Fish and Wildlife Service is complete. Coordination with the SHPO has been completed. A cultural reconnaissance survey was conducted, and a Determination of No Effect based on survey findings was forwarded to SHPO for his review and concurrence. A letter of comment was received on May 28, 1981. The SHPO recommended further subsurface testing be conducted in the beach and lagoonal sands. Intensive archaeological studies will be performed prior to construction.

51. The following agencies will receive copies of the combined Draft Environmental Impact Statement and Detailed Project Report. An asterisk denotes those agencies responding to the environmental statement.

Federal Agencies

- US Advisory Council on Historic Preservation
- US Department of the Interior
  - US National Park Service
  - US Fish and Wildlife Service
  - Heritage Conservation and Recreation Service
- US Department of Commerce*
  - US National Marine Fisheries Service*
- US Department of Transportation
  - US Coast Guard*
- US Environmental Protection Agency*

Government of Guam Agencies

- Governor of Guam
- Department of Parks and Recreation*
- Department of Public Works
- Department of Agriculture
  - Aquatic and Wildlife Resources Division
- Department of Commerce
- Department of Public Health & Social Services
- Department of Land Management
- Territorial Planning Commission
- Department of Labor
- Guam Environmental Protection Agency*
- Department of Public Safety
- Guam Economic Development Authority

Government of Guam Agencies (Con't)

Public Utility Agency of Guam
Bureau of Planning*
Bureau of Planning, Budget, & Management
Historic Preservation Officer*

52. Public Views and Responses. The public was more concerned with providing a launching ramp which the Federal Government could not provide. Improvements to navigation safety desired by the public included providing an entrance channel through the reef flats just north of the existing Nimitz Channel. There were some individuals who preferred utilizing the existing channel. A concern raised by a few people included possible conflicts with water-based recreational activities at Nimitz Beach Park.

53. During circulation of the Draft Environmental Statement comments were received from local and federal agencies. A summary of comments received is provided in the Public Involvement appendix. None of the comments received resulted in major changes in the study's decision factors. The Department of Parks and Recreation indicated a preference for Plan 5 base on favorable construction costs. The National Marine Fisheries Service (Department of Commerce) stressed the importance of minimizing impacts on the highly productive reef flats since harbor dredging conducted off the beach is anticipated for all alternative plans. The Department of the Interior sited the potential disruption to recreational activities in the project area. Plan 5, the preferred alternative, will conflicts with recreational activities centered around Nimitz Beach Park. The Environmental Protection Agency indicated that the final EIS should include a discussion of secondary impacts on water quality due to the proposed project. The U.S. Fish and Wildlife Service final 2(b) report recommends Plan 2 because of comparatively less adverse social-recreational impacts than Plan 5. Letters of comment on the Draft EIS and Report and responses to these comments are included in Appendix B of this report.

54. INDEX, REFERENCES AND APPENDICES

AGAT SMALL BOAT HARBOR IMPROVEMENTS
AGAT, TERRITORY OF GUAM

Subject	Environmental Statement	Main Report & Appendices
Public Involvement Program	Para 49, pg. EIS-24	Sec I:3 & 4, pp. 2-7, Table 1; App. B, pp. B-1 & B-2.
Public Views and Responses	Para. 52-53; pg. EIS-25	Appendix B
Relationship to Environmental Requirement	Paras 2 & 5, pp. EIS-5-6	Sec II:1, pg. 8; Sec III:4, pp. 36-37; App. A.
Required Coordination	Paras 2, 5 and 50, pp. EIS-5-6 and 23	Sec I:3, pp. 2-3; App. A, pp. A-2 to A-5; App. B, pp. B-2 & B-7.
Significant Resources	Paras 27-37, pp. EIS-14-22	
Business Activity/ Community Growth	Paras 27-31, 28-30, pp. EIS-14-16; Paras 38-40, pp. EIS-19-20	Sec II:3.c, pp. 14-15; App. C.
Seashore Parks	Paras 32-33, pg. EIS-16-17; Paras 41-42, pg. EIS-19-20	App. C.
Taleyfac Spanish Bridge	Para 34, pg. EIS-17-18; Para 43, pg. EIS-21	App. C.
Reef Resources and Water Quality	Paras 35-37, pp. EIS-18-19; Paras 44-47, pg. EIS-21-22	App. A:V, pp. A- App. D.
Sec 122 Resources and Effects	Para 28, pg. EIS-14; Para 48, pg. EIS-23	App. A, C & D.
Statement Recipients	Para 51, pg. EIS-24	App. B, Sec VII.
Study Authority	Para 6, pg. EIS-7	Sec I:1, pg. 1; App. A.
Table of Contents	Pp. EIS-2-3	Pp. i-iii.
Unresolved Issues	Para 4, pg, EIS-5	App. D.
Without Conditions (No Action)	Para 13, pg. EIS-9	Sec II:5, pg. 24; App. C & E.

AGAT SMALL BOAT HARBOR

AGAT, TERRITORY OF GUAM

PLAN FORMULATION CRITERIA

AND

COMPLIANCE REPORTS

APPENDIX A

APPENDIX A

PLAN FORMULATION CRITERIA AND COMPLIANCE REPORTS

TABLE OF CONTENTS

LIST OF TABLES

I. STUDY AUTHORITY

SMALL NAVIGATION PROJECT AUTHORITY

a. Legislative Authority.

Section 107 of the River and Harbor Act of 1960, as amended by Section 310 of the River and Harbor Act of 1965, Section 112 of the River and Harbor Act of 1970, and Section 133(a) of the Water Resources Development Act, approved 22 October 1976, states:

(a) The Secretary of the Army is authorized to allot from any appropriations hereafter made for rivers and harbors not to exceed $25,000,000 for any one fiscal year for the construction of small river and harbor improvement projects not specifically authorized by Congress which will result in substantial benefits to navigation and which can be operated consistently with appropriate and economic use of the waters of the nation for other purposes, when in the opinion of the Chief of Engineers such work is advisable, if benefits are in excess of the costs.

(b) Not more than $2,000,000 shall be allotted for the construction of a project under this section at any single locality and the amount allotted shall be sufficient to complete the Federal participation in the project under this section.

(c) Local interests shall provide without cost to the United States all necessary lands, easements, and rights-of-way for all projects to be constructed under the authority of this section. In addition, local interests may be required to hold and save the United States free from damages that may result from the construction and maintenance of the project, and may be required to provide such additional local cooperation as the Chief of Engineers deems appropriate. A State, county, municipality or other responsible local entity shall give assurance satisfactory to the Chief of Engineers that such conditions of cooperation as are required will be accomplished.

(d) Non-federal interests may be required to share in the cost of the project to the extent that the Chief of Engineers deems that such cost should not be borne by the Federal Government in view of the recreational or otherwise special or local nature of the project benefits.

(e) Each project for which money is allotted under this section shall be complete in itself and not commit the United States to any additional improvement to insure its successful operation other than routine maintenance, and except as may result from the normal procedure applying to projects authorized after submission of survey reports and projects constructed under the authority of this section shall be considered as authorized projects.

II. PLANNING CRITERIA AND CONSTRAINTS

Institutional Policies. Several institutional policies of the Federal government affect the design and decisions for local and Federal participation. Executive policies are issued through the Office of Management and Budget (OMB), the Water Resources Council (WRC) and the Council of Environmental Quality (CEQ). Legislative policies are expressed by various legislative enactments of Congress which has developed a body of laws establishing national concerns regarding the nation's natural resources.

Design/Benefit Criteria. In developing justification for Federal participation, technical and economic evaluation policies, standards, principles, and procedures are established in determining a benefit to cost comparison. All projects must have a benefit to cost comparison. Projects must usually have a benefit to cost comparison of one or greater to be eligible for federal participation.

Regulatory/Environmental Requirements. A number of statutory and regulatory requirements of the Federal government must be complied with during the planning process. These requirements largely relate to the assessment and evaluation of possible impacts on the environment resources of the project area.

Archaeological and Historic Preservation Act of 1974 (Public Law 93-291) as amended. The Act, also known as the Reservoir Salvage Act, provides for the preservation of historical and archaeological data which might be otherwise destroyed by flooding or other alteration of the terrain and authorizes up to one percent of the total amount authorized for appropriation for the project to be spent on recovery, protection and preservation of data. This act will be utilized only for sites eligible for or listed on the National Register of Historic Places. Applicability of this act to the project will be assessed in Appendix C and the EIS.

Clean Air Act, as amended (42 USC 7401 et seq.). As it applies to Corps studies and construction projects, this act requires that all federal projects must conform to EPA approved or promulgated state implementation plans. Compliance with this act will be addressed in the EIS.

Estuary Protection Act (Public Law 90-454). The act requires that Federal agencies in planning for use or development of water and land resources, give consideration to estuaries and their natural resources and that if estuaries may be affected, the Secretary of the Interior shall be given an opportunity to evaluate the effects of the project on the estuary. There are no estuaries in the study area.

Federal Water Project Recreation Act (Public Law 89-72, as amended). This act requires that full consideration be given to project opportunities for outdoor recreation and fish and wildlife enhancement; that planning based on coordination for use with existing and planned Federal and local public recreation developments; that the views of governmental agencies concerned with recreation and wildlife, including the USFWS and Heritage Conservation and Recreation Service (HCRS) be included in the report.

Land and Water Conservation Fund Act of 1965 (16 USC 4601-4 et seq). As it applies to Corps studies and project, this act requires that Corps recreation planning be coordinated with the State plan developed pursuant to the Act. For Guam this is the Guam Comprehensive Outdoor Recreation Plan. Moreover, the non-Federal cost for the project may not be paid out of LWCFA funds.

Rivers and Harbors Appropriation Act of 1899, as amended (33 USC 401 et seq.). This statute, which established Corps' regulatory responsibilities and generally prohibited a wide range of actions which might obstruct navigable waters of the United States, does not impose any requirements on projects that are affirmatively authorized by Congress.

Watershed Protection and Flood Prevention Act, as amended (16 USC 1001 et seq.). This statute which authorized the Soil Conservation Service to construct dams and other works in upstream watersheds, imposes no requirements on Corps projects.

National Environmental Policy Act of 1969 (Public Law 91-190). The National Environmental Policy Act (NEPA) requires an environmental statement in every recommendation or report on proposals for legislation and other major federal actions significantly affecting the quality of the human environment.

Clean Water Act of 1977 (Public Law 95-217). This act was formerly known as the Federal Water Pollution Control Act Amendments of 1972. The requirement is to evaluate discharge effects of dredged or fill materials into waters of the United States.

Coastal Zone Management Act of 1972 (Public Law 92-583). This act requires that the project must comply with the federal law as well as be consistent with the Coastal Management Program for the Territory of Guam (Guam E.O. 78-37: Compliance with the Guam Coastal Management Program Policies).

Endangered Species Act of 1973 (Public Law 93-205). The implementing agency shall coordinate with the appropriate federal wildlife agency to determine the presence of listed endangered or threatened species or their critical habitat may be present in the area of proposed action. The results of the assessment shall be contained in the EIS.

Fish and Wildlife Coordination Act of 1958 (Public Law 85-624). This act requires any federal agency proposing to impound, divert, or modify the channel of any stream or other body of water to consult with the Department of Interior, U.S. Fish and Wildlife Service (USFWS) and the head of the state or territorial agency exercising control over fish and wildlife resources, concerning the impacts of such action. The USFWS shall recommend, in a 2(b) report, methods to mitigate impacts of the proposed action and to conserve fish and wildlife resources.

Marine Protection, Research, and Sanctuaries Act of 1972 (Public Law 92-532). This act regulates the evaluation of the need and transportation of dredged material for the purpose of dumping in ocean waters. In the case of this project, there is no specific need to provide an ocean dump site for excess construction materials.

National Historic Preservation Act of 1966 (Public Law 89-635). Section 106 of this act requires that federal agencies shall, prior to the approval of the expenditure of any funds on an undertaking, or prior to the issuance of any license, as the case may be, take into account the effect of the undertaking on any property included in, or eligible for inclusion in the National Register and shall afford the Advisory Council on Historic Preservation a reasonable opportunity to comment with regard to such undertaking. The Commonwealth Historic Preservation Officer must also be given a reasonable opportunity to comment on the undertaking.

Executive Order on Floodplain Management (EO 11988). This order requires that agencies avoid the base floodplain unless it is the only practicable alternative. For potential action in the floodplain, an evaluation of effects on floodplain values, a description of other practicable alternative actions outside the floodplain, and adequate dissemination of the action to the public must be undertaken.

Executive Order on Protection of Wetland, (EO 11990). This order requires the agency to analyze potential impacts to existing wetlands and associated values and to give the public early public review of proposed actions.

Wild and Scenic Rivers Act of 1968 (Public Law 90-542). This act requires agencies to identify potential impacts to designated wild and scenic rivers and to coordinate action and obtain concurrence with the U.S. Department of the Interior.

III. PRESIDENTIAL EXECUTIVE ORDER 11988 ON FLOODPLAIN MANAGEMENT EVALUATION REPORT

1. The purpose of this supplemental report is to present the results of additional studies required by Executive Order 11988, Flood Plain Management, dated 24 May 1977. The objective of EO 11988 is to avoid to the maximum 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.
The Order requires Federal agencies to:

a. Avoid the base floodplain unless it is the only practicable alternative;

b. Reduce the hazard and risk of flood loss;

c. Minimize the impact of floods on human safety, health, and welfare; and

d. Restore and preserve the natural and beneficial floodplain values.

2. PROCEDURE

The basic determinations necessary to implement EO 11988 are stated in Section 2 of the EO and are summarized in the following paragraphs:

a. Determine whether the proposed action is the base floodplain. The base floodplain is defined in Section 6 of EO 11988 as the area inundated by a flood with a 1 percent chance of occurrence in any given year.

b. Determine whether there is a practicable alternative to locating the action in the base floodplain. The "action" is any Federal activity including (1) acquiring, managing, and disposing of Federal lands and facilities; (2) providing federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

c. Identify adverse impacts due to the action and any induced development and identify losses of natural and beneficial values of the floodplain.

d. If the proposed action induces development in the base floodplain, determine if there is a practicable alternative to the development. The decision on whether a practicable alternative exists is to be based on the advantages and disadvantages of floodplain and non-floodplain sites. Factors to be considered include water resources; conservation; economics; aesthetics, natural and beneficial values served by the floodplains; impacts of floods on human safety; locational advantage relative to availability of housing, education, and work force; the functional need for locating the development in the flood plain; historic values; fish and wildlife habitat values; endangered and threatened species; support of municipal infrastructure; energy conservation; cost effectiveness; enhancement of work opportunities for economically disadvantaged minorities; and in general the needs and welfare of the people.

e. Determine viable methods to minimize the adverse impacts of the action and any induced development and methods to restore and preserve the natural and beneficial values of the floodplain.

f. Advise the general public if the proposed action will be located in the floodplain.

g. Recommend the most desirable plan responsive to the established planning objectives and consistent with the requirements of the Executive Order.

DESCRIPTION OF FACTORS FOR THE SELECTED PLAN 5

1. PROPOSED ACTION LOCATION

The proposed action in the Agat Harbor area is located within the base floodplain limits. The base floodplain is defined as the one percent (1%) exceedance frequency floodplain.

2. EXISTING FEDERAL ACTIVITIES ON GUAM

a. Floodplain management services are available from the U.S. Army Corps of Engineers under the authority of Section 206 of the Flood Control Act of 1960 (Public Law 86-645). These services include providing flood hazard data, maps and technical assistance and studies.

b. A flood insurance program is available by the U.S. Federal Emergency Management Agency (FEMA) through the Federal Insurance Administration under the authority of the National Flood Insurance Act of 1968, as amended. The Government of Guam is in the emergency phase of the flood insurance program, which requires them to establish some building permit review process.

c. The U.S. Department of Housing and Urban Development (HUD) has minimum building standard requirements for federally subsidized housing projects administered by the agency.

d. Emergency and disaster operations, when in effect are administered by FEMA. Disaster recovery assistance includes protection of life and property, damage surveys, restoration of public services, and technical assistance. This assistance was given for the affects of Typhoon Pamela in 1976.

e. Relocation assistance for persons displaced as a result of federal and federally-assisted programs are authorized by the Uniform Relocations Assistance and Real Property Acquisition Act of 1970 (Public Law 91-646). This statute provides moving and related expenses to insure fair and equitable treatment of displaced persons.

f. The U.S. Army Corps of Engineers is currently conducting an overall planning effort under the Guam Comprehensive Study. Among the water resource problems and needs addressed by this study are regional harbors, water supply, floodplain management, shore protection and beach erosion. The study was initiated in FY 1979 and is expected to extend over a five-year period.

3. POTENTIAL FLOODPLAIN DEVELOPMENT WITH THE PROJECT

The proposed navigational improvement in the Nimitz Beach area would likely stimulate the expansion of existing facilities and induce new light industrial (fishing and boating) development to the surrounding community. Secondary residential development and satellite services associated with this industry should also occur in and outside the base floodplain.

4. POTENTIAL LOSSES TO THE NATURAL AND BENEFICIAL RESOURCES

All the natural resources present are subject to flood damage and are not dependent upon the flood occurrences for their continued survival. Potential loss of habitats is not considered to be significant to affect productivity or diversity of any existing ecosystem.

Nimitz Beach Area

a. The harbor facility will require dredging and the placement of fill and armor stones. Loss of marine life will result by burial from fill and by dredging of the channel areas. About 10.4 acres of reef flat would be modified for Plan 5. The breakwater will provide rocky intertidal and interstitial habitat possibly creating an increase in species and habitat density. Coastal strand vegetation along the shoreline will be cleared for access and operations during construction resulting in a minimal loss of vegetative habitat.

5. DESCRIPTION OF THE BEST NON-FLOOD ALTERNATIVE FOR POTENTIAL DEVELOPMENT

The only practical non-floodplain alternative would be the without project conditions. The nature of harbors being located along the coast makes it prone to typhoon and flooding conditions. No other alternative site would be practical, as the western coastal region offers the only feasible area suitable for the proposed project.

The no-action plan would be inconsistent with the local plans for orderly economic growth as noted in the Overall Economic Development Plan for Guam. The fish/ocean resource is only one of a few limited natural resources available for exploitation by the Government of Guam.

6. DESCRIPTION OF WHY THE PROPOSED ACTION WHICH WILL HAVE SOME NEGATIVE ENVIRONMENTAL IMPACTS AND ADDED FLOOD DAMAGE POTENTIAL DUE TO INDUCED DEVELOPMENT IN THE FLOODPLAIN IS THE PREFERRED SOLUTION

Harbor and fishery related activities are water dependent which necessitate their location in coastal zone areas which are subject to flood hazards. Guam is typical of many Pacific Islands characterized by limited low-lying areas and steep high rising cliffs and mountains in the interior areas. Quite often the only areas suitable for development are in the low-lying floodplains.

Development of this proposed action in the floodplains would help meet the needs identified by this study. This project would outweigh the anticipated environmental losses and added potential flood damage resulting from this action.

7. DESCRIPTION OF ACTIONS THAT WILL BE CONSIDERED PRIOR TO CONSTRUCTION TO MINIMIZE DAMAGE TO BOTH THE NATURAL VALUES OF THE FLOODPLAIN AND DAMAGES TO DEVELOPMENT INDUCED BY THE PROJECT

a. The design of the small boat harbor would minimize adverse drainage characteristics and losses to marine life within the project area.

b. The Government of Guam will be advised of existing Federal Floodplain Management policies, current recommended minimum building requirements for flood areas and general water resource planning assistance available to them for development at Nimitz Beach areas.

c. Any proposed action will be in conformance to all applicable Federal and local land-use, water and related resources regulations and laws.

8. ADVISEMENT OF THE GENERAL PUBLIC THAT THE PROPOSED ACTION WILL BE LOCATED IN THE FLOODPLAIN

The general public has been informed of this action by public notice and had the opportunity to address and comment on this action during a formal public meeting.

9. RECOMMENDATION OF THE MOST DESIRABLE PLAN RESPONSIVE TO THE ESTABLISHED PLANNING OBJECTIVES CONSISTENT TO THE REQUIREMENTS OF THE EXECUTIVE ORDER

Plan 5 for the Agat Small Boat Harbor at Nimitz Beach is the recommended plan because it maximizes net benefits and minimizes environmental quality impacts. It does not minimize adverse social impacts. Table A-1 summarizes the advantages and disadvantages of utilizing the floodplain.

TABLE A-1. EXECUTIVE ORDER 11988 - EVALUATION OF FLOODPLAIN SITE

Factor	Advantage of Floodplain Site	Disadvantage of Flood Plain Site
National Economic Development (NED)		
Functional Need	Fishing & Recreational Boating are dependent upon coastal locations.	None
Relationship to Existing/Proposed Development	Human activities are concentrated in the coastal zone.	None
Benefits	Reduces construction costs and vessel operating costs.	Periodic flooding damage.
Environmental Quality (EQ)		
Wildlife Habitat Values	Does not affect upland habitats.	Affects and impacts upon coastal habitat.
Endangered or Threatened Species	Not Applicable	Not Applicable
Commercial or Recreational Species	Enhances commercial and recreational fishing opportunities.	Portion of shellfish habitat in seagrass may be destroyed.
Natural Reserve Area	None	None
Historic & Recreational Values, Historical & Archaeological Resources	None	Some potential for disturbance, but Nimitz Beach site is not significant.
Parks & Recreational Area	Improves water-contact recreational opportunities.	Facilities exposed to flood hazards.
Water Resource Values		
Water Supply & Conservation	None	None
Water Quality	None	May degrade water quality which would place stress upon coastal habitats.
Agricultural & Food Production	Improves fishery opportunities. Does not affect agricultural lands.	None

TABLE A-1. EXECUTIVE ORDER 11988 - EVALUATION OF FLOODPLAIN SITE (Cont)

Factor	Advantage of Floodplain Site	Disadvantage of Flood Plain Site
Social Well-Being (SWB)		
Safety	None	Coastal area exposed to flood hazards.
Locational Advantage	Fishing is dependent on coastal location.	Coastal area exposed to flood hazards.
Community Welfare	Improves community's food resources and economic opportunities.	None
Aesthetic Values	None	May degrade aesthetic appeal of an open coastline.

IV. EVALUATION OF THE EFFECTS OF THE DISCHARGE OF DREDGED OR FILL MATERIAL INTO WATERS OF THE U.S. USING U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) SECTION 404 (b) GUIDELINES

1. Project Description.

a. Description of the material proposed discharge.

(1) General Characteristics of the Material.	Quarried limestone ranging in size from spall to 2.5 ton boulders and dredged coral material.
(2) Quantity of Material to be Discharged.	Plan 1 - 64,500 cy Plan 2 - 65,500 cy Plan 3 - 62,100 cy Plan 4 - 55,400 cy Plan 5 - 52,550 cy
(3) Source of the Material.	Existing quarries on Guam and dredged material.

b. Description of the proposed discharge site.

(1) Location.	Nimitz Beach.
(2) Type of discharge site.	Nearshore reef site and shoreline location.
(3) Method of discharge.	Material will be used to construct harbor protective structures at the discharge site. The material will be placed by cranes and bulldozers to form the breakwaters and revetted moles.
(4) Date and length of time when discharge will occur.	The project will be implemented within 2 years. All plans will take approximately 18 months to construct.
(5) Life of the discharge site.	All harbor plans have an economic life of 50 years.

2. Physical Effects (see Section II, Appendix D).

a. Potential Destruction of Wetlands.	Site is not considered a wetland.

b. Other Physical Effects.

(1) Area of bottom covered by discharge.	Plan 1 - 4.9 acres Plan 2 - 2.4 acres Plan 3 - 4.2 acres Plan 4 - 4.0 acres Plan 5 - 2.2 acres

2. Physical Effects. (Cont)

(2) Changes in bottom geometry and substrate composition.	The bottom substrate consists of coralline material. The fill is fossilized coralline material and at Nimitz Beach will raise the bottom elevation from approximately -1.0 feet MLLW to +8 to +13 feet MLLW.
(3) Water circulation and flushing.	The protective structures will reduce wave influence on water mixing and possibly increase water residence time within the harbor basins. At Agat Harbor wind and tides will continue to dominate the surface current regime.
(4) Salinity distribution and gradients.	No alterations are anticipated at either site, because discharge does not involve a release of high or low salinity waters or materials.
(5) Natural drainage characteristics, and flood and stormwater storage.	Nimitz site involves no drainage basin modifications; site has no flood or stormwater storage capability.
(6) Groundwater levels and recharge.	The site is not known as a groundwater recharge area, and the discharge is not expected to alter groundwater levels.

3. Chemical-Biological Interactive Effects (see Section II, Appendix D).

a. The material proposed for discharge meets EPA exclusion criteria and no bioassay testing is required. The material to be discharged is larger than silt size, similar in composition to the substrate at the project sites, and is obtained from sources removed from pollution point-sources.

b. Impacts on the Water Column.

(1) Reduction in light transmission.	Temporary increase in water turbidity is anticipated as dust may be washed from the quarried limestone by wave action and as dredged coral material is placed as fill.
(2) Degradation of water aesthetic values.	Only temporary effects and in area already turbid (Nimitz Channel only).

3. Chemical-Biological Interactive Effects. (Cont)

(3) Direct destructive effects on nektonic and planktonic populations.	Temporary distrubance and displacement during construction. Minor permanent loss of existing water column habitat.
(4) Are contaminants found in the material?	None anticipated.
(5) Concentration of contaminants released from sediment to the water column. (Results of elutriate testing).	Material exempt from chemical and bioassay testing.
(6) Comparison of constituent concentrations with applicable water quality standards.	Not applicable.
(7) Size of mixing zone.	Not applicable.
c. Impacts on Benthos.	
(1) Area of benthic community covered by material.	Plan 1 - 4.9 acres Plan 2 - 2.4 acres Plan 3 - 4.2 acres Plan 4 - 4.0 acres Plan 5 - 2.2 acres
(2) Changes in community structure and function.	Fill raises bottom elevation creating terrestrial, intertidal, and rocky interstitial marine habitat. Changes in community structure and function are localized and involve replacement of habitat.
(3) Effects of chemical constituents on benthos.	None anticipated.

4. Impacts of the Discharge at the Discharge Site (see Section II, Appendix D).

a. Need for the proposed action.	The discharge is needed to construct protective structures in the development of a harbor on Guam.
b. Availability of alternate discharge sites and alternate methods of discharge.	None (see Paras. 11 and 12, EIS).

IV. EVALUATION OF THE EFFECTS OF THE DISCHARGE OF DREDGED OR FILL MATERIAL INTO WATERS OF THE U.S. USING U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) SECTION 404 (b) GUIDELINES

4. Impacts of the Discharge at the Discharge Site. (Cont)

c. Evaluation of Impacts.

(1) Chemical, physical and biological integrity of the aquatic ecosystem.	Discharge is localized in effect, and will not affect availability of biological resources. The fill will not alter the chemical integrity and the aquatic ecosystem. An increased water residence time is anticipated within the harbor basins, but minimized under Plan 5. Minimal destruction of seagrass habitat is anticipated. There will be an increased habitat diversity created by the rocky substrate.
(2) Food chain and tropic level.	No effect anticipated.
(3) Diversity of plant and animal species.	A localized increase in habitat and species diversity is anticipated.
(4) Obstruction of movement into and out of feeding, spawning, breeding and nursery areas.	Movement to seagrass bed partially obstructed for organisms coming up Nimitz Channel.
(5) Wetlands having significant functions of water quality maintenance.	Not applicable.
(6) Natural highwater or flood water storage.	Not applicable.
(7) Degradation of Water Quality.	Temporary increase in water turbidity anticipated during construction.
d. Methods to minimize turbidity.	Dredging from shoreline toward Nimitz Channel. Contain escaping material within breakwater. Possible use of silt screens.
e. Methods to minimize degradation of aesthetic, recreational and economic values.	See 4d.
f. Methods investigated to minimize possible harmful effects.	See 4d.

IV. EVALUATION OF THE EFFECTS OF THE DISCHARGE OF DREDGED OR FILL MATERIAL INTO WATERS OF THE U.S. USING U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) SECTION 404 (b) GUIDELINES

g. Impacts on water uses.

(1) Municipal water supply intakes.	None.
(2) Shellfish	Possible temporary adverse effect.
(3) Fisheries	Negligible effect anticipated.
(4) Wildlife	None.
(5) Recreation Values	Improves recreational fishing and idle time diversion.
(6) Threatened and endangered species.	None.

	Plan 1	Plan 2	Plan 3 (In Acres)	Plan 4	Plan 5
(7) Benthic life.					
benthic area covered	4.9	2.4	4.2	4.0	2.2
rocky intertidal habitat	0.51	0.36	0.43	0.48	0.36

(8) Wetlands.	None affected.
(9) Submerged vegetation (located within moat area of reef flat).	All plans are located in vicinity of _Enhalus acoroides_ seagrass beds. The fill will cover 2.1, 0.6. 2.0, 1.9 and 0.3 acres in Plans 1, 2, 3, 4, and 5, respectively.
(10) Size of disposal site.	Total enclosed area of Plan 5: 15ac
(11) Coastal Zone Management Program.	Conforms with Guam Coastal Management Program.

5. Determination.

a. An ecological evaluation has been made following the guidance in 40 CFR 230.4 in conjunction with the evaluation considerations in 40 CFR 230.5 (40 CFR 230.3(d)).

b. Appropriate measures have been identified and incorporated into the proposed plan (see Paragraphs 24 and 29 of Section II, Appendix D) to minimize adverse effects on the aquatic environment as a result of the discharge (40 CFR 230.3(d)(1)).

c. Consideration has been given to the need for the proposed activity, the available of alternative sites, methods of discharge that are less damaging to the environment, and such water quality standards as are appropriate and applicable by law (40 CFR 230.5).

d. No wetlands are affected by the proposed action.

V FEDERAL COASTAL ZONE MANAGEMENT CONSISTENCY DETERMINATION

The following consistency determination is prepared in accordance with the Coastal Zone Management (CZM) Act of 1972 (Public Law 92-583) and the regulations on Federal Consistency with approved Coastal Management Program (15 CFR 930). Federal activities must be consistent to the maximum extent practicable with approved State/Territorial CZM program. In September 1979 the Government of Guam's (GOVGUAM) Coastal Management Program, prepared by the National Oceanic and Atmospheric Administration, U.S. Department of Commerce, and the Bureau of Planning, Government of Guam, was approved by the Federal government.

The determination, as documented below, specifically addresses the impacts of preliminary plans of improvement for navigation at Nimitz Beach, Agat, Guam, on the Guam Coastal Management Program (GCMP). The GCMP policies were made effective 15 November 1978, GOVGUAM Executive Order 78-37 (Guam Land-Use Policies). The component items of Executive Order 78-37) are documented in the Final Environmental Impact Statement and Coastal Management Program for the Territory of Guam, July 1979. The term "project" in this consistency determination document refer to the construction of any one of four alternative harbor designs at Nimitz Beach unless otherwise specified.

GOVERNMENTAL PROCESS POLICY

1. Objective: Provide an efficient, effective administration of natural resources.

2. Policy: Effectively administer the program, policies, and laws through regulatory revisions, improved interagency coordination, and improved educational and technical programs for local government personnel.

3. Consistency: The proposed project would not alter existing laws, programs, and policies.

DEVELOPMENT POLICIES

1. Shore Area Development.

a. Objective: Assure the environmental compatibility of uses on the shore area.

b. Policy: The location of any designated use within the shore area shall enhance, shall be compatible, and shall not generally detract from the surrounding coastal area's aesthetic, environmental quality, and beach accessibility. In addition, the dependence on the location and the lack of feasible alternative sites shall be demonstrated.

c. Consistency: The proposed project would intrude on the visual seascape, would temporarily degrade environmental quality, but would not affect beach accessibility. Plan 5 would intrude the least and would degrade the least area of marine environment, but would occupy 800 linear feet of beach. Suitable alternative sites do not exist.

2. Urban Employment.

a. Objective: Permit development of urban type facilities only in urban designated areas.

b. Policy: Commercial, multi-family, industrial, resort/hotels, and associated support facilities shall be concentrated within urban districts as outlined in the Land-Use District Map.

c. Consistency: The proposed project could stimulate commercial and industrial support activities in an area currently designated low density residential.

3. Rural Development.

a. Objective: Permit uses of rural designated areas consistent with its development.

b. Policy: Rural districts shall be designated in which only low-density residential and agricultural uses will be acceptable. Minimum lot size for these uses should be one-half acre until adequate infrastructure, including functional sewering, is provided.

c. Consistency: The proposed project should not impact on any rural district.

4. Major Facility Setting.

a. Objective: The location of major utility, fuel, and transport facilities shall consider national interests.

b. Policy: The Territory shall recognize the national interest in siting of major facilities including those associated with electric power production and transmission, petroleum refining and transmission, port and air installations, solid waste disposal, sewage treatment, and major reservoir sites.

c. Consistency: The proposed project would not affect potential sites nor affect any existing major utility, fuel, or transport facility.

5. Hazardous Areas.

a. Objective: Development of hazardous areas shall be consistent with the degree of risk to the community health and welfare.

b. Policy: Identified hazardous lands including floodplains, erosion-prone areas, air installation crash and sound zones, and major fault lines shall be developed only to the extent that such development does not pose unreasonable risks to the health, safety, or welfare of the people of Guam, and complies with land-use regulations.

c. Consistency: The proposed project is located in a designated flood hazard area, however, harbor and fishery-related activities are water dependent which necessitates their location in coastal zone areas which are subject to flood hazards. Small boat harbor construction at Nimitz Beach in consistent with uses allowable under Open-Space and Recreation Conservation land.

6. Housing.

a. Objective: Promote efficient and safe housing design and development locations.

b. Policy: The Government shall encourage efficient design of residential areas, restrict such development in areas highly susceptible to natural and manmade hazards, and recognize the limitations of the island's resources to support historical patterns of residential development.

c. Consistency: The project would not affect the design of housing, but will probably stimulate residential construction in the Government of Guam-owned Pagachao Subdivision.

7. Transportation.

a. Objective: Promote environmentally acceptable transportation systems.

b. Policy: The territory shall develop an efficient and safe transportation system while limiting adverse environmental impacts on primary aquifers, beaches, estuaries, and other coastal resources.

c. Consistency: The proposed project will temporarily and intermittently disrupt patterns on Highway 2 during construction. During operation of a harbor/marina at Nimitz Beach, particularly on weekends, vehicular and pedestrian traffic between the harbor and off-site parking area may disrupt the normal flow of traffic on Highway 2.

8. Erosion and Siltation.

a. Objective: Development shall be controlled in areas subject to erosion.

b. Policy: Development shall be limited in areas of 15 percent or greater slope by requiring strict compliance with erosion, sedimentation, and land-use district guidelines, as well as other related land-use standards for such areas.

c. Consistency: The proposed project does not impact the development of steep and erodible areas.

RESOURCES POLICIES

1. Conservation of Natural Resources - Overall Policy.

a. Objective: The natural resources of Guam shall be preserved and conserved.

b. Policy: The value of Guam's natural resources such as recreational areas, critical marine and wildlife habitats, the major source of drinking water, and the foundation of the island's economy, shall be protected through policies and programs affecting such resources.

c. Consistency: The proposed project would not affect any designated critical marine habitats, but would enhance outdoor recreation opportunities off the southwestern shore of Guam.

2. Air Quality.

a. Objective: Control activities to insure high air quality.

b. Policy: All activities and uses shall comply with all local air pollution regulations and all appropriate Federal air quality standards in order to ensure the maintenance of Guam's relatively high air quality.

c. Consistency: During construction the proposed project could cause temporary increases in dust and particulates in the immediate vicinity of the project. The contractor will be required to implement suitable measures to control all releases to an acceptable level.

3. Water Quality.

a. Objective: Maintain high water quality of potable and recreational waters and watersheds.

b. Policy: Safe drinking water shall be assured, and aquatic recreation sites shall be protected through the regulation of uses and discharges that pose a pollution threat to Guam's waters, particularly in estuarine, reef, and aquifer areas.

c. Consistency: Construction of the proposed plan would temporarily increase turbidity and discharge suspended solids in the reef-flat and Nimitz Channel waters. The contractor will be required to control such discharges so as to maintain Guam Water Quality Standards for the construction area. A potential exists for long-term water quality degradation of recreational swimming water near and in Nimitz Channel, but locally-sponsored and regulated management measures can reduce this potential. Drinking water will not be affected by the proposed project.

4. Fragile Areas.

a. Objective: Significant cultural, terrestrial, and wildlife habitats shall be protected.

b. Policy: Development in the following types of fragile areas shall be regulated to protect their unique character: historic and archeologic sites, wildlife habitats, pristine marine and terrestrial communities, limestone forests, and mangrove stands and wetlands.

c. Consistency: Unique and significant cultural and wildlife sites are not expected to be affected by the proposed project.

5. Living Marine Resources.

a. Objective: Marine life shall be protected in waters of Guam.

b. Policy: All living resources within the territorial waters of Guam, particularly corals and fish, shall be protected from overharvesting and, in the case of marine mammals, from any taking whatsoever.

c. Consistency: Harbor dredging and fill activities will destroy some coral reef habitat and modify other reef habitat. Plan 1 and 2 will probably destroy more live coral than Plans 3, 4 and 5. Coral may recolonize deepened harbor areas under all five plans.

6. Visual Quality.

a. Objective: Scenic resources and visual quality shall be promoted and protected.

b. Policy: Preservation and enhancement of, and respect for the island's scenic resources shall be encouraged through increased enforcement of the compliance with sign, litter, zoning, su division, building, and related land-use laws; visually objectionable uses shall be located to the maximum extent practicable, so as not to degrade significantly views from scenic overlooks, highways, and trails.

c. Consistency: The proposed project shall affect the existing seascape by intruding from 600 feet to 1,200 feet offshore with rock structures up to 13 feet high. Plans 2 and 5 would have the least obtrusive visual effect. The views from no designated scenic overlooks, highways or trails should be affected by the project.

7. Recreation Areas.

a. Objective: The implementation of suitable recreational and scenic facilities shall be promoted.

b. Policy: The Government of Guam shall encourage development of varied types of recreation facilities located and maintained so as to be compatible with the surrounding environment and land uses; adequately serve community centers and urban areas, and protect beaches and such passive recreational areas as wildlife and marine conservation areas, scenic overlooks, parks, and historic sites.

c. Consistency: The proposed project would enhance boating and fishing opportunities in the area and specifically in the Guam National/Territorial Seashore and War in the Pacific National Historic Park areas. All plans complement the use of Nimitz Beach Park in general but boating under Plans 3, 4 and 5 would compete for use of Nimitz Channel with recreational swimmers and divers.

8. Public Access.

a. Objective: Public access to the shoreline and other recreational and scenic areas shall be promoted.

b. Policy: The public's right of unrestricted access shall be ensured to all non-federally owned beach areas and all Territorial recreation areas, parks, scenic overlooks, designated conservation areas and other public lands; and the agreements shall be encouraged with the owners of private and Federal property for the provisions of reasonable access to, and use of, resources of public nature located on such land.

c. Consistency: The proposed project will not impair access to the shoreline. One secondary effect of the project would be to enhance opportunities to visit designated recreation and conservation areas by the sea which h rwise be easily accessible.

9. Agricultural Lands.

a. Objective: Agricultural lands shall be preserved for agricultural activities.

b. Policy: Critical agricultural lands shall be preserved and maintained for agricultural use.

c. Consistency: The proposed project should have no effect on existing agricultural lands in Agat District.

AGAT SMALL BOAT HARBOR

AGAT, TERRITORY OF GUAM

PUBLIC INVOLVEMENT

APPENDIX B

APPENDIX B

PUBLIC INVOLVEMENT PROGRAM
APPENDIX

TABLE OF CONTENTS

I. PUBLIC INVOLVEMENT PROGRAM

OBJECTIVES.

To insure that the desires and needs of the public were identified and considered, a public involvement program was developed. The public, as broadly interpreted by the U.S. Army Corps of Engineers, is any affected or interested non-Corps of Engineers entity; other federal and territorial government entities and officials; public and private organizations, and individuals. The public participation program is directed to maintaining information flow, achieving a mutual understanding and acceptance of the problems and opportunities, and attainment of interest level for proper decision making.

The objectives of the public participation program are:

a. To inform citizens of the current Corps of Engineers planning process and direction.

b. To surface key planning issues and concerns so that they are given full consideration.

c. To help formulate and review potential plans and improvement.

d. To offer technical, historical, and localized information pertinent to the study.

e. To provide a communicative forum between the Corps, local agencies, advocacy groups, and interested citizens on the subject plan and problems.

TECHNIQUES.

The types of public participation forums in this study are small meetings, workshops, and formal meetings:

a. Informal Meetings.

These meetings are of less than 10 persons with specific invited agency personnel, group representatives, or citizens. These meetings are undertaken at various intervals throughout the study to help the planners obtain information and address certain issues.

b. Workshops.

These meetings are informal exchange sessions open to the general public and usually numbering from 10 to 50 persons. The purpose is to promote the full airing of various views in recognition of current Corps' planning efforts. Public information notices and fact sheets are issued to all interested parties prior to the meeting.

c. Public Meeting.

A formal public meeting will be held at key points in the study effort. The purpose is to notify all interested parties of the planning effort to date and to obtain specific views on various items of the agenda. The meeting, presided by the District Engineer, will include a summary of findings to date, an informal question and answer period, a presentation of formal statements by others, and tentative conclusions. A public notice of the meeting is issued to the media and the general public invited. All information and statements are documented as part of the planning record.

ACTIVITIES CONDUCTED.

Detailed studies on a possible small boat harbor at Agat were begun in late 1976 at the request of the Government of Guam. In the initial study of the Agat area, Gaan Point was recommended as the selected site for a small boat harbor. However, during the latter stages of our study, Congress established the War in the Pacific National Historical Park. The compatibility of the harbor within the National Historic Park and the reevaluation of alternative sites for a similar harbor at Rizal Beach, Nimitz Beach, or Taleyfac Bay were discussed during a public meeting at the Agat Commissioner's office on 20 July 1979. At the meeting, it was the general consensus that construction of a small boat harbor at Gaan Point would conflict with the National Historic Park. In response to the Governor's letter of 5 September 1979, the Governor was notified on 1 February 1980 of the initiation of a detailed study for a small boat harbor at Nimitz Beach, Guam. A series of two workshops were conducted on 17 March and 23 July 1980 to obtain public views and comments on preliminary alternative plans for a harbor in the vicinity of Nimitz Beach. Details of the public meeting and workshops are provided in Section II of this appendix. A Notice of Intent to prepare a Draft Environmental Impact Statement (DEIS) for the Agat Small Boat Harbor was published in the Federal Register to notify those interested in contribution to the preparation of the DEIS.

A Draft Detailed Project Report and Environmental Statement was circulated to Federal and local governmental agencies, elected officials and interested groups and individuals for their review and comments. A public meeting was held on 21 January 1981 at Guam. The transcript of this meeting is provided in Section V.

The Draft Environmental Statement was filed with the U.S. Environmental Protection Agency and a notice of availability was published in the Federal Register. A forty-five (45) day comment period from the date of publication in the Federal Register was made available to those who wished to review and comment on the Draft Environmental Statement. No administrative action on the report was taken for at least ninety (90) days. Comments received during this review period is provided in Section VII (pertinent correspondence).

FUTURE COORDINATION.

The Final Detailed Project Report and Environmental Statement will be distributed for public review after approval by the Office of Chief of Engineers (OCE). OCE will file the Final Environmental Statement with EPA who in turn will publish a Notice of Availability of the Final EIS in the Federal Register. After a thirty-day review period a "record of decision" will be documented by OCE.

II. PUBLIC MEETING

A public meeting was held on 20 July 1979 at the Agat Community Hall, Agat, Guam. Public notices were sent to the local residents of Agat as well as to Federal and local government agencies.

ATTENDANCE AT THE PUBLIC MEETING

20 July 1979

Federal - Corps of Engineers

- Colonel Peter Stearns, District Engineer
- Mr. James Clark
- Mr. Mitsuo Waki
- Mr. David Sox
- Mr. Frank Rezac
- Ms. Sue Kim

Federal - Other

- Mr. Robert Utley, Deputy Executive Director of the President's Advisory Council on Historic Preservation
- Mr. Robert Barrel, National Park Service Director, Pacific Region

Government of Guam

- Mr. Antonio C. Babauta, Assistant Commissioner of Agat
- Senator Thomas Crisostomo, District IV
- Senator John F, Quan
- Mr. Felix Crisostomo, State Historic Preservation Officer
- Mr. David T. Lotz, Department of Parks and Recreation
- Mr. Michael J. Reidy, Governor's Office
- LT William Southwood, U.S. Coast Guard Section, Marianas

Individuals

- Mr. Glen Anderson
- Mr. Walter J. Chapman
- Mr. Raymond Crisostomo
- Mr. Cliff Cross
- Ms. Rosita Cruz
- Mr. Timothy A. Determan
- Mr. Nolan Hendricks
- Mr. William H. Hopkins
- Mr. Michael Ishizaki
- Mr. Henry T. Kami
- Mr. R. L. Keeler
- Mr. William D. Mian
- Mr. Gus Quidachay
- Mr. Vicente B. Reyes
- Mr. Jack W. Rice
- Dr. Robert Rogers
- Mr. Daniel M. Roller
- Mr. Robert Swigart
- Mr. V. T. Thompson
- Mr. Joaquin G. Topasna
- Mr. Robert D. Toves

SUMMARY.

The Corps of Engineers reviewed and briefed participants on the status of the study and discussed the issues concerning the compatibility of the Corps recommended plan for a harbor at Gaan Point with the National Historic Park Service's new War in the Pacific National Historic Park.

Statements made by three federal agencies concluded that the Gaan site was no longer considered feasible due to the conflicts with the War of the Pacific National Historic Park. Among the alternative sites discussed, the Nimitz Beach location was preferred. Real estate acquisition for project operation appears to have been a significant factor in selecting the Nimitz site location over the other alternative site at Taleyfac. Local officials and residents of the area reinforced their strong desire for a harbor and for action to expedite its planning and construction.

III. PUBLIC WORKSHOP I

The first in a series of two workshops was conducted on 27 March 1980 at the Agat Community center, Agat, Guam. Public notices were sent to the local residents of Agat as well as to Federal and local governmental agencies.

ATTENDANCE AT THE PUBLIC WORKSHOP

27 March 1980

Federal, Corps of Engineers

- Mr. Mitsuo Waki
- Mr. Bob Moncrief

Government of Guam

- Mr. A. R. Terlajc, Agat Commissioner
- Mr. Antonio C. Babauta, Assistant Commission of Agat
- Mr. John Perez, Santa Rita Commissioner
- Mr. David T. Lotz, Department of Parks and Recreation
- Mr. Gus Quidacman, Representative of Senator Quan
- Senator Ed Charfouros
- Senator John Quan
- Senator A. R. Umpingco
- Senator B. M. Palomo

Individuals

- Mr. Richard Randall
- Mr. Patrick McMakin
- Mr. Bill FitzGerald
- Mr. Henry Cruz
- Mr. Dan Forster
- Mr. Stephen Nelson
- Mr. Barry Smith
- Mr. Bill Hall

Individuals (contd)

Ms. Elsie Woodward
Mr. Roland Solis
Mr. Dan Matlock
Mr. Robert Anderson
Mr. Benigno Pelomo
Ms. Deborah Grasenbaugh
Mr. Jack W. Rice
Mr. Nolan Hendricks
Ms. Ella Rutledge
Mr. Cliff Cross
Mr. Tony Sublan
Mr. Felipe G. Pinaula
Mr. Lorenzo C. Cruz
Ms. Dolores Villarato
Mr. M. J. Cruz
Ms. Diane Lapola
Ms. Nanette Ferraris
Josefa Portodo
Mr. Johnny Chaco
Mr. Robert Cruz
Mr. Jess Torres
Ms. Rose Cabrera
Maua Dorato
E. Kovac
R. Munez
Mr. Jose Gueno
Mr. Ricardo Hecita
Mr. Geronimo Reyes
Joaqum Topasna

SUMMARY

The Corps of Engineers conducted an open discussion on the needs and concerns for recreational activities and its subsequent impact on the marine environment. No objections were voiced regarding destruction of some reef habitat by construction of a harbor. For preliminary discussions, two harbor schemes were presented for the Nimitz Beach offshore area. One concept depicted an entrance channel superimposed over the existing Nimitz Channel and the other showing the channel somewhat north of the Nimitz Channel. Mr. Terlajc (Agat Commissioner) recommended that the harbor be situated as far from the beach as possible in order to avert any detrimental effects from harbor construction. He suggested a harbor site between Pagacho Road and the C and H Poultry farms, since a 150-foot set back is available along this reach. Some of the problems and needs identified with the proposed project include:

a. Possible conflict with Nimitz Beach

b. Discharge of storm runoff into the proposed project vicinity

c. Lack of adequate circulation

d. Need for launch ramps

e. Real estate acquisition for project operation and backup facilities

IV. PUBLIC WORKSHOP II

A second in a series of two workshops was held on 23 July 1980 at the Agat Community Center, Agat, Guam. Public notices were sent to the local residents of Agat as well as to Federal and local governmental agencies.

ATTENDANCE AT THE PUBLIC WORKSHOP
23 July 1980

Federal, Corps of Engineers
- Mr. Scott Sullivan
- Ms. Elaine Tamaye

Government of Guam
- Mr. A. R. Terlajc, Agat Commissioner
- Mr. Antonio C. Babauta, Assistant Commissioner of Agat
- Mr. Thomas Crisostomo, Guam Legislature

Individuals
- Mr. Jack W. Rice
- Mr. Lorenzo Cruz
- Mr. Felipe Pinaula
- Mr. Carl Alerto
- Mr. Benigno Pelomo
- Ms. Martina Nededog
- Ms. Deborah Grosenbaugh
- Mr. John Eaels
- Mr. Joseph Herrera
- Mr. Fred C. Santos
- Ms. Brigida S. Terlajc
- Ms. Agnes Sablan
- Mr. Johnny A. Luces
- Ms. Janice Maloney

SUMMARY

The Corps of Engineers presented the participants with a number of planning and design considerations and preliminary alternative plans. The workshop participants were generally in favor of the planning and design parameters presented. The general consensus of the group felt that Plan 1, with a new entrance channel well removed from and north of Nimitz Beach Park and the existing natural channel, offers the most advantages. Possible problems likely to be encountered would be a lack of adequate circulation and flushing resulting in increased sedimentation and subsequent increase in maintenance dredging requirements.

V. PUBLIC MEETING

A public meeting presided by the Assistant Division Engineer was held on 21 January 1981 at the Agat Community Center. Public Notices were mailed to the general public, governmental agencies, the media and interested parties and individuals.

ATTENDANCE AT THE PUBLIC WORKSHOP
21 January 1981

Federal, Corps of Engineers
- LTC Kenneth E. Sprague, Assistant Division Engineer
- Mr. Timothy Young
- Mr. Frank Rezac
- Mr. John Ford
- Mr. Francis Dayton
- Ms. June Blaz
- Ms. Sueno Kim

Federal - Others
- Mr. Stell Newman

Government of Guam
- Mr. Tony C. Babauta, Agat Village Commissioner
- Mr. Juan N. Perez, Santa-Rita Village Commissioner
- Ms. Deborah A. Grosenbaugh, Bureau of Planning
- Mr. Ralph Reyes, Director, Department of Parks & Recreation
- Mr. Robert D. Anderson, Department of Agriculture, Division of Aquatic and Wildlife Resources
- Ms. Christie Anderson, Guam Environmental Protection Agency

Individuals
- Mr. Jaime Leano
- Mr. Jack W. Rice
- Mr. Vicente B. Reyes
- Mr. Antonio Q. Sablan
- Mr. F.G. Pinaula
- Mr. John Eads
- Mr. Ricardo Hecita
- Mr. Thomas Campian
- Mr. Manuel R. Babuta
- Mr. Andres O. Sulla
- Mr. Ken DaVieo
- Mr. Frank Kalman
- Mr. & Mrs. T.E. Duke
- Mr. Frankie Cruz Reyes
- Mr. Michael V. Ishizaki
- Mr. Sal S. Silpao
- Mr. Felit Mesa
- Mr. Duane D. Kelly
- Mr. Robert D. Toves
- Mr. & Mrs. M.J. Cruz
- Mr. Alex V. Constantino
- Mr. J.T. Aguigui

AGAT SMALL BOAT HARBOR AT NIMITZ BEACH
PUBLIC MEETING
21 January 1981

Mr. T. Babauta: Good evening. Thank you for taking time out to come down and share the information that the Army Corps from Hawaii is about to provide and also the Corps right here on Guam. I believe this is the moment we have been waiting for. We are approaching D-Day on the Agat boat basin; like Commissioner Perez said, it is long overdue. I myself am ready to start eating fish from some of the fishermen utilizing that boat basin in that area.

First, I would like to introduce some of the people we have tonight as our guests. First may I call upon the Assistant Commissioner, Mr. Joe Reyes; I would like to introduce my new partner. From the Army Corps in Hawaii, we have Colonel Sprague, Deputy District Engineer. We also have Miss Kim, the Secretary; Mr. Timothy Young, the hydraulic engineer and project engineer; Mr. Frank Rezac, the Public Affairs Officer, and Mr. John Ford, the environmental biologist. Of course, our big brother, my white brother, Mr. Frank Dayton, the Chief Engineer from the Army Corps right here in Guam. We also have sharing the evening with us, Dr. Stell Newman from the US National Park Service. Thank you for taking time out, sir. From the Parks and Recreation we have Mr. Ralph Reyes representing the Director. And, I don't want to miss my brother, the Commissioner from Santa Rita. He's always spying on us on what's happening in Agat, and I think that's why he's down here tonight. Welcome to our boat basin, John.

Now I would like to turn it over to Colonel Sprague, please.

LTC Sprague: Thank you, Tony. Welcome to the Corps of Engineers -- if I don't speak into the microphone, Sue can't get it on the recording. Might as well explain right now--we record what everyone has to say here tonight so that we can have an accurate transcript of your thoughts and ideas on the Agat small boat harbor plans. Based upon your input and all the other inputs we have, we'll come out with a final plan sometime after the middle of February. We'll receive written comments up until that time. So later on when we give you an opportunity to make your comments or ask questions, we would ask that you use the mircophone. That way it does on the tape and we'll be sure to get an accurate reading of your thoughts. It's very important to us; that's why we are here.

I know this project has been going on for some time. We had a workshop last summer in which there was an opportunity for people to interact with our staff and provide some input. Based upon that, we've come up with a draft report, and there are a few copies of the draft report left, as well as the yellow public meeting notice which has some information on the project. We'll have a box up here and if you want to write any comments down or any questions that you don't want to bring up at this time but you would like to have us entertain, you can leave them with Mr. Rezac and he'll take care of it. Or you can write to us, up to the middle of February. Now, we have asked you to fill out one of the blue cards, the record of attendance. Your name will be recorded in the plan itself as one of the members attending the meeting. On there we ask if you would like to make a comment during the course of the meeting. We will give you an opportunity after the presentation to do that. If you didn't indicate that you wanted to and you feel moved to speak during the meeting, we'll provide an opportunity for that as well. Has anyone not filled out the blue card?

We have a couple of other officials that are here according to the cards. We have Robert Anderson from the Division of Aquatic and Wildlife Resources, Department of Agriculture; we have Christie Anderson from the Guam Environmental Protection Agency; Debra Grosenbaugh from the Bureau of Planning. I think everyone else we had mentioned.

At this time, I would like to have Tim Young, who is the project engineer and who will be responsible for the preparation of the final plan, to come up and give a presentation on where we are at this point in time on this project. After that, you will have an opportunity to make comments, and I'll take the cards in the order in which we received them indicating those who would like to speak. Tim?

Mr. Young: Thank you, Colonel Sprague. Tonight I will be showing some slides with my presentation. If you'd like clarification of anything I've said or of anything you see, please feel free to ask questions. A question and answer period will be provided at the end of my presentation.

I'm sure most of you are aware of what has been going on with this study. I will just go over some brief background information for those of you who are unfamiliar with this study.

This study was initiated in August 1979 with a request from the Governor to investigate the possibility of Federal participation for small boat navigational improvements. The original sites considered were: Rizal Beach, the Namo River area, Gaan Point, Bangi Point, Taleyfac Bay, and, of course, Nimitz Beach. Rizal Beach and Bangi Point received no support and therefore were dropped from further consideration. Of the four remaining sites, the Gaan Point site was favored. During initial investigations, the War-in-the-Pacific National Historic Park was authorized and established making Gaan Point no longer compatible with the historic park. Among the remaining sites, the Nimitz Beach area was preferred by the Government of Guam and the local community.

Here we have an aerial photo of the Nimitz Beach area. On the left portion of this slide is the existing Nimitz Beach channel, and on the far right is the area where the new existing channel will be located for two of the alternative plans.

The first plan (1) utilizes an entrance channel through the extensive reef flats. This offshore harbor plan consists of a main breakwater, detached breakwater, revetted moles, and a revetted accessway. Circulation box culverts are provided through the revetted access way to provide water circulation along near shore areas. Openings within protective structures are provided for circulation within the harbor basin. This plan will provide berths for 150 boats and parking for 75 car stalls and 20 car-trailer stalls.

Plan 2 utilizes a 1600-foot long entrance channel through extensive reef flats. This plan consists of on-shore parking and a detached main breakwater. This plan, as well as Plan 1, is well removed from the Nimitz Beach Park area.

The next two plans, Plan 3 and Plan 4, utilizes the existing natural channel. Plan 3 will provide 150 berths and 75 car stalls and 20 car-trailer stalls. A revetted accessway is provided to the parking areas and a circulation box culvert through the revetted accessway is provided for near shore circulation. Plan 4 is similar to Plan 3. This plan provides for 80 berths, 40 car stalls and 15 car-trailer stalls.

Plan 5 was not included in the draft report. Based on the input we received from the last public workshop, there was no support for this plan. Therefore, Plan 5 was not included in the draft detailed project report. Plan 5, however, was reconsidered based on favorable costs and minimal environmental impacts and is being included in tonight's public meeting. Plan 5 is very similar to Plan 2 in that it also provides for onshore parking. This plan, like Plans 3 and 4, will also utilize the existing natural channel. Our wave studies indicate that utilizing the existing natural channel provides much greater navigational safety.

Shown on the front wall is a cost benefit summary of all of the alternative plans. The first item is the project first cost. Plan 1 will run approximately $4.3 million; Plan 2, $4.2 million; Plan 3, which is a 150-berth harbor, $4.03 million; Plan 4, $4.4 million; and of course, Plan 5, $3.86 million. The average annual cost and the average annual benefit are shown right below each of the plans. The second table on the right is the apportionment of cost for the various harbor plans. In all of these plans, the Corps of Engineers' cost sharing is limited to $2 million which is the maximum under our Section 107 authority. US Coast Guard first cost share was estimated to be $45,000. The nonfederal cost for each of these plans is as follows:

Plan 1, approximately $2.3 million; Plan 2, $2.2 million; Plan 3, $1.9 million; Plan 4, $2.3 million; and Plan 5, $1.8 million.

In all of the alternative plans shown, the Corps will be responsible for the dredging and maintenance of the entrance channel, the turning basin and the access channel. The dredging of berthing areas will be the Government of Guam's responsibility.

That about concludes my presentation. Colonel Sprague?

COL Sprague: I would like to explain one thing on that $2 million. We have a small projects authority in which Congress gives us, the Corps of Engineers, a certain amount of money that we do not have to then go back to Congress and receive the specific authorization to do the project. It's called Small Projects. $3 to $4 million is not really small. We've been very fortunate in the Pacific area in being able to get money to do those projects that we receive the local support for. There is some competition; there's only a certain amount of money that the Chief of Engineers has discretion to award. We feel here in the Pacific that small boat harbors have a great deal more benefits and are a higher impact on the folks in the area than similar type projects might have in Florida or California or some of the other areas. We've been very successful

in getting that money, but it is a $2 million limit. There is some talk, and they've been trying to get Congress to have that limit raised but without much success. Even if the limit were raised, they wouldn't necessarily provide total more money; there would probably be fewer projects constructed each with a higher dollar value. So, that's always a consideration. For that which the Corps builds, we retain responsibility for future maintenance dredging and breakwater repairs. For example, if you did have a severe storm and the breakwater was damaged, that would be repaired with Federal funds.

OK, there are several people who have indicated that they want to make comments at this time. The first one is Mr. Perez who is the Village Commissioner from Santa Rita. Did you want to make a comment at this time? Would you please come up to the microphone?

Mr. Perez: Thank you for this opportunity. I would like to make some comments on these plans. I believe that we are all looking forward -- it's a long overdue project. This actually was initiated way back in Governor Camacho's time and was started first from across the street and then we keep on going on to Nimitz Beach. Now, the comments I would like to make are in the use of this Plan 3 you will be using the natural channel. That will deprive the fishermen as well as the snorklers, swimmers in the natural channel. That's Plans 3 and 4. My opinion is that Plan 2, to berth 150 boats, is more feasible. It's closer to the beach and I believe it would accommodate a lot of the cars as well as it would be easier to launch the boat. I hope that this will become a reality and materialize in Guam because we sure need this. It's a long overdue project, I will repeat that. I worked hard way back and up to now we're still working on it. I know that everyone will enjoy boating and the people of Guam are boating enthusiasts, as well as the visitors here. So, thank you for this opportunity.

LTC Sprague: The next card I have here is Mr. Jack Rice.

Mr. Rice: Thank you, Colonel. Ladies and gentlemen, I've been up here quite a few times. One of the things I'd like to comment on before I read the letter I have is actually the plans and thoughts for a boat basin. Agat started with the first legislature on Guam way back in 1950 and every two years since then, there's been a bill put in for it and we still don't have one. The new areas, since 1971, the Corps of Engineers became responsible. I was in Alaska little over a year ago, and at Dog Bay, they have many thousands of boats and they are having the same problems. They have been for fifteen years trying to get a boat basin there and they've already got the boats. A little bit earlier, I was talking to the Colonel, and he was telling me that they've got the same proposition in Hawaii; they have problems. So, good luck to us.

I have a letter here that is going to be sent off to the Chief, Engineering Division, back there:

Dear Sir: As you know, I have been interested in boat basins on Guam since 1955. Agat has been my prime concern since 1963, not only because I live there, but because I have manufactured boats in the area and I'm interested in charter boat operations. My studies indicate that Agat could quickly expand to a 100-boat charter fleet. Several letters and my statements at public hearings bear this out. I agree with your choice of Site Plan No. 3, although I believe the original design for that area was far more practical than the present proposed design. I also believe there have been several deviations from your own directives and from the standpoint of cost. Please allow me to convey the following thoughts on the matter.

I believe that leaving the entrance channel parallel to the swimming area will be inviting for youngsters to venture out approximately 400 feet or so to dangerous waters. This condition could necessitate the employment of full-time life guards overlooking the area. The channel is only about 150 feet wide. There are some kids out there monkeying around. There's no maneuvering area because you're going to have boats coming in and going out if you've got approximately 150 boats utilizing the area. That does not include the non-resident boats that are tied up there. There's going to be quite a few that would be launched.

No. 2. Due to our present high fuel cost and also the congested road conditions all over Guam, it should be more practical and much less expensive to drill and set charges below grade on the reef flat during low tide when the fish are out and use the resulting rip-rap right on site rather than bear the expense of hauling it the length of the island from some quarry up north. In this manner, the main objective of building a boat basin rather than a reef flat surrounded by a mole can be achieved. Insurability of boats by boat owners in this area requires that adequate means of protecting the boats against preeminently severe typhoon damage be made available. In order to entice future boat owners of Guam to use the proposed facility, a swift and sure method of removing the boats from the water to shoreside parking or inside of sheltered areas must be made available. Boat owners have a substantial investment in their boats and consideration should be designed into the original structure to provide adequate protection and insurability of their investment. In case of emergencies, such as typhoons, the design shown may not be conducive to rapid transfer craft from the water to the shoreside shelter. Rapid and efficient means of removing the boats from the water in the event of oncoming typhoon may certainly help reduce insurance rates of Guam's future boat owners.

Here, I've got a note. Please note: my designs of underwater gear, props, shafts and rudders are to allow us much freedom from damage as possible in carrying out the above. I hope to have trailers and so forth to be able to pull the boats out. As shown in the plan, you've got a 36-foot boat, which I hope there's going to be quite a few of them, maneuvering the trailer to haul that size boat into pick up the boats from the waters, etc., is going to be pretty difficult.

In summary, let's do it right the first time. Make this boat basin deep enough to accommodate larger craft even at low tide. This can be done with the material already there. May we always consider the safety of our children first; the foundation of this plan then should be large enough to include room for future expansion that we anticipate without major alterations.

Conclusuion. The original Nimitz Beach plan that you proposed tends to serve Guam better than the subsequent plan submitted.

Thank you for your efforts to review this matter with me.

Respectfully, Jack W. Rice.

One comment I want to make. If these comments in anyway slow us down in getting our boat basin, disregard them, but I think they should be taken into consideration.

<u>LTC Sprague</u>: Thank you very much, Mr. Rice. Mr. Vincente Reyes?

<u>Mr. Reyes</u>: Good evening, ladies and gentlemen. My name is Vincente Reyes and I represent Agat. I've been up here several times ever since the Army Corps of Engineers came over here to all the workshops, and every time I come up here, I put out my comments. We have suffered a lot because of lack of facilities that the boat owners are requesting. As a matter of fact, I even mentioned one time, if it's feasible for the Army Corps of Engineers to give us a little leeway until we can pour our own cement, so that we don't get stuck on the beach. A lot of times, we go out and come in late at night. There's high tide and we can't bring our trailer out or low tide we can't bring our trailer out. When we do, we get stuck in the mud and there's nobody in sight to help us because we are out alone on the beach. That is why I am very much interested in this project, and I would really like and appreciate if the Army Corps of Engineers would materialize this dream for us. This, in conclusion, I would greatly appreciate if we support these people and let us have our boat basin rather than to bicker here and not get anything done. Thank you, ladies and gentlemen.

<u>LTC Sprague</u>: Thank you very much, Mr. Reyes. Mr. Antonio Sablan?

<u>Mr. Sablan</u>: Thank you, Colonel. I really wasn't going to speak tonight. All I'm hoping is that the marina will come into reality. The only reason why I dared to come up here to speak is because of my disappointment of the last marina that was proposed by the Army Corps of Engineers at Gaan Point. As a matter of fact, I don't know if any of you had read my letter regarding that proposal. And, again, as a matter of fact, I wrote to Colonel somebody in Honolulu regarding this, and I received a reply from someone in that office that this meeting is going to be held tonight, and if I would like to come and express my opinion.

I'm glad that the marina will finally come into reality but considering the strike that's going on for increase of salary and money that local Government of Guam is going to put out, I don't know how much reality it's going to be. According to the Colonel, the $2 million is here but according to our local funds, I wonder if the $1.some million is going to be available for the Agat boat basin. I just hope and pray that it will come into reality.

For years we've been hoping and praying that something like this would come up. I was so disappointed again when I saw at the post office, the permit for the Merizo marcon landing was approved before Agat. And all these years, Merizo always have a better facility for boating than Agat. And here again, Merizo, their permit; Agat doesn't have anything. I don't know why our leaders always bypass Agat; I don't know, really. Agat and Santa Rita go together--good size village, lot of people, but like I said, I'm just happy that this marina will come true.

Only one objection that I would like to make at this time. I don't know if any consideration has been made. In past experiences, if you notice the driveway from the beach going out -- anyway, there will be an opening there, right? Culvert, yes, OK. I notice that the culvert in Agana causes an extremely heavy current, and if that thing should be put up there in Nimitz, it's going to cause a very heavy current causing heavy current to go out towards the swimming area. That, I hope, something will be done because you realize that it's going to cause a lot of pressure going through that swimming area and somebody is going to get drifted out by that current. Even without this, the current coming from Bangi Island is going all the way down to Nimitz; that's how the current goes. I don't know if you people are familiar with it, but I know because I live there all my life. With this thing being blocked, and only as more culvert there for the water to pass, is going to cause a tremendous strong current and somebody might just be carried out to the open sea. That's all I have to say. Thank you.

LTC Sprague: Thank you very much, Mr. Sablan.

A couple of things--we are aware of which way the current goes and we are planning for that. The other thing is that the Agana small boat harbor, you have a lot more collection area for the current to come through. There is a strong current. These culverts will be properly sized to reduce that current if the plan selected needs the culverts and the causeway going out there. That's a point well taken.

I'm really pleased first, with the turn out that we have tonight, especially from the public officials as well as the people from the area. But this process, although it's a small project and can go much rapidly than a specifically authorized project from Congress, those specifically authorized from Congress take an average of 20 years from the time Congress authorizes the project until it's complete. These go, we think, much more rapidly, but it's only a matter of degree. After this final plan is developed, after the written comments come in, there still needs to be environmental impact statement, we need to go through the formal process, we have to get the assurances from the local government that in fact they will support the plan, and then at some time in the future, they would have to sign on the dotted line that they will provide the money. And only after monetary commitment is given, can we then go out and contract. We do this as rapidly as we can, but it's with all due concern for all the processes that have to be gone through. We understand your desire for this and your concern that time has gone on forever; yet it will be, even with the best of circumstances, some time yet before the harbor could be brought into fruition. So, patience is necessary, but let people know that you are interested and you continue to be interested in the project. Your support here tonight will all be duly documented. You also have to show the local entities here of your support for this project that it is something worthwhile and should have an appropriate level of priority in the scheme of things. That's why I'm happy to see so many people from the various government entities here tonight so they can also see your enthusiasm for the project.

We do have the two different channels here as a possibility, and one thing that Tim has mentioned, is that we have done some wave studies as mentioned in the draft plan. Our studies show that the Nimitz Beach side channel,

that closer channel, is actually a safer channel for boating because the waves defract away from the channel and it keeps that channel fairly calm, even in moderately rough seas. The other channel doesn't work in exactly that way. It has more of a tendency for the waves to come on down the channel and it is a long, narrow channel coming in. With waves coming down that longer channel, you may have some difficulty from time to time. So, there are a variety of considerations that we go through on this. I just want to make sure that you are aware of that point.

OK, let's get some more comments from the floor. Mr. Pinaula?

Mr. Pinaula: Thank you for the opportunity. I would only like to present my view on the two plans that is projected there on the board. The advantage of the two plans is that the channel on rough waters...I've been boating for 25 years and 20 years trailering my boat out of the water. I realize that the channel in Plans 1 and 2 are the best plans because of wave action. It's the deepest channel on the site proposed. Under medium rough waters, you can get in and out safely. The disadvantage of the plan, Plan 2, is that it's too close to the beach and I would prefer Plan 1 because it discourages vandalism when you park your boats and your cars out there because they have to go out that accessway. Everybody notices vandalism if you park your cars -- that's the disadvantage of Plan 2. That's all. Thank you.

LTC Sprague: Thank you very much. Mr. Ricardo Hecita? (No comments) Sal S. Silpao? (No comment, sir.) John Eads?

Mr. Eads: I'm here for the fishermen corporative and I'm also here for myself because I like to fish out of Agat. My main concern is the access and the greatest concern is the Government of Guam coming up with the lump sum of some \$1.8 or \$1.9 million for the preferred plan. I guess we've all been involved and most of you fishermen know what's been happening at the Agana marina. It was done in an incremental policy; that is the Army Corps completed its work, and now the Government of Guam reluctantly at best is coming up with bits and pieces of money to do things slowly. What I would like to see is that we take parts of Plan 3 and Plan 4 and at least get the launch ramp, the channel, and the turning basin built and let most of the fishermen of Agat who use trailer boats have access to the ocean. That is one of the greatest problems we have--anybody that wants to fish from Agat can either take a chance at low tide or buy a four-wheel drive or leave it on the beach and you don't get a chance to go out. It may take you four hours to get ready to go fishing and it's not cost effective with the price of fuel.

I think the most important thing that can happen here is for the Army Corps and the Government of Guam to come to some sort of agreement on an incremental plan. First, get the launch ramp, the turning basin, and what can be built with Federal funds. Start it, and then as Government of Guam comes slowly, as they are doing with the Agana boat basin which has been completed, start putting in slips, putting in fuel piers, putting in the other things that are needed. If we ask the Government of Guam for a lump sum of nearly \$2 million, I think you've all heard what's happened. I don't think we can expect to see things go ahead, and I think it's most important for the Army Corps and the Federal people and the local government to come to some agreement on what can be done on an incremental basis and at least get the first part, the launch ramp. Let most of the Agat fishermen who now use trailers get out and fish easily. That's all.

LTC Sprague: Thank you very much. I'd like to comment very briefly on that. When we talk about the $1.8 up to $2.3 million for the various projects, if you notice, the nonfederal first cost has a little "3" there. It says, it does not include the cost of self-liquidating facilities such as the berthing facilities, dredging the berthing area, utilities, etc. That is the incremental aspect that's going on right now at Agana. The whole package of the breakwater, the entrance channel, and the turning basin, that's where the money is. Right now, we don't have the authority to let the Government of Guam say, "Let the Corps build $2 million worth and then we will come up with the roughly $2 million along the way and do the rest of it." Among other things, the Corps is under the mandate to provide a nearly complete facility, at least as far as the dredging and the protective structure itself. We have to do that; otherwise, we cannot obligate the money. The other aspect of it is spreading it out over a number of years on breakwater construction is not necessarily cost effective. In fact, it is probably going to cost you a great deal more, especially with the recent inflationary rates than if it were committed now. That's a very real possibility. You would have to mobilize the contractor each time to do another little piece, whatever the Government of Guam would come up with a per annum basis, and it would be very inefficient as far as getting something done in addition to the effects of inflation. We have the comments; we've talked to various entities in the Government of Guam and will check back and see. We are willing to explore any possibility; I just do not want to raise false hopes. This is not something that would be just a discretionary matter that I could make a decision and say, "well certainly, that sounds reasonable." We go by a lot of restrictions and regulations ourselves even though we are a part of the regulatory function. We are only a channel for the federal government to participate with the local entities in creation of these needed marine facilities. Are there any questions?

Audience: I would like to ask sir, how come none of our representatives are here--members of the legislature or a representative from the Governor's office?

LTC Sprague: That's a good question, and I don't have an answer for you.

Audience: If you have a plan, something that will seem like it will materialize, because everything depends on their decision, really this is just a useless meeting because you have your $2 million, like you said, but the rest of the money has to come from the general fund. And yet the people that are responsible, none of them are here. Maybe the Commissioner can answer that. How about the Commissioner from Santa Rita?

Commissioner Perez: Well, I don't know. I received my letter inviting me here. Of course, I hope that the Senators know about this meeting, but even if they don't know we'll ask them for some input.

LTC Sprague: That is a good question and we like to have as many representatives as we can from the various agencies and entities involved so that all can hear the same enthusiasm and questions. However, the purpose of this meeting is to provide all of the individuals and representatives of the various groups, as well as various governmental agencies, an opportunity to comment on the plans that we have come up with to meet this need. Although costs are involved and it is necessary to realize what those are and the impacts that it has on the projects, it is primarily an opportunity to comment on the plans as they exist.

Even if any entity decides to comment on the engineering aspects of it and the use aspects of it and the safety and all these other things, they may not have felt that this was a forum for that.

We happen to like this process, public involvement, because we think it is very necessary to meet the needs of the people in the area, and that's why we are here. That's why we had the workshops. It's very easy to sit back in Honolulu, which is a long way away, and make decisions that affect you, but we like to have you here and like to have the involvement. So, that's a good question, but there may be another forum you may have to influence your senators and congressmen and legislatures in the financing process.

Audience: If the Government of Guam does not come up with its share, would the project be terminated?

LTC Sprague: OK, the question was, if the Government of Guam does not come up with its share, they are not able to come up with their share, would we scrap the project or terminate the project. We will carry it as long as it is an active project. Now, in order for the Corps to proceed into design, what we need is an assurance from the Government of Guam that they intend to support this project. They sign a letter, it's a gentlemen's agreement that says, yes, the Government of Guam thinks this is a good project and intends to support it. But they have obligated no money at that point in time and the Corps will continue to move forward with the environmental impact statement and final designs, etc. Then will come the time when we say, "Gentlemen, we'd like to see a little hard cash on your part; we need the guarantees now." At that time, it is possible that it would go into an inactive status. About the only way we would terminate this is if the Government of Guam said that it did not intend to support this project or if the people in the area said they did not want a small boat harbor here, that it would ruin their way of life. We have had this happen in areas where the local interests have indicated they do not want a small boat harbor, and we have terminated the project. So, if the government won't support it or the people won't support it, then we will terminate the project. It is not a quick death if they cannot come up with a check tomorrow for the money. Mr. Rice?

Mr. Rice: I put in a lot of years in what might be called public works type projects. You have a figure of $10/cubic yard for dredging. I add up all these other things and we get 150,000 yards of total dredging due and we've got approximately 150,000 yards of revetment to build. The total won't come out to any $6 million. I'm wondering, on the engineering bit, any engineer can design a wall that they have to haul the rocks for 40 miles. On all the projects that I have worked on overseas, we attempted the design so that all the materials came on site so we didn't have this additional 5 or 6 million or so to come up with for any particular project. I can't quite see where we get the situation of hauling all this stuff from somewhere else to build this wall. Each contract that has come down from the Corps has been designed in the manner where we have to haul the stuff the entire length of the island. I would like to have a comment on that.

LTC Sprague: Alright, basically the question is, why can't we use the on-site material to build the protective structures. To the extent possible, that can can be done. Our dredging is confined to the limits of the project. Environmental concerns, which will be addressed in the Environmental Impact Statement, is the impact of any dredging whatsoever in this area. Extra dredging to create materials for the protective structures--I know you are saying that it balances--would have to be evaluated. Well, we also have to go to the quality and the size of the material. We go through a very restrictive process when we build these structures and the specifications and the quality of the construction that we do. In other areas like flood protection, for example, people say, "we'd only prefer to have built to the 20-year flood." Well, our requirement may be to build to the 100-year flood. We have regulations that come down from Congress, and we have our Principles and Standards that we design the civil works to and we don't have a lot of deviation from them. We have no vested interest whatsoever in trying to make a project expensive. In fact, if anything, the cheaper it is, the more likely it is to go. We want to build a quality product that will do the job for you, and that's what we intend to do. Consideration is always given to efforts to keep those costs down.

Mr. Rice: In other words, the Corps sampling out there indicated that the materials were entirely too soft to be utilized.

LTC Sprague: A lot of it is, and the probability of being able to use it is low. We have value engineering by contractors that say, "hey, we can do this; I can provide the rock out of what I'm cutting out of there and it will save us X-amount of dollars." We share this savings with the contractor. In this case, the savings would all go to local entity because our $2 million is the base price and everything else is on top of that. Anything that can bring the cost down would be a savings to the Government of Guam and to the taxpayer in general. So, we have the best interest in trying to keep it as low as possible. This is a reasonable, at this point, engineering estimate of what it will cost to do it.

Audience: I noticed in the papers, perhaps last month, that Saipan was building a fisheries complex. Is the Army Corps involved in this project?

LTC Sprague: Not that one, no.

Audience: It's an indirectly federally funded project that CNMI is building for the fishermen. It seems so difficult for us to find out what the funding sources are and how can Saipan afford to build a facility when Agat cannot build one. Maybe the Corps can help us find a way.

LTC Sprague: Well, if we were involved in it, the question of the funding for the facilities in Saipan, then it would not be too difficult for us to know what was going on. The fact that it is a shoreside type operation, we're not even involved in a permit-type basis where we have a regulatory function. So, you are right, I suspect that indirectly, at least, Federal funds are coming in. It is the only source there is, really. They have, I believe, a Capital Improvement Program which is funded through the Department of Interior that Guam doesn't have. So, I think they have a different source of funds that are coming out of the trust that is not available to you. I suspect that's it.

Other comments, questions?

We'd like to thank you very much for your presence here. I realize that you would all like to see a project underway as soon as possible because you see

the need and you would like to be able to use the harbor. As someone said, he would like to taste the fish before long. We share your concerns, and we'll promise you this--that we will take as expeditious action as we can to insure that a quality product is produced to meet your needs and within the mandate we have, the laws and regulations that we have. We thank you again for your attendance tonight.

OK, we have a question.

Audience: What we are talking about is mostly money involved in completing the project. You don't know if the Government of Guam will get back to you; you do know that you have Federal funds.

LTC Sprague: Well, we don't know that we have. We know that there are Federal funds for which we can apply for this, and we have reasonable expectations that they would be available. We have been very successful in gaining those funds.

Audience: How much money do you think could be available for this?

LTC Sprague: If this project, in the final stage, we get the approval, we would have the $2 million. That's the limit of our authority.

Audience: Alright, $2 million to do a certain amount of work.

LTC Sprague: To do the project right there (pointing to drawing). $2 million of that $3.8 or $4.3 million.

Audience: OK, forget about the Government of Guam. Let's use the Federal money and as this gentleman said, let's put the fishermen in the water with that $2 million. Think about this gentleman who is speaking about putting the boat in the water, and I'm pretty sure that $2 million will take several boats out in the water. After that, maybe we can go to the Government of Guam to donate a little money. Government of Guam has the money. What we are talking about is appropriations. We are not operating within our framework when we talk about money. Nobody here can raise money; all we do is talk. We repeat the question and repeat the problem, but we do not have a solution. Take that $2 million and let this man go out in his boat; he can go out with that $2 million. And, according to Mr. Rice, with that project, the area is limited to incoming and outgoing boats, but there could be a way to square that problem. There should be a ramp for a 30-foot boat, there should be a ramp for run-about boats, and there should be a ramp for sail boats. They don't have to congest in one family but on an individual basis. So, we are talking here about how the fishermen will go out into the waters. That's our principle concern, and if we use that $2 million, I think we can put the fishermen in the water. They may not catch fish, but at least, they tried.

LTC Sprague: Alright. That point has been made, and as I said, I don't believe that it is within our authority to do that, but we'll check every way we can to see what we can do. I don't want to leave you any false hopes. I think I understand the situation pretty well, and I just don't believe that that is possible. That doesn't mean that we won't pursue it with whatever vigor we can to see what can be done. We have asked--in the past there were some legislative initiatives for here in the Pacific to realize that it is not the Great Lakes or mainland U.S., that there are different requirements out here. But that's a long process. We brought the Assistant Secretary for Civil Works, Mike Blumenfield, out here last spring. He was very impressed. With the change of regimes in Washington, he will be gone and we will have a new person there. We are going to try and bring whoever fills that position out here as quickly as we can so that he/she can appreciate your problems that are somewhat different that the mainland U.S. But, right now, it does not look like we can do what you are asking. It is on the record, your questions and concerns, and those have to be addressed and answered. We are not the people with the money here. We are talking about the five plans in order to support your needs.

Mr. Rice?

Mr. Rice: What I was trying to say is that the 150,000 cubic yards of dredging and 150,000 cubic yards of fill at $10 is $1.5 million. We don't have the champaign but at least we will have a boat basin; we'll have a place that can be used. It won't be so pretty, it won't have all the rocks nicely placed in there, but at least we'll have a boat basin that maybe somewhere in the future, we can say, "hey, we need to put some armor under that." But we need the boat basin. What we are getting here is the cart before the horse as far as designs that have been coming out. We have a boat basin down here that was built three or four years ago and you can still wonder around it at low tide. That, I believe, is our objective of what we have been asking for. The people are not aware that when we were finally granted the privilege to have the Corps come out here and show us how to built a boat basin, or issue permits or whatever, if I wanted to take a boat basin out here on Guam, apparently I would have to instead of putting it up for $250,000 dredged out with riprap, etc., I wouldn't be able to build that because it would not meet Corps of Engineers quality type thing. I would have to build a $2 million one. Then you come up with your cost benefit situation, and I've got a $2 million outfit that's going to take me until hell freezes over and all my grandchildren for many, many years before we can pay for it. I would like to see a $1.5 million project that we could start using. This is the type of things we are concerned about.

LTC Sprague: I appreciate your concerns. Over the years, on various protective structures, we have found that if you don't build it to the standards we set, we are throwing away money. You say, yes, you can have that out there and you start using it, but that material would start coming right back into the basin and you would be screaming at us to come in and dredge it out. Don't tell me you wouldn't; you would be the first one on the horn saying, "hey, I can't get my boat out of there." And so, we are going to build you a quality product or we are not. Now, you can get your local government or you, yourself, to ask for a permit to do something less. But the Corps of Engineers, as the agent of Congress, to use this money, we have to use it within the Principles and Standards given to us. If I do anything less, I am not doing my job right. I appreciate your concern; I understand how you think you can get something by being able to manipulate this $2 million and have at least a better facility than what you have now, but that's not the way they give us the money. This is not within discretionary powers of the District Engineers. I have a lot of discretion with a variety of things where I can express my professional judgment, put my name on it, and that's the way it is. The use of the small projects money is not one of those things. The Chief of Engineers does not have

that authority. We're given this money by Congress within certain laws and regulations--we would be breaking the law to do anything else, and I'm not going to do that.

Mr. Rice: That's what I wanted to hear you say.

LTC Sprague: OK. Tony, you had another question?

Mr. Baubata: Yes. Two years ago when this same meeting was called, it wasn't you at that time, it was another Colonel, he presented us with several areas here in Agat, including Gaan Point. At that time, the same amount of money was allocated for appropriation by Congress of $2 million for small projects. The reason Gaan Point was selected was that it cost only $1.7 million. Nimitz Beach, at that time, was estimated at $2.4 million. Maybe, Colonel, your request could be made to Congress to increase the small project amount because of the inflationary price which continues to exist. Like I said, with that $2 million, in two years maybe they can allow you another $1 million.

LTC Sprague: I wish it were so and I wish they would increase the funds appropriately, but until they do, our authority is limited to $2 million. Personally, if we waited for that to get to $3 million, the project would probably cost $9 million by then because of inflation. They are not likely to catch up.

Mr. Baubata: Colonel, why was Gaan Point cancelled?

LTC Sprague: Basically because of the Park.

Mr. Baubata: It was before the park it was finally decided to take over because we had the meeting here and we decided Gaan Point, and then the Park came in.

LTC Sprague: Yes, that's true. That's why I mentioned that this still has to go through a process from this point on of coordination with the various Federal agencies, environmental impact statement, all those things still are the future on this. And that type of process, when you come there and another Federal entity says, "This is going to be a park," we have problems with historic preservation, environmental constraints, someone finds that there's a seagrass down at Nimitz Beach that grows only at Nimitz Beach, that could be a severe problem. Not necessary insurmountable, but a severe problem, and that type of thing comes up and has to be dealt with at the time. The problem at Gaan Point was insurmountable and the project has been shifted to Nimitz Beach. We have now come up with the five plans for Nimitz Beach and that's what we are addressing. We serve the public interest, but there are a lot of publics and that makes it difficult.

Audience: What we are doing here is saying something that has not come up to specifics. Now, if the money is returned to this project, there is nothing we can do. We can sit here all day and all night and we are not going to do any work. Now, if we can get that amount of money so that it can be used.

LTC Sprague: It cannot be used without the Government of Guam participating to the full extent of the project.

Audience: So, there's no need coming here tonight.

LTC Sprague: The need to come here tonight is to talk about the project. If you don't have a project, there's no way you are going to get any funding for it. One of the first steps is deciding upon the plan that is feasible, usable, and meets all the constraints in the system and then along the line you get the authorization and the authority and the money.

Audience: I think this is nothing but gobble-dee-gook.

LTC Sprague: Alright. Everything that is said here, including your gobble-dee-gook comment, goes in the record. When we have the final plan, the Government of Guam, all of its agencies, will get copies of that and your concerns, verbatim, and so indirectly, it will get to all the entities that have the decision making for the release of the money. But you are right in saying that we are not going to come to any decision on the money tonight. That was not the purpose of the meeting. I appreciate the concern; I think there are some very good questions and they will go into the record.

Audience: What we got here is that we have an elaborate plan--just like planning a big party. You plan to have hummingbird's tongue, ice cream and baked alaska when you've got hamburger money. You can't make a plan like that. You cannot make it elaborate when you don't have it.

LTC Sprague: It is not elaborate. It is the minimum, essential to have the project. You have to have the protective structures. That's what we're providing for you. We're providing a place to put your boat that will be safe from the elements. In order to do that, we have to dredge the entrance channel. Those are all parts of the aspect of providing this for you. We are not in the business to build boat ramps; we can provide a protective structure for your boat ramp, that's a possibility. We've done that on the Big Island at Pohoiki. We built a protective structure to protect an existing State-funded boat ramp, but the channel was there, and they just needed a way so that they would not have 8 men and 2 jeeps and a small boy to direct them to get a boat in and out of there because of the wave action. Now, it's a beautiful boat ramp that the local fishermen and people use. So, that can be done. You can build a protective structure for a boat ramp. But, when we start talking about providing a harbor for you, this is the minimum--it's not hummingbird's tongue--this is hamburger. The hummingbird's tongue comes when you are down this bottom part here, when you want to have your berthing facilities. You talk about the slips and the shoreside facilities and all that, then you can economize, you can have whatever you want, but you have to build it on a solid foundation of a decent, adequate quality structure.

Audience. You don't have the money. You need $4 million if you want any project.

LTC Sprague: I don't know that we don't have the money; I have nothing from the Government of Guam that says they will support this or they will not support it at this point in time. When we get a final plan, we'll go to them and at that time, they will have to start making commitments or start backing off. There's no need at this point in time for them to make a commitment to the Corps. We don't have an approved final plan. Until we get that final plan to them, they have no basis to make a decision. Now a lot of things can happen in the meantime.

Audience: That's what makes it gobble-dee-gook.

LTC Sprague: Well, I don't know of anyone, to tell you the truth, who gets a lump of money and then starts planning how to use it. In this day and age, you have to have a plan before you get any money. No one is just going to give you the money. That is what we are here for--to select a plan. Based on that plan and based on the support for that plan, it will either go or it won't go. I know you have the need to address these other issues. I'm sorry that I don't have the capability to say, "that sounds super; let's do that." We don't. So, we are going to do the best we can for you. What you have done is that you have addressed these issues which will be in the final report. So, if you want to refer to that when you are dealing with your local government, that's fine. You say, "hey, we brought that up at the meeting; it's right there and you have a copy of the report on page such and such--what about it?" You are going to ask your people in the legislature, "are you going to support this?" We have a plan now, are you going to support that plan? See, once you have something concrete like that, then you can start working, but if you talk in general, anything can be said because there is no commitment. There is nothing yet to commit to.

Mr. Rice: Colonel, I'd like to ask you if it's possible to have another look at Plan 5 and afterwards why don't we have a showing of hands to see which plan is preferred.

LTC Sprague: OK, I have no objection to that. Our decision is not based upon a popular vote, but the record can reflect that. I have no objection to that just as long as you realize that that is not a binding decision on us as we go through all the concerns. You wanted to see Plan 5.

Actually Plan 5 and Plan 2 are basically the same structure except one is on the right-hand channel. One of the advantages of it is that it has good circulation; it has a park right adjacent to the area. The disadvantage as it was brought up is that might be a problem for vandalism, but on the other hand, you can get out of there very quickly. You also have less protective structure than in some of the other plans. There are advantages; it's shortening the dredging and lowers the cost. There are some environmental concerns with dredging. You have less dredging in this plan, but you have more filling which is also an environmental cost. There is a concern for public safety for swimmers in the area. That is a concern and one of the things that should be addressed. Yet I know from experience of other areas--like in Honolulu--the biggest small boat harbor is the Ala Wai. It has more boats than you have in Guam, and yet there are people fishing in the entrance channel all the time. That's not a real safe condition, but I've never seen an accident there either. This is safer for the boats, although we have some of your experiences that say otherwise. The analysis we did indicated this was better under a lot of conditions. We have done a wave study and we will do further studies. I also realize, although no one brought it up, that any of the plans on this side does restrict your access to harbor flats.

We have the 5 plans, three of them in the Nimitz Beach channel and two to the right channel. The only one that was down to the 80 boats was Plan 4 which has a smaller berthing area.

Plan 3 is for 150 boats, Plan 2 is for 150, Plan 1 is for 150 and Plan 5 is for 150 spaces. All of these plans provide for 75 car spaces and 20 car trailer spaces.

This one, by the way, Plan 4, you might not even consider because of the benefit cost ratio which is less than 1. It is not impossible to get approval for a project that doesn't have more benefits than cost, but to my knowledge, the only way you can do that is to show your enhancing environment. I would say that Plan 4 is not really a viable alternative.

Audience: Could any of these safely harbor a sailboat during typhoon condition?

LTC Sprague: Tim, would you care to comment?

Mr. Young: What was the question again?

LTC Sprague: The question is, would any of these safely harbor a sailboat during typhoon conditions?

Audience: If you can hold one in Agana, you could hold one in here too.

LTC Sprague: I wouldn't guarantee it.

Audience: But it's a factor to consider for a boat owner.

LTC Sprague: Yes. I would say that each of them offer equal protection. Once again, the reef flat itself provides some protection.

Plan 2 is also quite aways back, although we've noted in the right-hand channel that the waves do not diverge. When severe waves occur, they can come up that channel. You would have some wave action in the channel, although you would have protection for the boats in the harbor, whereas in the Nimitz Beach channel, you do get a diversion action on the waves--you have less energy coming in toward your structure, and the reef flats also provide some protection. The structures themselves are designed to provide a relatively equal degree of protection.

Mr. Rice: One thing I find is that you are actually giving Government of Guam false figures as to what the cost of the boat basin is. I can see that in each one of these plans, it was your figures; there is approximately $1.5 million to be done after you do your part. That is just to get the boat basin. You are providing a place to put a boat basin. By putting these figures up here, somebody's going to say, "Oh boy, we are going to have a boat basin for $6 million," but actually with the channels and the wall around it, the total cost would be somewhere around possibly $10 million.

LTC Sprague: The total cost for Plan 2 is $4.2 million of which $2 million is Federal and $2.155 is Government of Guam. You are saying, we're starting at $6 million and going to $10 million; I'm saying we're starting at $4 million. What we intend to build will cost approximately $4 million which is, as you see right here, a protective structure, the entrance channel, the turning basin, access channel and shoreside facilities. That cost $4.2 million is for this plan. The mooring basin is not part of that and must be accomplished by the Government of Guam.

Mr. Rice: Right, but still, that $4.2 million is only part of the cost.

LTC Sprague: The Government of Guam knows what the cost is to do the rest of the work. It is not hidden; it's right there. That footnote 3, that's part of the cost that they know they are going to have to do. But that's not part of the cost we have to consider in getting approval to do this project. The only cost we have to consider is that $4.33 million down to $3.86 million; that's the cost here. Yes, in order to get the rest of this done, to provide shoreside facilities, that's extra--you're right.

Mr. Baubata: Since Plan 5 was not brought up in the last meeting or not even considered, we did move, in the last meeting, only the signs over next to the road leading to Pagancho Street. Now the sign you have over there right now, it looks like it's dangerous to the swimmers in the Nimitz Beach. If you were to move that over to the same as Plan 1, would that be an additional cost?

LTC Sprague: You want Plan 5 to be moved down here.

Mr. Baubata: Yes, because we did not address this the last time. Move this down, just this portion here, thus providing the safety for the swimmers. I know you'll be dredging a little bit more, but how much more are we talking about? I'm looking at the cost factor.

LTC Sprague: The difficulty of that is, if you are talking about sliding this down this way, the safest way to come out of this channel is straight--like this. So, this channel which is, as I understand it from some of the people here, the concern for the safety of the swimmer, is the use of this channel. If we came down somewhere here and then just turned and came further this way, the channel would be further away from the boat mooring; however, I don't think the moored boat is a hazard. I think it's in the boat in motion that is considered to be a hazard. Plan 2 is essentially this type of a structure, except using the other channel. Plan 2 is the same type of structure, shoreside, simple wall revetment, and the channel comes in like this. It is removed from Nimitz Beach itself. So, that's the advantage, if you will, is moving it further away from the beach. The disadvantage is that you have a much longer channel to dredge which is basically why it cost another $340,000. That additional dredging is also an additional environmental cost. You are changing more of the reef flat there. That's a concern.

Mr. Baubata: The reason why I brought that up is that like the other fishermen, they want something that can become a reality. This is what we are looking forward to really and hoping that this meeting will be the conclusion of all the frustration that we have had from the time we started. And, if Plan 5 will be the answer to that, then I'm in favor of Plan 5. I'm looking at something that we can afford, Government of Guam can afford, and that's really the main point.

LTC Sprague: Finance is a very real part of life; it's the cry of the public sector, and that's a concern and you have to deal with reality. And that has to have some influence on your decision. I'm not going to tell you on what basis to make your decision. Plan 5 was in the workshop stage; that's why this is a drawing like this. I was concerned when we were reviewing this before the public meeting that we provide as many alternatives as possible because what we really have is four different structures on two different sites. This one looked as if, if we took Plan 2 and moved it over to the Nimitz Beach one, it has some cost advantages. In fact, it does. Plan 5 is not in the draft because there was not a lot of support for it at the workshop; however, it was presented at the workshop. But we started looking at it again now that we have preliminary cost estimates. I wanted to offer that as an option.

Audience: The problem was that at the last workshop we had, Plans 1 through 5 were mentioned, but only seven people were present that night. It was advertised all over that this workshop was taking place that night, but only seven people showed up. We voted on this too. Now a lot of people show up and they don't agree with what we have--why didn't they show up before? Right now we are having all kinds of problems.

LTC Sprague: I understand your concern.

Audience: I have been attending these meetings from the time it was started until now; I've never missed a meeting yet. Last time we were here, we discussed this. The Plans were here--1 through 5--and we voted on these two because it's better for us. The way we look at it, it's better for us. Anyway, you made your studies, and it was thrown out for the public to comment. Now they want Plan 5.

LTC Sprague: Now I don't know if they want Plan 5. Your input was religiously followed and the draft that you have in front of you only lists these four--not Plan 5. I was the one that looked at it and said -- you see, in this stage here, it's more like a conceptual stage, an artist's concept of what you are doing. You look at it and say, this is approximately of what we do. We don't add numbers on there; we don't go through some of the calculations until we have some idea of what we want to do. Well, as we did the calculations on these, because the structures here and shoreside ones are almost identical to these and this, if we could come up with a dollar cost for this one as well and because it occurred to me that there was a difference in dollars, I wanted to provide that opportunity to you and all the people here to consider that. Yes?

Mr. Baubata: You say that Plan 2 would be the cheapest of Plans 1 and 2?

LTC Sprague: Well, if we went to 1 and 2, Plan 2 is cheaper, if that's your only concern. If the concensus is that the Nimitz Beach channel is not acceptable, then this would leave only Plans 1 and 2. Of Plans 1 and 2, Plan 2 is $130,000 cheaper than Plan 1. So we have two plans on the Nimitz Beach channel and three plans on the right channel there, one of which is only an 80-boat facility. So we really have two 150-boat plans on the Nimitz Beach channel and two on the other channel. What's the concern?

Mr. Baubata: Mr. Reyes was right in the last meeting in approving 1 and 2. We were going through the process of elimination and was considering safety, security, the water circulation, the responsibility for future expansion. Under recreational facilities, we are down to Plans 1 and 2, and I thought

tonight we were going to vote between 1 and 2. But now that we are talking about money, I don't know if that will be a reality. Give us something that we can actually afford or we can use or you guys start it and we finish it.

LTC Sprague: The reason why Plans 3 and 4 were added in there were two things. One provides for a smaller structure, a smaller mooring basin, to see if that could work out better. It turns out that it doesn't. The other factor was that when we did our wave studies, it turns out that this left-hand, Nimitz Beach, channel appears to be much safer than the right-hand channel used in Plans 1 and 2. So with that added information, we wanted to provide the alternative of using Nimitz Beach channel. When you came out to the public workshop, based on the information we had, this is what you thought to be the best. We have more information now, and we are trying to give it to you. You are free to consider that, disregard it, do what you will and say, "we told you in the beginning what we wanted to do and that's what we want." That's your prerogative. OK?

Audience: Colonel, which one is safer?

LTC Sprague: We're saying that either provides a safe harbor, but according to the wave studies, the Nimitz Beach channel is safer. Because of those studies, we came back and presented plans to deal with the Nimitz Beach channel because our engineering studies say that it's a safer channel.

Audience: Plan 4 is an 80-boat facility and Plan 3 is how many boats?

LTC Sprague: 150. All the others are a 150-boat facility.

Audience: Why the cost difference between Plan 4 & Plan 3--why is Plan 4 $340,000 more expensive?

LTC Sprague: Primarily the parking is out here on the revetment.

Audience: Let's put it to a vote.

LTC Sprague: Sure. I have no objections as long as everybody is satisfied with the information they have. You may not agree on it all; that's fine, I have no objection to that. As I said, it's not binding on anyone--it's not binding on you, it's not binding on us. It does express what the membership here feels.

Audience: Are you looking to having another meeting or another workshop?

LTC Sprague: No. This is the public meeting we're having after the workshop; this is our last public meeting. Based upon this, based upon any written information, and based upon information from other agencies, we will come up with a final plan. You are allowed up until the 13th of February to submit written material. You know, sometimes I go to a meeting and everything goes wrong, and when I go home I say, "I should have told them whatever it is I had on my mind." If that happens to you, you still have an opportunity to put it down in writing.

Audience: Who do we write to? The Army Corps?

LTC Sprague: Yes, or you can get it to Frank Dayton in our Guam Operations Office, and he'll give it to us.

Mr. Regis: I think we should vote on that because it is the final draft.

LTC Sprague: We want to look at the plans on the slides here and just take a look and see again what you have in mind on what the plan is.

Plans 1 and 2 are with the right-hand channel; Plans 3, 4, and 5 are with the Nimitz Beach channel; Plan 4 is for an 80-boat facility.

Plan 1; Plan 2, close to the shoreside, long entrance channel in the right-hand natural channel. Plan 3, this is the Nimitz Beach channel; it does require a slight causeway, may have some difficulty with circulation as someone brought up. Plan 4, this is the 80-boat facility; also the Nimitz Beach channel. Plan 5 is the Nimitz Beach channel; it has the shoreside type parking and should have good circulation. This is the one that costs the least under our current estimates.

Mr. Rice: One thing I would like to bring up. As I mentioned in my letter, according to the figures you came up with, within a very short period of time, we're going to have to expand. You may have to double the size of our boat basin. In my opinion, if we had to expand, it might be easiest to expand Plan 5. It would be the easiest one if we had to go on out a little bit further down the coastline for expansion. It would be the easiest one to expand as far as future planning would be.

Audience: If they ever started to work on Plans 3 and 4, Nimitz Beach would be silted in the whole area.

LTC Sprague: We are very much concerned in the control of silt. The construction may require silt curtains. It will require a permit type action that will list environmental constraints in the project.

Mr. Rice: The area in Agana, when they were doing that, was very similar and they didn't have that problem. They used the screens and so forth so it caused very little problems.

LTC Sprague: Let me assure you that in our environmental studies, if it appears that whatever plan is selected would be unacceptable environmentally, then it won't go. That's a concern; you can't do the detailed environmental analysis until we have a plan and that will be a consideration in the plan.

Audience: As far as future expansion is concerned, I think that Plan 1 also shows a big space there, and maybe a lot of us are considering the money factor here, but I think the people here would like to work this. Number 1 may show the biggest cost, but since we are putting up a marina here, let's have a big one, a good one so that the future generation will be able to enjoy it. I think Number 1 should be the plan to recommend.

Audience: If you were to make an expansion to Plan 1, would it be hard to make an expansion as it is right now--to accommodate more boats?

LTC Sprague: Well, there's a variety of ways it could be done. Perhaps this can be taken out and you could move it over. Any facility can be expanded.

Audience: This is what I'm trying to say, Colonel, since we are bickering back and forth about future expansion. All we have now is 150 boat spaces. To me 150 is very clean because we don't have one right now, and the thing I'm trying to get about is so that we can vote on it so you people can start doing what you have to do. Let's get something started.

LTC Sprague: We don't have cost figures for expansion. Let's not speculate too much as to additional costs later on. When it comes time to expand, we'll do a similar process and we'll have several plans for expansion.

Audience: This is what I'm saying, Colonel. We're talking about expansion right now. I'm satisfied with 150 boat spaces. OK, if we have to expand, let the future generation take over that. Why do we have to worry? Let our generation try to utilize that so that we can utilize it. We're still zero space yet; why don't we work for 150 spaces then work after that.

LTC Sprague: You in your own mind can consider expansion, can consider any of the factors that have been brought up. There were a lot of points made, a lot of very valid concerns. Every concern that has been raised has a valid point of view, and they will be addressed as we come to the final decision of the plan. One of the elements will be the vote you want to take here. The fact that whether expansion should be considered or not, that's up to you to decide as you make up your own mind. If you think that's just gobble-dee-gook to consider that, that's up to you. If you think expansion is one of the more important things, that's up to you. I think you should look at what best meets your needs, as you see your needs. Each one of you sees your needs differently, but that's what you are here for--to express them.

Are there any points that we haven't already addressed?

Mr. Rice: One additional one. I feel that for some reason to me, looking at Plan 1 and Plan 2. What I don't like about Plan 1 is that it is out there in the middle of the bay and in the event of typhoon or something like that, it's way out there, and it's wide open to the winds that come back and forth across there. I kind of like the ones that are hovered closer to the shore as far as I'm concerned for the safety of our boats and the possibility of having to take it out of the water and bringing it back, etc. Sticking way out there, I can visualize trying when the winds start getting high to get through that causeway, etc., to work on your boat way out there where it is fully exposed to the wind. That's it.

LTC Sprague: Any other points? Well, I tell you what -- we've had a very lively meeting tonight. I tell you, the worst thing to do is to hold a public meeting when nobody comes and those few that do come don't have anything to say, because we are here to serve the public interest. You have certainly expressed your interest and I appreciate that. So, the last thing before we close is we will take a vote. So, starting with Plan 1, those of you who think that Plan 1 best meets your needs, please raise your hand.

Plan 1 - 10
Plan 2 - 0
Plan 3 - 4
Plan 4 - 0
Plan 5 - 5

The results were 10 for Plan 1, zero for Plan 2, 4 for Plan 3, zero for Plan 4, and 5 for Plan 5.

I thank you again for your interest. Please be reminded that you can write until February 13, and we will include your written comments in our consideration for the plan. Thank you again.

VI. SUMMARY OF COMMENTS RECEIVED

1. The following is a summary of comments received during the review period and the Corps of Engineers' response to each comment. All letters received and transmitted in response to the comments are provided in Section VII, Pertinent Correspondence.

FEDERAL AGENCIES

US Department of Commerce, National Marine Fisheries Service

Comment: The final EIS should discuss the alternative of a two-lane launching ramp with a protective breakwater and dredged entrance channel north of Nimitz Channel and associated dry boat storage facilities.

Response: As discussed in the Main Report of the accompanying detailed project report, there is a projected remaining need of approximately 225 berths for moored boats in 1985 and 300 berths in 1990 beyond that which will be available in Merizo and the Agana Boat Harbor. Therefore, a two-lane launching ramp with dry storage facilities would not satisfy the projected need for permanent mooring spaces.

Comment: Minimize impacts to the existing Nimitz Channel.

Reponse: Dredging will be done from the shoreline outward so that as much dredged coralline material as possible that may escape the dredging equipment will be contained within the newly created channel/harbor area or on the reef flat platform. This should minimize the amount of suspended material carried through Nimitz Channel. An attempt will be made to dredge the last gap between the new channel and Nimitz Channel during a period of rising tide so that suspended material will tend to be transported shoreward. Coral areal coverage at the connection point between the artificial and natural channel is relatively low compared with outer channel walls. The channel alignment will run within the natural channel thus direct destruction of corals will be minimized.

Regulation of pollutant discharge including sewage within Guam harbors is the responsibility of the Guam Environmental Protection Agency and U.S. Coast Guard. Discharge of many solid wastes and much water is prohibited or controlled under Guam's Water Quality Standards and sewage may be discharged only through a marine sanitation device approved by the Guam Environmental Protection Agency. Proposed Guam Department of Parks and Recreation Rules and Regulations (Section 15.21) also provide controls over the use of marine toilets in marinas.

Use of Nimitz Channel for boat traffic will create increased chances for boater/swimmer conflicts with an increased likelihood of accidents occurring. Strict regulation of boat velocity within the channel may help to ameliorate the safety hazard as well as the development of some sort of warning system so that both swimmers, divers, and boaters will be aware of each others presence.

US Department of the Interior

Comment: Every effort should be taken to minimize potential conflicts between recreational and boating activities.

Response: Plan 5, the NED alternative and the least environmentally damaging plan, is being recommended for construction. The Government of Guam supports this plan and every effort will be made to reduce potential conflicts between recreational and boating activities. One means would be to strictly control vessel speed during passage through Nimitz Channel. A warning system could also be developed such as a noise making device for boats and floating buoys or flags for divers so that each party would be aware of one another. Access of clamming and other reef fishing areas immediately north of Nimitz Channel will be impaired but not blocked.

Comment: Evidence of compliance with Federal historic preservation legislation and regulation should include correspondence from the Guam Territorial Historic Preservation Officer, Mr. Joseph F. Soriano (Director, Department of Parks and Recreation).

Response: The Guam Territorial Historic Preservation Officer has provided a letter of compliance with Federal historic preservation legislations and regulations on 28 May 1981.

US Environmental Protection Agency

Comment: A discussion of secondary impacts on water quality due to the proposed project should be included in the final EIS.

Response: Section II of Appendix D, "Natural Resources and Fish and Wildlife Coordination," will contain a discussion of secondary impacts of marina operation on water quality as it relates to human use and marine organisms. This discussion will be summarized in the Final EIS and will be based on "The Environmental Impacts of Marinas and Their Boats: A Literature Review with Management Considerations" by Gail L. Chmura and Neil W. Ross, University of Rhode Island Marine Advisory Service, 1978.

Comment: A discussion of potential impacts on water quality and quantity is necessary if the proposed project encourages additional growth in the area. The final EIS should assess the capacity of the local sewage treatment facility to determine if an additional or expanded facility is needed.

Response: Additional urban growth in the immediate community landward of the proposed harbor is anticipated even without the project. However, the anticipation of a future harbor and the actual construction should encourage further and perhaps more rapid planned urbanization in the area. The area south to Nimitz Beach and the Pagachao Subdivision is currently sewered and the Agat Wastewater Treatment Plant (0.75 MGD capacity) is believed to contain enough capacity to accommodate a fully operational marina. Eight- to twelve-inch water lines run along Highway 2 and additional capacity (lines and storage tank) are planned for the Pagachao Subdivision in the next decade. A 150-berth harbor is estimated to use no more than and average 0.210 MGD of potable water based on Oahu marina use. This projected need has not been calculated into the most recent Water Facilities Master Plan for Guam. The combined water demand of a partially developed Pagachao Industrial Park and Agat Marina could result in a significant increase in projected water needs for the year 2000.

Comments: The selected plan should minimize environmental impacts under Section 404(b) guidelines.

Response: Plan 5, the NED alternative and the least environmentally damaging plan, is being recommended for construction. Under the Section 404(b) guidelines, plan 5 is the most desirable alternative. The final EIS will include and justify the criteria used in the selection process.

Department of Transportation, US Coast Guard

Comment: The EIS should consider the possible effects of increased sewage and oil pollution from vessels in the harbor.

Response: Section II of Appendix D "Natural Resources and Fish and Wildlife Coordination" will contain a discussion of secondary impacts of marina operation on water quality as it relates to human use of waters and marine organisms. This discussion will be summarized in the Final EIS. The discussion will be based on "The Environmental Impacts of Marinas and Their Boats: A Literature Review with Management Considerations" by Gail L. Chmura and Neil W. Ross, University of Rhode Island Marine Advisory Service, 1978.

Comments: For prevention of oil pollution, the marina should have small oil spill clean-up capabilities.

Response: We will incorporate your recommendations for measures to prevent oil pollution into the Final EIS and the Report. According to the Section 208 Guam Water Quality Management Plan (1979), the Marine Safety Office of the U.S. Coast Guard, in cooperation with a number of Federal offices, Government of Guam offices, and local business organizations has developed a Guam Pil Spill Contingency Plan for cleaning up local spills within navigable waters where the responsible party is either unwilling or unable to do so. We will recommend to the local sponsor that this plan be extended to Agat Small Boat Harbor when the harbor is constructed.

GOVERNMENT OF GUAM AGENCIES

Guam Environmental Protection Agency

Comment: Consideration of phased development for the selected plan is strongly suggested since Government of Guam may have difficulty obtaining the necessary funds for full scale development.

Response: Phased development of the selected plan is possible provided the Corps of Engineers receive assurance from the Government of Guam that funds for the local share of contribution will be made available. Construction funds may be allocated each fiscal year as harbor development progresses.

Comment: Dredging in the Nimitz Channel area or through the 250-foot wide depression in the existing reef flat should be minimized to reduce the impact on live coral communities.

Response: Plan 5, the recommended plan will not require any dredging through the 250-foot wide depression in the reef flat north of Nimitz Channel. Dredging in the Nimitz Channel will be minimized to only one sloping face in the shoreward part of the channel where coral species diversity and areal coverage is relatively low in comparison with the outer channel walls. The dredging of this slope should occur last in the total dredging phase in order to minimize adverse effects of suspended materials in the water column interfering with live coral growth processes.

Comment: Removing large coral heads temporarily and then reattaching them to channel walls should be considered.

Response: No coral heads are found on the channel walls except where the entrance channel connects to Nimitz Channel. Those found near this transition area will be removed by dredging. Mr. Richard Randall of the University of Guam Marine Laboratory will be consulted prior to construction to determine the need and feasibility of transplanting any coral head which could be affected by dredging.

Department of Parks and Recreation

Question: Is the initial construction flexible enough for a launching ramp to be included in Guam's share of the initial construction cost?

Response: The Corps of Engineers can provide the necessary service to the Government of Guam to design and construct such a facility on a reimbursable basis. When construction plans and specifications for the harbor are initiated, Government of Guam's requirements can be assessed and incorporated into the Federal portion of the contract work.

Bureau of Planning

Comment: The Corps estimates for local share of funding ($2.0 million) far exceeds any contribution that could be made given current fiscal constraints. To minimize costs, we would recommend that the Corps analyze the cost effectiveness of Plan 5 with berthing space for 80 boats instead of 150.

Response: The cost effectiveness of Plan 5 was evaluated for an 80-berth harbor. Since the main navigation features, such as the protective structures and dredged areas, are relatively unchanged for the 80 and 150-berth harbor schemes, the savings in the local first cost share will be minimal. By reducing the 150-berth harbor scheme by 70 berths, estimated savings of only 7 % would be incurred on the project first cost from a reduction in the length of the breakwater and the main access channel.

VII. PERTINENT CORRESPONDENCE

1. LISTS OF LETTERS:

Date	Subject	Initiating Agency	Page No.
22 May 79	Site Selection	U.S. Dept of the Interior	B-26
22 May 79	Site Selection	U.S. Dept of the Interior	B-26
6 July 79	Public Meeting	Office of the Governor	B-27
July 79	Public Meeting Notice	U.S. Army Corps of Engineers	B-28
15 Aug 79	Public Meeting	U.S. Army Corps of Engineers	B-29
5 Sep 79	Comment to Site Selection	Office of the Governor	B-30
1 Feb 80	Initiation of DPR	U.S. Army Corps of Engineers	B-30
31 Mar 80	Comments to Public Meeting	Dept of Parks & Recreation	B-31
23 Apr 80	Response to Dept of Parks & Recreation, 31 Mar 80	U.S. Army Corps of Engineers	B-32
8 July 80	Public Workshop Notice	U.S. Army Corps of Engineers	B-33
28 July 80	Comments on Agat Harbor Plans	Dept of Land Management	B-33
30 July 80	Comments on Agat Harbor Plans	Dept of Parks & Recreation	B-34
8 Aug 80	Comments on Agat Harbor Plans	Bureau of Planning	B-34
25 Aug 80	Comments on Agat Harbor Plans	Guam EPA	B-35
8 Dec 80	Public Meeting Notice	U.S. Army Corps of Engineers	B-35
20 Jan 81	Comments on draft DPR	Jack W. Rice (private citizen)	B-36
9 Feb 81	Comments on DEIS	US EPA	B-38
10 Feb 81	Comments on draft DPR	US Dept of the Interior	B-39
11 Feb 81	Comments on DEIS	National Marine Fisheries Service	B-40

VII. PERTINENT CORRESPONDENCE (Cont)

Date	Subject	Initiating Agency	Page No.
13 Feb 81	DEIS	US Dept of Transportation	B-41
13 Feb 81	Comments on draft DPR	Dept of Parks and Recreation	B-42
19 Feb 81	Comments on draft DPR	Guam EPA	B-43
23 Feb 81	Comments on DEIS	US Coast Guard	B-44
27 Feb 81	Comments on draft DPR	Bureau of Planning	B-45
2 Mar 81	Aids to Navigation	US Coast Guard	B-46
28 May 81	Letter of Compliance	State Historic Preservation Officer	B-47
29 May 81	Letter of Support	Office of the Governor	B-48

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

H30(560)

MAY 22 1979

Major General Charles McGinnis
Director of Civil Works
DAEN-CW2-A
Department of the Army
Washington, DC 20314

Dear General McGinnis:

I understand that the Corps of Engineers continues to propose the construction of a small boat harbor within the boundaries of the Agat unit of the War in the Pacific National Historical Park, Guam. This proposal is totally unacceptable to the National Park Service and the Department of the Interior because it would introduce an incompatible use, constitute a severe visual intrusion to the historical scene, and grossly damage the integrity of the invasion beach and reef area. No mitigating measures relating to design, size, or alternate location elsewhere within the park are acceptable to this Department.

I recognize that planning for the marina began before the park was authorized, but with the passage of legislation creating the park, conditions have changed and the importance and significance of the Agat invasion beach have enormously increased.

I urge that the Corps of Engineers reconsider its plans and select one of the two previously proposed alternative harbor locations outside the park and discontinue pursuing a location within the park.

Please advise me of your decision.

Sincerely,

Bob Herbst

Assistant SECRETARY

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

H30(560)

MAY 22 1979

Honorable Paul Calvo
Governor of Guam
Agana, Guam 96910

Dear Governor Calvo:

I am enclosing a copy of a letter I sent to the Corps of Engineers stating my displeasure at locating the proposed small boat harbor anywhere within the Agat unit of the War in the Pacific National Historical Park. I hope you will concur in my request that an alternative location outside the park be chosen as a means of meeting the needs of the people of Guam without adversely affecting one of our nation's historical treasures.

Sincerely,

Bob Herbst

Assistant SECRETARY

Enclosure

PAUL M. CALVO
Governor

Territory of Guam

OFFICE OF THE GOVERNOR
AGANA, GUAM 96910
U.S.A.

6 JUL 1979

General Henry J. Hatch
Brigadier General, U.S. Army
Pacific Ocean Division
Corps of Engineers
Building 230, Ft. Shafter
APO San Francisco 96558

Dear General Hatch:

I understand the Corps of Engineers will be holding a public meeting on July 20 regarding the compatibility of the Corps' recommended plan for an Agat small boat harbor with the War in the Pacific National Historic Park. As you know, the residents of Agat are particularly interested in this issue. I am personally committed to assist both the Corps and the National Park Service in resolving any conflicts which may jeopardize the development of both a boat harbor and a historic park in Agat.

Therefore, I am cordially inviting you to meet with me and a representative from the National Park Service in my office at 10:00 a.m. on July 19, 1979. The objective of the meeting will be to arrive at a solution to the boat harbor-historic park problem.

If you are personally unable to attend, I request that your representative be authorized by you to arrive at a solution acceptable to all parties. I am making the same request of the National Park Service.

I am optimistic we will be able to arrive at a compromise acceptable to the people of Agat.

Very truly yours,

PAUL M. CALVO

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
BUILDING 230
FT. SHAFTER HAWAII 96858

PODED-P

During July, the US Army Corps of Engineers will hold three public meetings on Guam:

Ugum River Water Supply Study - 18 July
Guam Comprehensive Water Resources Study - 19 July
Agat Small Boat Harbor (Gaan Point) - 20 July

We urge you to attend and make your views known. Effective communication is necessary to share ideas and concerns which may affect these studies. Only with your participation will we be able to provide the best possible solutions.

For accuracy of record, any important facts or positions should be submitted in writing, either at the meeting or to the Honolulu District at the address above.

Additional information on the Ugum River and Guam Comprehensive Studies can be obtained from the draft reports which will be available at the meetings or from the Guam Project Office, US Army Corps of Engineers, Pacific Daily News Building, Suite 905, Agana, Guam 96910.

As required by Executive Order 11988 and Section 404 of the Clean Water Act of 1977, any comments on the possible impacts associated with occupancy and modification of the floodplain and the possible effects of the discharge of dredged or fill material on water quality will be considered.

I look forward to seeing you at the meetings.

Sincerely yours,

PETER D. STEARNS
Colonel, Corps of Engineers
District Engineer

Ugum River

The findings of the study on surface water development for the Ugum River Basin will be presented at the meeting. Key items to be discussed will include existing and future water demands on Guam, water use reduction versus water supply increase, various alternative plans, environmental assessments, the tentative recommended plan, and financial and institutional arrangements.

Comprehensive Study

The Guam Comprehensive Study will address the water resource problems of navigation, water supply, flood plain management, and shore protection and beach restoration. During the course of the study, alternative plans will be prepared to consider water resource problems to the year 2040. Although an important purpose of the study is the evaluation of long-term problems, immediate needs will also be evaluated. The study will consider environmental quality and management or non-structural measures which could be applied to solve water resource problems.

Agat Harbor

The purpose of this meeting is to allow the public an opportunity to express their views on the effects of construction of a small boat harbor on the Agat Invasion Beach National Register historic property and on alternative courses of action that could avoid, mitigate, or minimize any adverse impacts on the historic site. The particular issues are the compatibility of the Corps' recommended plan for a 125-boat harbor at Gaan Point with the National Park Service's new War-in-the-Pacific National Historic Park and re-evaluation of alternative sites for the construction of a similar size harbor at Rizal Beach, Nimitz Beach, or Taleyfac Bay.

PODED-PJ

15 August 1979

Honorable Paul M. Calvo
Governor of Guam
Agana, Guam 96910

Dear Governor Calvo:

As a follow-up action to our recent series of meetings on Guam, we would like to review the status of planning for the Agat Small Boat Harbor. Based on the many discussions held with both federal and local officials, as well as on the comments made at the Advisory Council's public information meeting on 20 July 1979, it appears that the Nimitz Beach alternative site is favored in view of the opposition to Gaan Point based on historical park conflicts. The Nimitz site appeared to have the support of those attending the meeting and to possess significant advantages over the other alternative at Taleyfac, where real estate acquisition for project operation could reportedly be a significant factor.

Before we can proceed with any further planning for a small boat harbor facility in the Agat area, we need your recommendation on one of two possible courses of action. First, we can continue the detailed planning at the Nimitz site under the authority of Section 107 of the River and Harbor Act of 1960. We estimate that it would take about 12 months to complete the study and submit a report for approval, after study funds are made available. As was previously indicated to your staff federal participation under this authority is limited to $2 million. Establishing the federal and non-federal share of the project costs related to the general navigation feature, is based on the commercial or recreational nature of accruing benefits. In those cases where the computed federal share of construction exceeds the monetayy limitations, the excess costs are assigned to the non-federal interests. The alternatives at Nimitz Beach and Taleyfac are expected to have significantly higher costs, and consequently a larger local contribution than was projected for development at Gaan Point.

PODED-P
File

The second course of action would be to review the alternatives under our on-going Harbors and Rivers in Guam survey investigation as part of the overall small craft harbor requirements for the Territory of Guam.

An advantage of this route is the possibility of increased federal participation, and consequently, lesser cost to the Government of Guam. A major disadvantage is the length of time required for this type of study as compared to those undertaken under our continuing authorities program. Any harbor project recommended under the Harbors and Rivers of Guam authority would be subject to specific authorization and construction funding by the U.S. Congress. This course of action would require additional reporting, reviewing, and programming requirements that would considerably lengthen the time from planning to construction by at least ten years.

We have deferred further action on this study since the public meeting, pending receipt of your recommendation on the direction to be taken. Receipt of your comments by 30 August 1979 would be appreciated.

The residents of Agat have clearly stated and supported the need for a harbor and we look forward to receiving your views so that we may work toward making that harbor a reality.

Sincerely yours,

/s/
PETER D. STEARNS
Colonel, Corps of Engineers
Deputy Division Engineer

CF:

Mr. Felix L. Crisostomo
Director and Guam Preservation Officer
Department of Parks and Recreation
Government of Guam
P.O. Box 682
Agana, Guam 96910

HQDA DAEN-CWP-W
Wash DC 20001

Territory of Guam
OFFICE OF THE GOVERNOR
AGANA, GUAM 96910
U.S.A.

PAUL M. CALVO
Governor

05 SEP 1979

Colonel Peter D. Stearns
District Engineers
U.S. Army Engineer District
Honolulu
Building 230
Ft. Shafter, Hawaii 96858

Dear Colonel Stearns:

I am responding to your letter of August 15, 1979, concerning the appropriate course of action for future planning for a small boat harbor in the Nimitz Beach area of Agat.

Numerous meetings were held in July of this year on the subject and a consensus opinion was reached. Therefore, I do concur that the Nimitz Beach site is the best available alternative. I would recommend that the Corps of Engineers follow the first alternative and continue the detailed planning under the authority of Section 107 of the River and Harbor Act of 1960. I feel that it is the most appropriate course of action to ensure the economic and recreational benefits from the project.

However, I do feel that significant commercial input is lacking from the original analysis of the Nimitz Beach site. This includes such items as fishing, charter diving, and sight seeing boats for the War in the Pacific National Historic Park and the Guam Territorial Seashore Park.

Therefore, I would suggest that you contact the Government of Guam's Department of Commerce and Department of Parks and Recreation for this additional input. These items should adjust your cost sharing basis to accurately reflect the commercial and recreational nature of benefits. We look forward to cooperatively completing the study and implementing the Agat small boat harbor.

Sincerely,

PAUL M. CALVO

PODED-PJ

1 February 1980

Honorable Paul M. Calvo
Governor of Guam
Agana, Guam 96910

Dear Governor Calvo:

In response to your letter of 5 September 1979, we are initiating a detailed study for a small boat harbor at Nimitz Beach, Guam. Section 107 of the River and Harbor Act of 1960, as amended, is the authority for this study.

In our previous study of the Agat area, we recommended a small boat harbor at Gaan Point. During the late stages of our study, Congress established the War in the Pacific National Historic Park. The compatibility of the small boat harbor within the National Historic Park was discussed during a public meeting at the Agat Commissioner's office in July 1979. At the meeting, the Advisory Council on Historic Preservation, the National Park Service, and the U.S. Army Corps of Engineers basically agreed that locating the small boat harbor at Gaan Point would conflict with the National Historic Park.

Also, at this meeting the Taleyfac and Nimitz Beach areas, located outside of the boundaries of the National Historic Park, were discussed as alternatives to the Gaan Point site for a small boat harbor. The local citizens and officials present at this meeting favored the Nimitz Beach location. The most significant factor for the Nimitz Beach site is the accessibility and availability of public land. We expect to complete this study in the spring of 1981.

We appreciate the fine cooperation you and your staff have given us in our assistance to the Government of Guam in the Water and Land Resources Development Program. We will keep you informed on the study progress.

Sincerely,

B. R. SCHLAPAK
Colonel, Corps of Engineers
District Engineer

DEPARTMENT OF PARKS AND RECREATION

GOVERNMENT OF GUAM
AGANA, GUAM 96910

March 31, 1980

Colonel B.R. Schlapak
District Engineer
U.S. Army Engineer District, Honolulu
Building 230
Fort Shafter, HI 96858

Dear Colonel Schlapak:

We are corresponding to your office concerning the Agat Small Boat Harbor. In view of the recent public meeting in Agat and our previous correspondence of March 17, 1980, we desire to discuss additional points.

We desire for your office to study locating the entrance channel to the small boat harbor at the cut in the reef to the west of the C and H Chicken Farm. Correspondingly, the study should look at locating the small boat harbor between the above mentioned reef cut and the channel to Nimitz Beach. The final location should be removed from the swimming area of Nimitz Beach and so located to minimize the effect on aquatic life and recreation activities such as snorkling, fishing, and surfing.

In addition, the design should consider location of the support activities on or adjacent to the breakwaters to minimize fill. Likewise, can access to the small boat harbor from the shore be over bridges to minimize fill and obstruction to the current and littoral drift?

The design should be condusive so that the local interest can construct a boat ramp within the small boat harbor with minimal dredging beyond the scope of the Federal project, at minimal cost, and without the necessity of completing the project entirely composing of slip dredging, slips, and support infrastructure.

In addition, we believe that additional data for your study can be obtained from two other departments of the Government of Guam. Fishing census information can be obtained from the Aquatic and Wildlife Resources Division, Department of Agriculture and information on boat sizes can be obtained from the Department of Public Safety.

We trust that these items will benefit a small boat harbor for Agat.

Sincerely yours,

FELIX L. CRISOSTOMO
Director, Department of Parks
and Recreation
State Historic Preservation Officer

PODED-PJ 23 April 1980

Mr. Felix L. Crisostomo, Director
Department of Parks and Recreation
Government of Guam
Agana, Guam 96910

Dear Mr. Crisostomo:

I am responding to your letter of 31 March 1980 in which you have stressed several points that should be considered in formulating alternative small boat harbor plans. In the recent workshop, the acceptance of two concerns was unanimous among those present. These were (1) Nimitz Channel should be utilized for the entrance channel to the harbor; and (2) the harbor should be at a location fronting a 150-foot-wide strip of land just east of the highway and situated between Pagachao Road and the C&H Farms. As we understand, this strip of land is dedicated for public use.

We will be evaluating an entrance channel at the location you suggested in addition to the Nimitz Beach Channel. The engineering, economic, and environmental impacts are primary factors to determine an acceptable location of the entrance channel.

The location of the harbor, as you have recommended, is consistent with the desires of those who were present at the recent workshop. It is also possible to locate the support facilities adjacent to the breakwaters; however, this may not significantly reduce the fill requirement. We will be looking at several harbor variations, and will evaluate concepts where fill areas are held to a minimum, plans for access over culverts to accommodate water circulation, and varying harbor sizes to handle different numbers of boats.

The currents are very important to maintain the water quality at Nimitz Beach as was pointed out in the workshop. The small boat harbor will be planned such that adverse impacts to the littoral processes are minimized to maintain the quality of the water and beach.

With regard to a boat ramp, you have stated that it should be designed to minimize dredging beyond the scope of the federal project and without the necessity of completing the non-federal portion of the work, such as

dredging of slips, construction of slips and support infrastructure. From an engineering standpoint, the boat ramp can be located at any convenient location within the sheltered portion of the harbor. We will work with you to develop an acceptable ramp location. As you know, the federal justification for a harbor is based on the benefits derived from its use. The benefits start to accrue once the harbor is constructed and the necessary berthing facilities are provided. There should be very little time lag between completing the federal and non-federal portions of the small boat harbor project.

We appreciate your concern and interest in the small boat harbor. I understand that you will be the principal contact for all future coordination on this study. I look forward to your continued cooperation.

Sincerely,

KISUK CHEUNG
Chief, Engineering Division

CF:
Mr. Frank Dayton
Guam Project Office
US Army Corps of Engineers

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
BUILDING 230
FT. SHAFTER, HAWAII 96858

PODED-PJ

8 July 1980

AGAT SMALL BOAT HARBOR

PUBLIC WORKSHOP

WEDNESDAY, JULY 23, 1980

7:30 P.M.

AGAT COMMUNITY CENTER

This informal public workshop meeting is being held to discuss alternative plans for a small boat harbor in the vicinity of Nimitz Beach Park, Agat, Guam. The purpose of the workshop is to obtain views and comments on several preliminary alternative harbor plans from the public and interested Government of Guam agencies. The US Army Corps of Engineers will present design features, costs, and general impacts associated with harbor construction. Information and public views expressed at the workshop will be used to help prepare a final array of alternative plans.

B. R. Schlapak

B. R. SCHLAPAK
Colonel, Corps of Engineers
District Engineer

DEPARTMENT OF LAND MANAGEMENT
GOVERNMENT OF GUAM
AGANA, GUAM 96910

JUL 28 1980

Mr. Kisuk Cheung
Chief Engineering Division
USACOE, Pacific Division
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

We appreciate your staff's presentation and request for comments on the Agat Boat Harbor plans. We hope that the following comments will be helpful in drafting the EIS, conceptual designs and the ultimate site selection of an onshore versus an offshore boating facility:

1. It is reasonable to expect that an onshore facility cost less to construct, operate and maintain;

2. It is desirable to limit the boating impacted area (land mass and use intensity) at either the onshore or offshore location;

3. It is necessary to quickly and without space restriction, respond to emergency conditions such as fire, explosion, pollution containment-removal, etc;

4. It is preferred that the facility be easily expanded for incidental, land related uses, or conversely (although remote) for other public uses; and

5. It is recommended that structural configuration (horizontal and vertical) effectively resolve cross current problems, sedimentation and/or erosion at or adjacent to the harbor and park site.

As we have stated in our July 22, 1980 meeting, we will gladly undertake the proposed project real estate requirements.

Sincerely yours,

Dometro R. Pablo

DOMETRO R. PABLO
Director

DEPARTMENT OF PARKS AND RECREATION
GOVERNMENT OF GUAM
AGANA, GUAM 96910

July 30, 1980

Colonel B.R. Schlapak
District Engineer
U.S. Army Engineer District
Honolulu
Building 230
Fort Shafter, Hawaii 96858

Dear Colonel Schlapak:

We are briefly responding to the information recently received concerning the proposed Small Boat Harbor at Nimitz Beach, Agat. Our comments should be considered brief and preliminary until such time as when the draft project report and environmental impact statement are made available to our office.

First, we desire to see the total gross acreage affected for each of the project alternatives. Second, we have noted on the cost of alternate plans no inclusion of U.S. Coast Guard costs for navigational aids. Third, we desire that on alternative 4 and 5 that the launching ramp be immediately adjacent to the turning basin.

Thank you for allowing us the opportunity to review the recent proposal.

Sincerely yours,

FELIX L. CRISOSTOMO
Director, Department of Parks and Recreation
State Historic Preservation Officer

BUREAU OF PLANNING
GOVERNMENT OF GUAM
AGANA, GUAM 96910

AUG 08 1980

Colonel A. Thiede
District Engineer
U.S. Army Engineer District, Honolulu
Building 230
Ft. Shafter, HI 96858

Dear Colonel Thiede:

This letter is in response to the Corps' request for preliminary comments regarding the proposed Small Boat Harbor at Nimitz Beach, Agat. While we will reserve the bulk of our comments until such time that the draft project report and EIS are made available, there are several points that should be considered in the preparation of these documents.

Our major concern is that costs be kept at a minimum, since the two million dollar ceiling on Corps projects requires that additional local funds be made available for construction of the harbor. The limited availability of local funds for such a project might prevent its completion, should costs be in excess of Federal funds allocated for construction. For example, one area where costs could possibly be minimized is channel depth. All of the harbor plans are designed to accomodate a vessel with an 8' draft. It is unlikely that a vessel of this size would be utilizing the harbor. It might be useful to analyze the cost-effectiveness of reducing maximum vessel size with respect to dredging costs.

Although more information is needed to make a full assessment of the alternatives provided, it seems that alternative =1, with the entrance channel through the reef flat, would be preferred. The general feeling at the July 23rd public workshop was that alternative #1 would be most navigable under the majority of weather conditions and would have less impact on the existing recreational areas at Nimitz Park.

We thank you for the opportunity to comment at this stage in the project report preparation.

Sincerely yours,

BETTY S. GUERRERO
Director
Bureau of Planning

GUAM ENVIRONMENTAL PROTECTION AGENCY

POST OFFICE BOX 2999 AGANA, GUAM 96910 TELEPHONE: 646-8863/64/65

25 AUG 1980

Colonel Alfred J. Thiede
District Engineer
Department of the Army
U.S. Army Engineer District
Building 230
Fort Shafter, Honolulu
Hawaii 96858

Dear Colonel Thiede:

Reference is made to the Agat Harbor at Nimitz Beach Public Workshop held on the 23rd of July, 1980 at Guam's Parks and Recreation Office.

Our initial response should be considered preliminary until such time as the project report in draft form and an Environmental Impact Statement are made available to us.

1. We would like to see a current study done in the area to clarify sediment transport zones, effectiveness of breakwater and amount of potential habitat lost.

2. We feel car parking for 80% of berths is much too high and unnecessary. A percentage figure of 50% of berths would be adequate.

3. We would like to see an assessment of the total amount of area to be filled and dredged for each of the alternative plans.

4. We question the depths of 15 feet for the entrance channel and 10 feet for the access channel. Will these depths be deep enough?

We have no comments on the preferability of the alternative plans at this time.

Thank you for the opportunity you have given us to provide input for the draft report.

Sincerely yours,

Ricardo C. Duenas
RICARDO C. DUENAS
Administrator

"ALL LIVING THINGS OF THE EARTH ARE ONE"

DEPARTMENT OF THE ARMY

U. S. ARMY ENGINEER DISTRICT, HONOLULU
FT. SHAFTER, HAWAII 96858

PODED-PJ

8 December 1980

PUBLIC NOTICE
AGAT SMALL-BOAT HARBOR STUDY

At the request of the Governor of Guam, the Honolulu District Corps of Engineers is continuing detailed feasibility studies for construction of a small-boat harbor in the Nimitz Beach area of Agat. I invite all interested parties to attend the public meeting on the 21st of January 1981.

We will present and discuss alternative harbor plans. We seek your views on these plans and the various technical, economic, social, and environmental issues associated with them. A Draft Detailed Project Report and Environmental Statement containing descriptions of these plans will be available at the public meeting or at the Guam Project Office, US Army Corps of Engineers, Pacific Daily News Building, Suite 905, Agana, Guam 96910.

As required by Executive Order 11988 and Section 404 of the Clean Water Act of 1977, comments on the possible impacts associated with the occupancy and modification of the floodplain and on the possible effects of the discharge of dredged or fill material on water quality will be considered and discussed.

There will be an opportunity for all interested persons to express their views or comments. However, for accuracy of record, important facts or positions should be submitted in writing either at the public meeting or to the Honolulu District office at the above address.

Please bring this announcement to the attention of other persons interested in these matters. I look forward to seeing you at this meeting.

ALFRED J. THIEDE
Colonel, Corps of Engineers
District Engineer

DEPARTMENT OF THE ARMY

U.S. ARMY ENGINEER DISTRICT, HONOLULU

FT. SHAFTER, HAWAII 96858

20 January 1981

KISUK CHEUNG
Chief, Engineering Division

Dear Sir:

As you know, I have been interested in Boat Basins on Guam since 1955. Agat has been my prime concern since 1963, not only because I live there, but because I have manufactured boats in the area and am interested in charter boat operations. My studys indicate that Agat could quickly expand to a two hundred boat charter fleet. Several letters and my statements at public hearings bear this out. I agree with your choice of site plan #3 although I believe your original design for that area was far more practical than the present proposed design. I also beleive there have been several deviations from your own directives and from standpoints of costs.

Please allow me to convey the following thoughts on the matter.

#1 I beleive that leading the entrance channel parallel to the swimming area will be inviting youngsters to venture out a mere 400 feet or so into dangerous waters. This condition could necessitate the employment of full-time lifeguards over looking the area.

#2 Due to our present high fuel costs and also the congested road conditions all over Guam, it should be more practical and much less expensive to drill and set charges below grade on the reef flat at low tide when the fish are out, and use the resultant riprap right on site rather than bear the expense of hauling it the length of the island from some quarry up north. In this manner, the main objective of building a boat basin rather than a reef flat surounded by a mole can be acheived!

#3 Insurability of boats by boat owners in this area requires that adequate means of protecting the boats against the pre-imminently severe typhoon damage be made available.

In order to entice the future boat owners of Guam to use the proposed facillity, a swift and sure fire method of removing the boats from the water to shore side parking or inside of sheltered areas must be made available. Boat owners have a substantial investment in their boats and considerations should be designed into the original structure to provide adequate protection and insurability to their investment. In the case of emergency such as the typhoon, the designs shown may not be conducive to rapid transfer of craft from the water to the shore side shelter. Rapid and efficient means of removing the boats from the water in the event of an oncoming typhoon, may certainly help to reduce the insurance rates of Guams future boat owners.

Please note: My designs of under water gear, props, shafts, and rudders are to allow as much freedom from damage as possible in carrying out the above.

SUMMARY

Let's do it right the first time. Make this boat basin deep enough to accomidate larger craft even at low tide. This can be done with the material already there.

May we always consider the safety of our children first.

The foundation for this plan should be large enough to include room for the future expansion that we anticipate without major alterations.

CONCLUSION

The original Nimitz Beach plan that you proposed tends to serve Guam better than these subsequent plans submitted.

Thank you for your efforts to review this matter with me.

Respectfully Submitted,

Jack W. Rice

Jack W. Rice

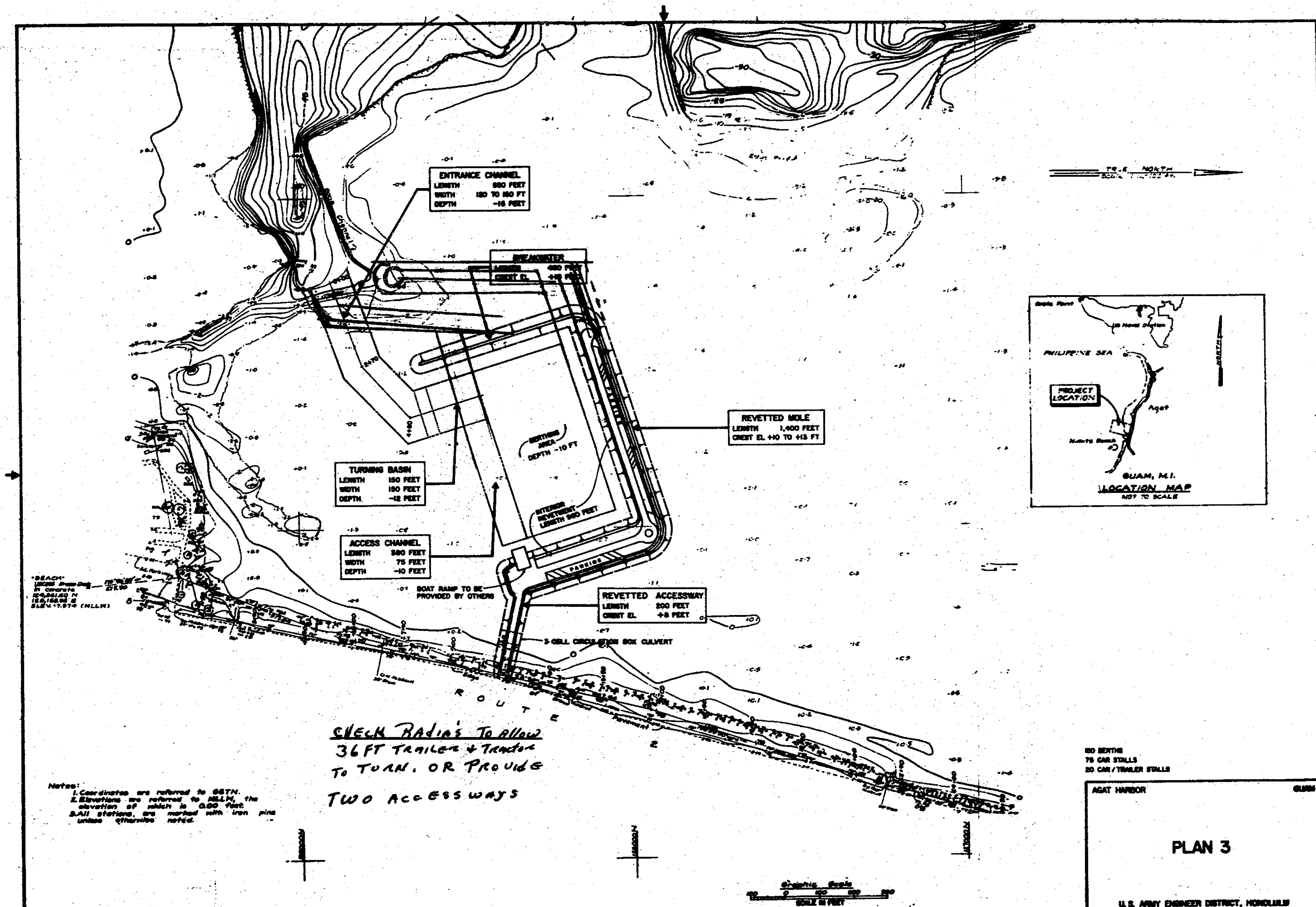

ENTRANCE CHANNEL
LENGTH 580 FEET
WIDTH 120 TO 150 FT
DEPTH -16 FEET
BREAKWATER
TURNING BASIN
LENGTH 150 FEET
WIDTH 150 FEET
DEPTH -12 FEET
ACCESS CHANNEL
LENGTH 580 FEET
WIDTH 75 FEET
DEPTH -10 FEET
BERTHING AREA
DEPTH -10 FT
INTERIOR REVETMENT LENGTH 980 FEET
PARKING
REVETTED MOLE
LENGTH 1,400 FEET
CREST EL +10 TO +13 FT
REVETTED ACCESSWAY
LENGTH 200 FEET
CREST EL +8 FEET
BOAT RAMP TO BE PROVIDED BY OTHERS
3-CELL CIRCULATION BOX CULVERT
ROUTE 2
CHECK RADIUS TO ALLOW
36 FT TRAILER & TRACTOR
TO TURN, OR PROVIDE
TWO ACCESSWAYS
PHILIPPINE SEA
PROJECT LOCATION
Agat
GUAM, M.I.
LOCATION MAP
NOT TO SCALE
Notes:
1. Coordinates are referred to GGTN.
2. Elevations are referred to MLLW, the elevation of which is 0.00 feet.
3. All stations are marked with iron pins unless otherwise noted.
Graphic Scale
SCALE IN FEET
150 BERTHS
75 CAR STALLS
20 CAR / TRAILER STALLS
AGAT HARBOR
GUAM
PLAN 3
U.S. ARMY ENGINEER DISTRICT, HONOLULU

FIGURE 6

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
215 Fremont Street
San Francisco, Ca. 94105

FEB 9 1981

Project #D-COE-K32026-GU

Kisuk Cheung, Chief, Engineering Division
Department of the Army
U.S. Army Engineer District, Honolulu
Ft. Shafter, Hawaii 96858

Dear Mr. Cheung:

The Environmental Protection Agency (EPA) has received and reviewed the Draft Environmental Impact Statement (DEIS) titled AGAT SMALL BOAT HARBOR, GUAM.

The EPA's comments on the DEIS have been classified as Category LO-2. Definitions of the categories are provided by the enclosure. The classification and the date of the EPA's comments will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal Actions under Section 309 of the Clean Air Act. Our procedure is to categorize our comments on both the environmental consequences of the proposed action and the adequacy of the environmental statement.

The EPA appreciates the opportunity to comment on this DEIS and requests five copies of the Final Environmental Impact Statement when available.

If you have any questions regarding our comments, please contact Susan Sakaki, EIS Review Coordinator, at (415) 556-7858.

Sincerely yours,

for Sheila M. Prindiville
Acting Regional Administrator

Enclosure

UNITED STATES
DEPARTMENT OF THE INTERIOR
OFFICE OF THE SECRETARY
PACIFIC SOUTHWEST REGION
BOX 36098 • 450 GOLDEN GATE AVENUE
SAN FRANCISCO, CALIFORNIA 94102
(415) 556-8200

ER-80/1541

February 10, 1981

Kisuk Cheung
Chief, Engineering Division
U.S. Army Corps of Engineers
Honolulu District
Building 230
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

The Department of the Interior has reviewed the draft detailed project report and draft environmental statement (combined) for Agat Small Boat Harbor Study, Territory of Guam. We offer the following comments.

General Comments
The National Park Service acknowledges the selection of alternative sites away from the War-in-the-Pacific National Historic Park in response to concerns expressed at public meetings on the proposed project.

Recreational Resources
Potential disruption of swimming and diving, and reef fishing and shell collecting at Nimitz Beach Park by construction of Plans 3 or 4 is predicted (page EIS-18). Conflicts between recreational uses of the project area may be reduced by selection of Plan 1 or Plan 2. If Plan 3, the NED Alternative, is selected every effort to reduce conflicts between recreational activities should be undertaken.

The Guam Department of Parks and Recreation and the Guam Territorial Seashore Commission may be able to provide suggested mitigation measures or assist in the selection of the preferred alternative plan.

Cultural Resources
Evidence of compliance with Federal historic preservation legislation and regulations should include correspondence received from the Guam Territorial Historic Preservation Officer, Mr. Joseph F. Soriano, Director, Department of Parks and Recreation, Post Office Box 3950, Agana, Guam 96910, in the final environmental statement.

Specific Comments
Page EIS-16, line 1: The Taleyfac Spanish Bridge is 1600 feet (not miles) south of the proposed harbor site.

Thank you for the opportunity to review this document.

Sincerely yours,

Patricia Sanderson Port

Patricia Sanderson Port
Regional Environmental Officer

cc: Director, Office of Environmental Project Review
Director, Fish and Wildlife Service
Director, Heritage Conservation & Recreation Service
Director, National Park Service
Director, Geological Survey
Director, Bureau of Mines
Regional Directors

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
Western Pacific Program Office
P. O. Box 3830
Honolulu, Hawaii 96812

February 11, 1981 F/SWR1:JJN

Colonel Alfred J. Thiede
District Engineer
U. S. Army Engineer District, Honolulu
Building 230
Fort Shafter, Hawaii 96858

Dear Colonel Thiede:

The National Marine Fisheries Service has reviewed the draft environmental impact statement (DEIS) for Agat Small Boat Harbor, Territory of Guam. (DOC DEIS #8101.09).

In order to provide as timely a response to your request for comments as possible, we are submitting this report to you directly, in parallel with its transmittal to the Department of Commerce for incorporation in the Departmental response. These comments represent the views of the National Marine Fisheries Service (NMFS). The formal consolidated views of the Department should reach you shortly.

General Comments

A biologist on my staff recently conducted a site inspection at the proposed Agat Small Boat Harbor site. Based on this and our review of the combined DEIS and Draft Detailed Project Report, we feel resources for which NMFS bears a responsibility and alternatives to reduce adverse impacts on these resources have been addressed to our satisfaction in the document.

Of the four plans detailed in the subject DEIS this agency recommends construction of the proposed small boat harbor based on Plan 2, the onshore harbor with entrance channel north of Nimitz Beach. This plan would minimize impacts on the highly productive reef front since harbor dredging would be conducted immediately off the beach. The open harbor design would not significantly alter existing circulation and current patterns on the reef flat and would provide excellent harbor flushing. The entrance channel would avoid Nimitz Channel, an area heavily used by Guam residents for subsistence and recreational fishing/diving and containing an extremely abundant and diverse coral reef community.

During our site inspection nearly 100% live coral coverage was found on the Nimitz Channel slopes and the immediate reef front. We are concerned that a small boat harbor entrance channel utilizing Nimitz Channel would subject this area to stress from dredging turbidity, from pollutants flushed off the inshore reef flat and harbor, and from heavy boat traffic which would create unsafe conditions for fishing and diving activities.

An alternative plan which we feel was not adequately addressed is that of an entrance channel (north of Nimitz Channel) and a two-lane boat launching ramp. The DEIS acknowledges the high percentage (75%) of trailer-mounted boats in Guam and the immediate need for additional launching facilities. This was confirmed during recent discussions with commercial fishermen at Agana Boat Harbor. They also felt the Government of Guam could not meet the non-Federal cost of sharing funds required for a larger harbor as proposed in Plans 1-4. Therefore, we feel the alternative of an entrance channel and launching ramp should be discussed in the DEIS and should also consider the possibility of a protective breakwater as well as increased dry boat storage capacity.

We hope these comments will be of assistance to you in selecting the final Agat Small Boat Harbor plan. Please send us a copy of the final EIS as soon as it becomes available.

Sincerely yours,

Doyle E. Gates

Doyle E. Gates
Administrator

cc: F/SWR3
Office of Habitat Protection, F/HP

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
REGION NINE
Hawaii Division
Box 50206
Honolulu, Hawaii 96850

ARIZONA
CALIFORNIA
NEVADA
HAWAII
GUAM
AMERICAN SAMOA

February 13, 1981

IN REPLY REFER TO
HEC-HI

Mr. Kisuk Cheung, Chief
Engineering Division
Department of the Army
U.S. Army Engineer District, Honolulu
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

Subject: Draft Detailed Project Report and Environment Statement - Agat Small Boat Harbor, Territory of Guam

Thank you for the opportunity of reviewing the subject draft environmental statement.

We have no comments to offer at this time.

Sincerely yours,

Ralph T. Segawa
Division Administrator

By: H. Kusumoto
Assistant Division Administrator

Department of Parks and Recreation
GOVERNMENT OF GUAM
AGANA, GUAM 96910

FEB 13 1981

Mr. Kisuk Cheung
Chief
Engineering Division
U.S. Army Engineering District
Building
Fort Shafter
Honolulu, Hawaii 96858

Dear Mr. Cheung:

We have reviewed the Draft Detail Project Report and Environmental Statement for the Agat Small Boat Harbor and our comments are hereby submitted.

On page 20 of the Draft, under 4.b., Boating Problems and Needs, an earlier report indicated that by Fiscal Year 1980, the number of spaces is for 300 boats. An update of this is that the Agana Marina Phase IIA, presently under construction and scheduled for completion by July 1981, will only provide an additional 10 berthing spaces, parking lot, launching ramp, and installation of 14 mooring anchor blocks at the seaward side of the boat basin proper.

A pre-public hearing meeting was conducted at our office on January 20, 1981, per arrangement by Mr. Tim Young of your office, where Government of Guam was well represented by staff members from various departments and agencies.

An interesting point of discussion was centered enthusiastically when Mr. Young presented Plan 5 to the group, basically aimed at cost factors and immediate needs, and are listed as follows:

1. The overall construction cost is the most reasonable of all the plans presented for all parties involved on the projects.

2. The 3.6 acres of Government property across from Route 2 between the Pagachao Road and the C & H Farm can be utilized for parking of vehicles and boat trailers thus eliminating the need for on-shore parking as indicated on Plan 5. Another alternate, temporary parking area is located at Nimitz Beach. This area can be utilized until such time as the Boat Harbor facility reflect a demand for parking expansion. We are hopeful that by this time, projected revenues from slip rentals and other fees from concessions

FEB 13 1981

may just generate enough funds for construction of the on-shore parking lot.

3. We understand the Corps' position in just providing protection of the harbor and shore. We fail to see the construction of a launching ramp included in any of the plans presented. It appears that the ramp is an integral part of the initial construction, but is only recommended to be done by others. Is the initial construction flexible enough for a launching ramp to be included in Guam's share of the initial construction cost?

In closing, we are hoping to hear from your office as regards to the impact of January 21, 1981 hearing at Agat as soon as the evaluation is completed. Thank you for the opportunity to review the Draft.

Sincerely yours,

JOSEPH F. SORIANO
Director
Department of Parks and Recreation

GUAM ENVIRONMENTAL PROTECTION AGENCY

POST OFFICE BOX 2999 AGANA, GUAM 96910 TELEPHONE: 646-8863/64/65

INTER-AGENCY MEMORANDUM

TO: Director of Public Works FEB 19 1981

FROM: Administrator

SUBJECT: Draft Detailed Project Report and Environmental Statement, Agat Small Boat harbor.

The staff of the Guam Environmental Protection Agency has reviewed the Draft Detailed Project Report and Environmental Statement for the Agat Small Boat Harbor and have the following comments.

We generally favor Plan 5 as outlined in the coordination meeting held at the Department of Parks and Recreation on January 20, 1981. We would however like to review detailed environmental information on this plan so that we can compare it with the four plans presented in the report.

In addition, we strongly suggest that the Army Corps of Engineers consider phased development of the selected plan since the Government of Guam may have difficulty in obtaining the necessary funds for full scale development. Phased development could reduce the impact of siltation due to dredging as well.

Dredging in the Nimitz Channel area (Plans 3,4 and 5) or through the 250-foot wide depression in the reef flat (Plans 1 and 2) should be minimized as much as possible to reduce impact on the diverse coral communities present. The possibility of moving some of the large coral heads temporarily and then re-attaching them to the channel walls should be considered. The Marine Laboratory has shown that this is feasible.

Thank you for the opportunity to comment on the Draft Report and Environmental Statement. We look forward to reviewing more detailed information on Plan 5.

Ricardo C. Duenas
RICARDO C. DUENAS

CC: Mr. Kisuk Cheung, Chief Engineering Division, U.S. Army Engr., District Honolulu, Building 230
Fort Shafter, Hawaii 96858

"ALL LIVING THINGS OF THE EARTH ARE ONE"

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

COMMANDER (dpl)
Fourteenth Coast Guard District
Prince Kalanianaole Federal Bldg.
300 Ala Moana Blvd.
Honolulu, Hawaii 96850

11000
Serial 527

23 FEB 1981

Department of the Army
U. S. Army Engineer District, Honolulu
Ft. Shafter, Hawaii 96858

Dear Sir:

The Fourteenth Coast Guard District is concerned about the proposed Agat Small Boat Harbor's potential on the marine environment from both sewage pollution and oil pollution. The EIS for the project should consider the possible affects of increased sewage and oil pollution from the vessels in the harbor.

The Clean Water Act of 1977 authorizes the discharge of adequately treated sewage. From vessels in the harbor, that would be sewage from a Type I or Type II Marine Sanitation Device (MSD). If the vessel has a Type III device, it would probably be a "holding tank." Holding tanks may be accidently or illegally emptied into the harbor. Vessels with portable toilets may empty raw sewage into the water. While this is illegal, it does occur. The existance, or lack of existance, of pump out facilities for vessels with holding tanks or portable toilets should be addressed in the EIS.

The discharge of oil either from legally operating marine engines (outboard motors) or vessels illegally draining waste oil from bilges should be considered in the EIS.

If a fueling facility is included in the subject complex then the chance of oil discharges increase. If there is a fueling facility, how it receives fuel, by pipeline, truck or vessel should be mentioned in the EIS.

The design and operation of fueling facilities may be regulated by 33 CFR 154 and 33 CFR 156. However, these regulations are only for facilities involved in the bulk transfer of oil to or from a vessel that has a capabity of 250 or more barrels of oil.

We recommend that the marina have a waste oil facility for boaters who wish to empty their oil. As a final suggestion for preventing oil pollution, the marina should have a small oil spill clean-up capability in case a spill does occur.

We concur with the cost estimates for aids to navigation on page E-32.

Thank you for this opportunity to comment on the Agat Small Boat Harbor Study. If you have any questions about any of our comments or suggestions, please contact LTJG Deborah Fontaine at 546-2862.

Sincerely,

J E Schwartz

J. E. SCHWARTZ
Commander, U. S. Coast Guard
Planning Officer
Fourteenth Coast Guard District
By Direction

BUREAU OF PLANNING
GOVERNMENT OF GUAM
AGANA, GUAM 96910

27 FEB 1981

Colonel Alfred J. Thiede
U.S. Army Engineer District, Honolulu
Building 230
Ft. Shafter, HI 96858

Dear Colonel Thiede:

The Bureau has reviewed the Draft Project Report and Environmental Statement for the Agat Small Boat Harbor. We offer the following comments.

Of the plans discussed at the January 21, 1981 public workshop and at a multi-agency meeting with the Corps, Plan 5 appeared the most acceptable. The alternative features the specifications of Plan 2 with the existing Nimitz Channel as an extension of the harbor entrance.

The Bureau, however, is concerned that the Corps estimates for local share of funding (approximately 2 million dollars) far exceeds any contribution that could be made, given current fiscal constraints. In the interest of minimizing costs, we would recommend that the Corps analyze the cost effectiveness of Plan 5 with berthing space for 80 boats instead of 150.

In addition, we are interested in information on Corps' policies regarding assistance with channelization and provision of protective structures for boating facilities the government may provide, should costs for a harbor be prohibitively high.

We appreciate the opportunity to provide comment.

Sincerely yours,

Betty S. Guerrero
BETTY S. GUERRERO
Director
Bureau of Planning

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

COMMANDER (oan)
Fourteenth Coast Guard District
Prince Kalanianaole Federal Bldg.
300 Ala Moana Blvd.
Honolulu, Hawaii 96850
(808) 546 7130

16500
Serial 32046
2 MAR 1981

From: Commander, Fourteenth Coast Guard District
To: District Engineer, U. S. Army Engineer District, Honolulu
Building 230, Ft. Shafter, Hawaii 96858
Attn: Mr. Tim Young

Subj: Aids to Navigation for Agat Small Boat Harbor, Guam

1. The Agat Small Boat Harbor proposal has been reviewed. The following aids to navigation are planned:

a. A multi-pile steel structure in six to ten feet of water approximately 1080 yards 246° True from the southern tip of the main breakwater ($45,000).

b. A single pole structure on the southern tip of the main breakwater ($10,000).

c. A range system to mark the channel centerline, consisting of two single pole structures established on shore. The rear range will be approximately 550 yards 083° True from the southern tip of the main breakwater. The front range will be approximately 360 yards 091° True from the southern tip of the main breakwater ($25,000).

2. Presently the aids are not scheduled to be lighted due to lack of information concerning projected nighttime traffic in the harbor. Provisions will be made in the design of the structures to light them at a future date, if necessary. If you have any additional information, please forward it to this office.

3. The cost to maintain the aids as unlighted aids will be approximately $500 per year.

4. To assist us in completing design work on the proposed aids for the harbor, the following information is requested:

a. The latitude and longitude of the harbor site survey reference point.

b. An expanded drawing of the area surrounding the proposed range sites, to 200 yards inland, showing shoreline features and elevations. This will expedite our design work and will provide construction site alternatives in the event the proposed sites can not be used.

c. Data on the availability and the nearest location of commercial power for future lighting of the ranges.

2 MAR 1981

5. We anticipate including construction of our aids in the CofE contract for construction of the harbor. When must our designs be received in order to be included in the contract?

6. Questions concerning our plans may be directed to either LTJG MIKE VAN HOUTEN or LTJG PAUL DAL SANTO, both at 546 7130.

V. R. ROBILLARD
By direction

Encl: (1) Chartlet of harbor showing proposed aids

Copy to: (w/encl)
MARSEC
CCGD14(ecv)

JUN 1 1981

GOVERNMENT OF GUAM
AGANA, GUAM 96910

MAY 28 1981

Kisuk Cheung
Chief, Engineering Division
U.S. Army Engineer District, Honolulu
Ft. Shafter, Hawaii 96858

Dear Mr. Cheung:

The Department has reviewed the report, "Cultural Resources Reconnaissance Alternative Project Sites for Agat Small Boat Harbor, Territory of Guam," as prepared by Pacific Studies Institute in 1977.

At this time, we believe that an additional reconnaissance survey should be undertaken since there is good indication that additional cultural materials will be located in the project area not investigated during the preliminary reconnaissance survey. This recommendation is based upon the following reasons:

1. Page 2 of the above mentioned report, that states in part that "there may be more artifacts buried in the sand in the lagoon portion of Survey Area 2."

2. The recent archaeological discoveries in similar projects (Ypao and Asan) involving water and related land resources. It was only after construction had been undertaken that archaeological resources was discovered.

3. Especially that section of the report prepared by the Advisory Council on Historic Preservation on the Guidelines for Implementing 36 CFR 800 "Protection of Historic and Cultural Properties," May 1979 that mentions that, "of particular interest in projects involving water and related land resources are potential archaeological sites. It has been estimated that eighty (80) percent of all archaeological sites lie near present or former water bodies."

The additional reconnaissance work should include an extensive subsurface testing, literature review and underwater work. The Department also recommends that an archaeological monitor dredging operations for possible prehistoric and historic artifacts.

It is not our Department's responsibility to fund the reconnaissance survey, compliance is the sole responsibility of the Federal agency having direct or indirect jurisdiction over a proposed undertaking to take into account the effect of the undertaking on National Register or eligible properties, this responsibility cannot be delegated by the

MAY 28 1981

agency. While joint participation by Federal, State and local officials may, under the proper circumstances, be consistent with the mandate of Section 106, outright delegation of Federal agency responsibility is not. Refer to Guidelines for Implementing 35 CFR 800 "Protection of Historic and Cultural Properties and the Archaeological and Historic Preservation Act of 1974" (copy enclosed).

Sincerely,

JOSEPH F. SORIANO
State Historic Preservation Officer

Enclosure

Territory of Guam
Office of the Governor
Agana, Guam 96910
U.S.A.

PAUL M. CALVO
Governor

MAY 29 1981

Kisuk Cheung
Chief, Engineering Division
U.S. Army Engineer District, Honolulu
Ft. Shafter, Hawaii 96858

Dear Mr. Cheung:

Upon review of Plan 5, received from your office on May 6, 1981, and in reference to your letter of February 24, 1981, the Government of Guam hereby endorses the concept of Plan 5 of the Agat Small Boat Harbor Project. As regard to the local cooperation requirements specified in Section 107 of the River and Harbor Act of 1960, as amended, the following assurances are provided in connection with the Agat Small Boat Harbor Project, Guam. The Government of Guam gives assurance that it will:

a. provide without cost to the United States all lands, easements, and rights-of-way required for construction and subsequent maintenance of the project and for aids to navigation upon the request of the Chief of Engineers, including suitable areas determined by the Chief of Engineers to be required in the public interest for initial and subsequent disposal of spoil, and also necessary retaining dikes, bulkheads and embankments thereafter or the costs of such retaining works.

b. hold and save the United States free from claims for damages due to the construction work and subsequent maintenance of the project, excluding damages due to the fault or negligence of the United States or its contractors.

c. provide and maintain without cost to the United States necessary berthing or mooring facilities, and attendant utilities, including a landing with suitable supply facilities open to all on equal terms.

d. provide and maintain without cost to the United States depths in the berthing or mooring areas, and in local access channels thereto, commensurate with the depths provided in the related project areas.

e. provide and maintain without cost to the United States all appropriate on-shore structures, access roads, parking areas, public restrooms and boat launching ramps as necessary to insure a complete and adequate project.

f. Accomplish without cost to the United States such utility or other relocation or alterations as necessary for project purposes.

g. Establish regulations prohibiting the discharge of pollutants into the waters of the channel and harbor by users thereof, which regulations shall be in accordance with applicable laws or regulations of Federal and local authorities responsible for pollution prevention and control.

In carrying out the specific non-Federal responsibilities for the Agat Small Boat Harbor Project, the Government of Guam agrees to comply with the provisions of the "Uniform Relocation Assistance and Real Property Acquisitions Policies Act of 1970", Public Law 91-646, approved 2 January 1971, and Section 221 of Public Law 91-611, approved 31 January 1970, as amended.

In closing, we look forward to cooperatively completing the study and the implementation of the Agat Small Boat Harbor Project.

Sincerely,

PAUL M. CALVO
Governor of Guam

VIII. MAILING LIST

AGAT SMALL BOAT HARBOR
AGAT, TERRITORY OF GUAM

TERRITORY OF GUAM

Honorable Paul M. Calvo
Governor of Guam
Agana, Guam 96910

Honorable Joseph Ada
Lieutenant Governor of Guam
Agana, Guam 96910

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Historic Preservation Officer
Department of Parks & Recreation
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Marianas Yacht Club
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Agana, Guam 96910

Save Our Beauty
P. O. Box 20721
Guam Main Facility
Agana, Guam 96910

War in the Pacific National
Historical Park
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Nolan Hendricks, President
Guam Surfing Association
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Mr. Glen Anderson
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Agat, Guam 96915

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Mr. Raymond Crisostomo
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AGAT SMALL BOAT HARBOR
TERRITORY OF GUAM

CULTURAL AND SOCIAL RESOURCES

APPENDIX C

APPENDIX C

CULTURAL AND SOCIAL RESOURCES

Table of Contents

List of Tables

APPENDIX C

CULTURAL AND SOCIAL RESOURCES

I. INTRODUCTION

1. Part I of Appendix C summarizes the findings of the Corps in identifying prehistoric sites, historic structures, or other cultural resources in the study area and assessing the effects of the alternatives on the sites or resources. Identification of historic sites is required by the Reservoir Salvage Act of 1960 as amended and Executive Order 11593 (1971). The Federal agency must evaluate the significance of the sites in order to determine possible eligibility for the National Register of Historic Places. If any sites in the project area were determined eligible for or already listed on the National Register, they would be protected by Federal law and regulation to the extent that the Federal agency must consult with the State Historic Preservation Officer and the US Advisory Council on Historic Preservation to determine the effect of the Federal project and to identify measures to either avoid or mitigate for any adverse effects.

2. Part II of the cultural and social resources appendix summarizes pertinent socioeconomic profile data on the study area and assesses the social well-being components of the four alternative plans. The other social effects component analysis derives from the Water Resources Council's "Principles and Standards for Planning Water and Related Land Resources--Level C" (P&S), 45 Federal Register 64366-64400, 29 September 1980. The other social effects components now required by P&S consist of (1) Urban and community impacts such as income distribution, employment distribution, population distribution and composition, the fiscal condition of the local government, and the quality of community life; (2) Life, health and safety; (3) Displacement including people, businesses, and farms; (4) Long-term productivity involving renewable resources such as fisheries; and (5) Energy requirements and energy conservation both during construction and operation of facilities.

II. AFFECTED RESOURCES

3. Prehistory. According to radiocarbon dating studies, the Mariana Islands including Guam were inhabited by 1327 BC. These original inhabitants were probably seafarers of Asian origin who, over generations, migrated through the Philippines, Western Caroline Islands and perhaps Japan, before arriving in the Marianas. These early settlers were undoubtedly joined by many subsequent migrations over the centuries before western contact. These travelers brought with them the technologies of rice cultivation, pottery making, fishing, and canoe building (Jennison-Noland, 1979b).

4. Since Guam is a high island with fertile soil and lush river valleys, precontact food production was primarily horticultural and gathering in nature. Finfish and other edible aquatic fauna provided the major source of animal protein. Canoe building and sailing had developed to a sophisticated level by the time of early Spanish contact. Large voyaging canoes allowed trade, commerce, and fishing throughout the Marianas and probably into the Carolines. Precontact population estimates run as high as 100,000; thus, subsistence fishing and agricultural activity provided adequate food supplies for a population not greatly different from today's.

5. In prehistoric times, Guam's coastal regions were densely populated with village settlements. In comparison with other parts of Guam, no systematic archaeological surveys have been conducted in the area of Agat-Santa Rita-Piti (Guam Department of Parks and Recreation, 1976). Thus, although no prehistoric sites are known to occur in the Agat area, a cultural resources reconnaissance conducted in April 1977 by Pacific Studies Institute (PSI) under subcontract to Bishop Museum for the US Army Corps of Engineers found evidence of prehistoric pottery shards in the beach fronting and north of Nimitz Beach Park. The shards found near Nimitz Beach were described as waterworn and associated with material which had washed down from the hilly areas east of the beach (PSI, 1977). The report expressed the likelihood of similar artifacts being buried in the sand pockets on the reef flat platform. The natural sand berm may also contain archaeological materials.

6. Guam and Its People Under Spanish Influence. Ferdinand Magellan arrived in Guam in 1521 and was followed by Spanish colonization (Beaty, 1967). As Spanish influence over the island increased during the 19th century, inter-island trade was curtailed and the construction of large ocean-going canoes fell into disuse; however, the population continued to fill protein needs by fishing in waters surrounding the island. The center of life in the village was the church. When the men went to work in their fields, they sometimes had to journey for a day or more. The basic economy of Guam was subsistence agriculture. Copra was also produced by households as a cash crop. As in former days, the basic unit of production was the household. Households were augmented by members of the older generation and sometimes by women or men who came to the family by marriage. Kinship ties extended well beyond the confines of the households and, although the household was nominally self-sufficient, there was extensive sharing and exchange of food between households related by kinship, including marriage and god-parental relationships. Relationships between persons and households formed complex interlocking networks (Wilson, 1975). Social ties were symbolized and cemented by annual fiestas given in each village for its patron saint. Other social occasions, including marriages, baptisms, and funerals also called for feasts and brought people together from all parts of the island. Each household prepared and served the food at village fiestas and each household was assisted by related households. Fiestas and other special occasions served both to create and to discharge whole systems of obligations between households and individuals.

7. Old Agat was built by Spanish Governor Don Jose Quiroga and his successors between 1680 and 1684. He was one of the most ruthless of the Spanish rulers, and soon earned the nickname, 'tyrant'. Open rebellion against Spanish religious practices erupted by 1671. Reprisals by the Spanish garrison further embittered the people, resulting in 25 years of sporadic warfare. To control the rebellious islanders, Governor Quiroga systematically destroyed their small scattered settlements and relocated them in centralized communities of his own making such as Agat. Many of its residents were brought from the interior village of Fena, which he had wiped out. In 1681, the missionaries completed the first Agat Church and dedicated it to Santa Rosa de Lima. The eighteenth century (1700's) seems to have been a time for Spanish construction projects. According to a study of cultural resources within the Guam National Seashore study area of southwest Guam prepared by the University of Guam Department of Anthropology and Geography for the National

Park Service in November 1979, a road was built in the 18th century from Umatac to Agana passing along the western shore of Guam (Jennison-Nolan, 1979a). In conjunction with the road development, several bridges were constructed, two of which, just south of Nimitz Beach Park, have been preserved to this day.

8. The Taleyfac Spanish Bridge (Guam Site 66-02-1071) is located about 1,600 feet south of the proposed harbor site on the seaward side of Highway 2 crossing Taleyfac River. The bridge is 36 feet long and 12 feet wide, double-arched and floored with heavy timber covered with earth. Flooring was originally wood timbers, however, these no longer exist and have been replaced by a rock and dirt floor with a 6-foot-wide roadbed (Jennison-Nolan, 1979a). By analyzing Carano and Sanchez, "A Complete History of Guam" (pg 11, 1964), the bridge could have been originally constructed during the enlightened governorship of Mariano Tobias (1771-1774), who administered, what was for Spanish Guam, a remarkable reconstruction program. The Jennison-Nolan report (1979a) described the Taleyfac Spanish Bridge as an example of Spanish stone-slab and mortar bridge construction of the 19th century, symbolizing perhaps more than any other structure on the island, Spanish-era construction. Based on the Carano and Sanchez (1964) history, the Taleyfac Spanish Bridge may have been reconstructed during the governorship of Francisco Ramon de Villalobos (1831-37) who reportedly personally superintended the building of roads and bridges. Taleyfac Spanish Bridge is listed on the National Register of Historic Places. Taelayag Spanish Bridge (Site 60-02-1072), located about one mile south of Nimitz Beach is a small, one-arch structure. It is not listed in the National Register.

9. Modern History. The village of old Agat was originally located about one mile north of its present location near Rizal Beach. It was a fishing village along with its sister community of Sumay, which was on the northern shore of Orote Peninsula where US Naval Station now lies (Beaty, 1964). During the pre-war period, few fish were sold on the monetary market except in Agana, the center of population. The continued importance of subsistence fishing is underscored by a government survey in 1941 which reported a conservative estimate of 200 outrigger canoes scattered in various locations around the island. Mr. Jose Lizama Charfauros of Agat recalls an average of at least one canoe and usually more for every third household in the pre-war village of Agat where he has lived all of his seventy-eight years (Jennison-Nolan, 1979a). Agat and Sumay were destroyed in the American invasion of Guam in 1944 to retake the island from the Japanese who had occupied it for 3 years. Old Agat was moved to its present location and Sumay was moved into the hills northeast of the new Agat to an area known then and now as Santa Rita. Agat Beach was one of the two American invasion points where thousands of Allied troops stormed ashore. Japanese fortifications and the American fighting were limited along the beach to the zone north of an including Bangi Point. Nimitz Beach was not affected. In 1978, the War in the Pacific National Historic Park was established extending in its southern portion from Bangi Point north to Rizal Point. This park encompasses Agat Invasion Beach which is listed on the National Register of Historic Places. There are no sites listed on or eligible for listing on the National Register known to be located in the project area at Nimitz Beach Park.

10. Land Use. Agat and Santa Rita Villages are primarily residential suburbs for workers at the US Naval Station, the Guam Oil Refinery in Santa Rita, other industries located near the Commercial Port of Guam in Apra Harbor, and the major employment center of the Agana-Tamuning area in central Guam. The urban villages themselves comprise only 4.8 percent and 3.9 percent, respectively of the total district. Dominating land use in the districts of Agat and Santa Rita is the role of the US Navy which controls 50 percent of eastern Agat District for the Naval Magazine and 77 percent of Santa Rita in the east for the Naval Magazine and in the west for the Naval Station. The landscape south of Agat-Santa Rita villages is characterized by scattered residences and farms. Other than the US Navy, Japanese interests and other aliens controlled 29 percent of urban and agricultural lands in Agat District.

11. All local permits are the responsibility of the local sponsor to obtain, however, Federal planning must take the local regulatory criteria into account in assessing and evaluating the final array of alternative plans. According to the "Official Zoning Map" prepared by the Department of Land Management, Territory of Guam, in 1967, all the Agat Bay shoreline is zoned agricultural use. This zoning was designed to preserve these areas from urban development. The new "Land Use Plan: Guam 1977-2000," changed this designation of the Agat Bay shoreline to a "Conservation District." The new land use districting system was implemented by Guam Executive Order 78-23 signed 8 September 1978. A Conservation District is designed, among other aspects, to preserve scenic and historic areas, provided parklands, wilderness and beaches, and conserve indigenous plants, fish and wildlife. All of Nimitz Beach Park and the Highway 2 frontage 12,000 feet north of the Park (Plat 194-2-1) is owned by the US Department of the Interior, which originally had intended to incorporate Nimitz Beach Park into the War in the Pacific National Historic Park. A 150-foot-wide buffer zone (Plat 194-2-2) landward of Highway 2, which is claimed by the Government of Guam, is designated low-density (R1) "Urban Residential". Parks and public facilities are among the conditional uses permitted within R1 zoning. Based on available information, marinas do not appear to be a permitted or conditional use within this zoning (Guam Bureau of Planning & US Office of Coastal Zone Management, 1978).

12. Further land-use controls are provided by the designation of "area of particular concern" (APC) as required by the Coastal Zone Management Act (Public Law 92-583). Only two APC's have been formally designated in Guam, flood hazard areas and wetlands (Guam Executive Orders 78-20 and 78-21). The study area lies within a one percent (1%) exceedance frequency floodplain. The Rules and Regulations for Flood Hazard Areas as promulgated under Guam Executive Order 78-20 by the Territorial Planning Commission require a certain procedure to be followed to obtain a development permit. The evaluation report prepared under Presidential Executive Order 11988 on Flood Plain Management which is contained in the Plan Formulation Appendix A describes the proposed project in relation to the Guam flood hazard area APC.

13. Other APC's have been proposed for implementation for the Nimitz Beach area including the category of "coral reefs" under Unique Marine Ecological Communities, the category of "lagoon deposits" under Mineral Deposits, and the category of "boating, fishing, aquaculture and associated services and activities" under Shoreline Development Areas (Guam Bureau of Planning & US Office of CZM, July 1979). Adjacent and about 4,000 feet southwest of the study area is Anae Island at which the additional APC's of surfing sites and a Marine Pristine Ecological Community are located.

14. All "developments" within the seashore reserve, which extends from 10 fathoms seaward to 100 meters landward (or the nearest public highway) of the mean high waterline, must also obtain a permit from the Guam Territorial Seashore Protection Commission. The Commission was established by Guam Public Law 12-108 (Title XIV, Chapter V-A, Section 14415) and Commission Rules and Regulation became effective 14 August 1975. No permits will be issued for any development which has any substantial adverse environmental or ecological effect. All developments and permittees must further ensure that:

a. Access to beaches recreation and historical areas, and natural reserves is increased to the maximum extent possible by appropriate dedication;

b. There is no substantial interference with or detraction from the line of sight toward the sea from the territorial highway nearest the coast;

c. Adequate and properly located public recreation areas and wildlife preserves are reserved;

d. Provisions are made for solid and liquid waste treatment, disposition, and management which will minimize adverse effects upon coastal reserve resources.

e. Alterations to existing land forms and vegetation, and construction of structures shall cause minimum danger of floods, landslides, erosion or siltation.

15. Local Economy. The local economy of the Agat-Santa Rita is dominated by employment opportunities at the US Naval Reservation at Apra Harbor and the US Naval Magazine. Table 1 summarizes changes in gross labor categories in the Agat-Santa Rita region from 1960 to 1970 (less US Navy personnel residing in Santa Rita District).

Table C-1. Employment: Class of Worker in Percent of Village Labor Force for 1960 and 1970*

Village	Agriculture		Private Wage		Government		Self Employed	
	1960	1970	1960	1970	1960	1970	1960	1970
Agat	5	1	5	23	68	21	4	1
Santa Rita	a	a	86	33	14	65	a	a
Islandwide Total	411	146	8,981	10,136	7,297	7,532	437	431

*Source: Jennison-Nolan, Jane and others. "Cultural Resources within the Guam Seashore Study Area and the War in the Pacific National Historical Park." Submitted to National Park Service, US Department of the Interior by University of Guam, Department of Anthropology and Geography, November 1979, Table 6.

[a] Less than 1 percent.

The government category includes Federal governmental agencies, primarily the US Navy, and the Government of Guam which in 1980 employed 4,506 and 9,300 payrolled employees, respectively (Guam Department of Commerce, Economic Research Center, 1981). The 1980 Census employment breakdown for the districts of Agat and Santa Rita is not yet available. Local, non-governmental economic institutions primarily consist of small businesses servicing the residents of the Agat-Santa Rita region and a number of small farms. According to the "yellow pages" in the Guam Telephone Book for 1980, there were nine retail food outlets, one nightclub, no restaurants, one lumber-home construction firm, and one gift shop in Agat-Santa Rita. The latter together with the Agat Boat Center, located north of Agat Village near Naval Station and the International Divers Association are the sole local businesses that appear to primarily serve visitors, including tourists and Guam residents living outside the area. The Agat Boat Center provides sales, servicing and repairing of boats and engines, and the International Divers Association provides guide services for SCUBA divers and snorkelers. An average of ten scuba dive tours a month originate out of the Agat Boat Center (Guam Department of Parks and Recreation, 18 March 1980).

16. There are also sixteen farms totalling 31 acres in Agat District, most located inland and south of Bangi Point. These farms average in size from one quarter acre to 8 acres and all but two are located on Government of Guam leased land (Guam Environmental Protection Agency, 1979). The second largest commercial poultry operation, C&H, has one of its two farms located at Agat, with approximately 8,000 layers. The C&H Farm is across Highway 2 from the northern end of proposed harbor Plan 2. Approximately six of the 16 farms appear to be located in areas designated Urban while the remaining are in areas designated Rural or Conservation by the Guam Bureau of Planning. Agriculture is not a permitted or conditional use in Urban Zones.

17. <u>Guam's Subsistence Economy</u>. Underlying Guam's monetary economy is a traditional non-monetary or semi-monetary subsistence one in which goods (subsistence foods, e.g., fish, vegetables and fruits, beef and pork and other food products) are exchanged for services and to a degree, other goods. The following description of this subsistence sector of the Guam economy is adapted from R. Otto Haverlandt's, "The Guamanian Economic Experience" and Ronald L. Klimek's, "The Family on Guam," both chapters in <u>The Social-Economic Impact of Modern Technology Upon a Developing Insular Region: Guam</u> produced <u>in 1974-75 by the University of Guam Community Development Center.</u> Much of the statistical data is derived from a sample survey of Guam households conducted in 1974.

18. An analysis of the economic profile of the Guamanian-Chamorro family interviewed in 1974, combined with a historical review of the economy, reveals a uniqueness in the adaptation these people have made to the world of modern economics. In 1974, the Guamanian families in the sample required 1.9 workers to earn a median income of only $7,800 per year for 4.3 children and/or dependents. Eighty-three percent of the Guamanian families worked for either Federal or local goverment agencies. Nearly half of these worked for the Government of Guam. Only 15 percent worked in the private sector. Fifty percent of the Guamanian wage-earners in the survey were in occupations categorized as "skilled labor" or "sales/clerical and kindred." This economic situation was associated with an educational disadvantage experienced by the Guamanian family.

19. Despite the apparent economic disadvantage of the average Chamorro family in such a low-income, high-cost place as Guam, Chamorros manifest signs of a nearly complete adaptation to the worlds of modern media, modern consumer technology, and corporate capitalism. This adaptation is made analytically complex, however, by the information that in 1974 the Chamorro family still spent four times the amount spent by families from the other major ethnic groups for large-scale parties and fiestas. Hence, the question once posed by Governor de la Corte in 1855 is still appropriate today (9): "How is it that these people not only can survive but even appear to prosper in spite of their low income, the exhorbitantly high cost of living on Guam and their simultaneous commitment to mechanical conveniences and to extremely expensive parties for more than 150 people at a time?"

20. The answer to this question, for both the past and present, is to be found in the evolutionary process of the cultural patterns of the Guamanian-Chamorro. What would prove to be impossible for a comparable stateside family is made possible for Chamorros (despite a 30 percent higher cost of living on Guam in 1974) because of the existence of the practice of reciprocity. First, the Guamanian family, by and large, pools some of the total family income. Even the children's earnings are viewed as belonging to the family as a unit. Second, the Guamanian extended family, in most instances, functions as a reserve, or a backup, in the eventuality of either a planned or an unforeseen expenditure of a significant amount. In the case of the death of a family member, although the total expense for the lengthy funeral practices exceeds that of an average American funeral by $1,600 in 1974 ($3,200 vs. $1,400), the Guamanian family can expect about $2,000 of reciprocal cash exchange in addition to the real wealth exchange that is measured in the form of donated foods and/or labor. Exact accounts of all exchanges are kept in extensive ledgers and are repaid in kind when any of the donors experience a similar outlay. The Guamanian-Chamorros, then, have developed an admirable no-interest loan system that functions to provide for the untoward expenses incurred in a money economy. This adaptation appears to be purely islander in origin and thus probably constitutes a cultural carry-over from their past. As many Guamanians would affirm, "You can do nothing without friends."

21. In terms of daily survival, it would appear that the Guamanian family flourishes in the world of modern inflated economics. No one on Guam goes hungry. Every family interviewed in the 1974 survey had more than a respectable range of mechanical luxury appliances and entertainment components. For example, the survey indicated that the Guamanian household owns more automobiles than either the US or Filipino households:. 1.9 to 1.7 and 1.8 autos per household for the three groups. While 40.7 percent of the US families reported owning a black and white TV, 58 percent of the Guamanian families said they owned one. Forty-six percent of the Guamanian and 55 percent of the US families owned a color TV set. Another indication of the degree of participation in modern technological society is that, according to the survey, Guamanians spent an average of 4.5 hours per day watching TV, went to 1.7 movies per month, and went out to eat at a restaurant 2.1 times per month.

22. Part of the Guamanian family's ability to cope can be found in their partial reliance upon subsistence patterns as well as upon reciprocal exchanges. A Guamanian may earn $18,000 per year as a Government of Guam Director, but he may still tend his garden, care for his chickens and pigs, be on the lookout for new varieties of fruit and nut trees for his yard, and be

ready to lend a helping hand to his family and friends. Guamanian's reliance upon subsistence was evident in 1974. Whereas, the US, Filipino, and Micronesian families purchased an average of 91 percent of their food from the stores, the Guamanian families on the average purchased 84 percent of their food from stores. Furthermore, 82 of the 199 Guamanian families who responded to the question on where their food comes from indicated that they obtained approximately 21 percent of their food by farming or gardening, 62 families had obtained an average of 17 percent of their food by fishing, and 43 families obtained about 27 percent of their food from relatives and friends. This indicates that by 1974, the Guamanian family had adapted to the wage economy, but at the same time it had not yet totally given up the subsistence and reciprocity practices of the past.

23. The role subsistence food plays in Guamanian-Chamorro society has been well described in Teresa del Valle's doctoral thesis in anthropology (University of Hawaii, 1978) as published in an abridged form in "Social and Cultural Change in the Community of Umatac, Southern Guam" by the Micronesian Area Research Center at University of Guam, 1979. Umatac is a traditional village in southwestern Guam, about 6 miles south of Agat. The socio-cultural institutions described as occurring in Umatac also occur in other Guam communities. The provision of native foods by individual households at village fiestas, social and religious events associated with the life cycle (christening, birthdays, marriages, funerals), job promotions, farewells, and nobenas (novenas) is one major way to repay one's obligations to kith and kin.

24. The Fiesta. Today, as in traditional times, the fiesta is an opportunity to measure household ties with people from neighboring and distant villages. However, of all the activities connected with this celebration, both religious and secular such as the mass, procession, nataotaomano ball games and raffles, the most important one which is the sharing of food takes place at the household level. Preparing for the fiesta requires a lot of good planning. In contrast to other gatherings or celebrations held during the year (e.g., fandanggo), in which the responsibility is shared with related households, at fiesta time, each household has to rely mainly on its own power to generate money, food and ayuda (labor). Most of the preparation of food is done by the members of the household and by other parientes (relatives) or friends from outside Umatac. Some of the goods transacted between household A and other households include: cooked food (e.g., corn tortillas, barbecued fish, salad); raw food (e.g., octopus, pig, bananas); drinks (tuba, soft drinks, beer, whiskey). A variety of services are also provided such as supplying things from the Navy exchange where prices are lower than at regular stores.

25. The number and social standing of the visitors contribute to the prestige of the household and this generates competition among the people in the community. Everybody knows that for everyday activities, the people in Umatac come first, but that in order to obtain jobs, to get things done through the Government of Guam, one needs to rely on connections outside Umatac. An invitation to the fiesta is a way to reciprocate for a previous favor or a means to reinforce a tie which could be useful in the future if the need arose.

26. The focus of reciprocal exchange of goods and services at the fiesta is between households of the same village and between those of different villages. The principal social category in Guam society is the kindred or one's parientes (extended family members on both paternal and maternal sides). Parientes still come together during events connected with the life cycle of an individual--baptism, marriage, and death--or with the celebration of religious nobenas in the home. Parientes are also called upon when help is needed to build a house, to support a political candidate at election time, or to find a job. An example of the continuity with traditional Guam is the existence of unwritten rules about the strength of the obligation to participate in kindred events and the amount of contribution a person must give in labor, food or cash (chenchule').

27. Del Valle emphasizes that in the planning, preparing and carrying out of family social events, having the right quantity, quality, and variety of food is an indication of good planning based on a correct appraisal of the honored family member's social standing and the social standing of his/her parientes (siblings, offspring, parents). Planning is considered very important because of the need to have enough food to feed everyone who is expected to attend, plus enough food left over for those who have helped in the cooking, preparing for the party and others.

28. It can thus be seen from this discussion that the Guamanian-Chamorro family has extraordinary cultural demands laid upon it to generate far more food than it consumes on an annual basis. The other goods, services and time that the family (household) must contribute to the reciprocal exchange of obligations further demands that subsistence foods be generated for in-family use to supplement the family income and diet. A major source of this food is from reef and nearshore facilities. Del Valle reports that 83 percent of Umatac's households engage in fishing (Del Valle, 1979). A larger survey of 931 households throughout Guam in 1977 by the Guam Department of Labor and Bureau of Planning indicates that 32 percent of all households contained family members who regularly went fishing and 51 percent of southern Guam households engaged in fishing activities. The Community Development Center's 1974 survey (published in 1975) indicated that of a subsample of 127 households, almost 40 percent went fishing (Jennison-Nolan, 1979b). Among the fishermen, over 70 percent were Guam-born (called Guamanian) and 92 percent of those were male. Among all Guamanian households sampled, only 15 percent bought fish in stores. Another indication of the participation of Chamorro-Guamanians in subsistence fishing is the statistic that most (46 percent) fishermen said they eat the catch themselves, but nearly as many (44 percent) said that they ate some and gave it away.

29. Social Characteristics. Detailed information on territory-wide social and economic statistics may be found in the Main Report. Information is primarily based on the 1970 Census except for district-level population figures, estimated numbers for which are currently available from the 1980 Census. Tables 2 and 3 from the Main Report provide historic and projected population figures for Guam as a whole. Based on a surprising 1980 census population of only 105,816, population projections have been revised downward from their mid-1970's estimates and at present, annual growth through the year 2030 is expected to average 0.25 percent compared with earlier more optimistic figures of 2 percent. The following Table C-2 summarizes the changes that have

occurred in the Agat-Santa Rita region, which comprised the study impact population. Table C-2 also summarizes the few known ethnic characteristics of the local population. The population projections to the year 2000 are based on a technique portrayed in the Guam Bureau of Planning Community Design Plans, Guam: 1977-2000 (n.d.) which uses aerial photographs completed in 1975, actual densities of recent housing developments, data relative to planned developments and certain geographic constraints to development. These projections, however, are too high in light of the 1980 Census which reported a total residential population of 105,816 in contrast with the Bureau of Planning projection which assumes a 1975 population estimate of 106,700. Without knowing the specific local parameters involved in projecting the population growth of particular areas, these place-specific projections have not been changed.

Table C-2. Population Characteristics in the Agat-Santa Rita Area

a. Changes in Population Levels

	1960 1/		1970 1/		1980 1/		2000 2/	(Projected)
District	Amount	Percent Change	Amount	Percent Change	Amount	Percent Change	Amount	Percent Change (1980-2000)
Agat	3,107	NA	4,308	+39%	3,979	- 8%	6,900	+73%
Santa Rita	12,126	NA	8,109	-33%	10,408	+28%	12,990	+25%
Guam	67,044	NA	84,996	+2.4%	105,816	+2.2%	136,000	+29%

b. Changes in Ethnic Proportions

	1960 3/			1970 4/			1978 1/			1960-1978 1/
Ethnic Group	Agat	Santa Rita	Guam	Agat	Santa Rita	Guam	Agat	Santa Rita	Guam	
Chamorro	71.3%	-	51.8%	74.6%	34.7%	55.9%	NA	NA	47.8%	+4.3%
White	17.6%		30.9%	9.5%	53.2%	28.2%	NA	NA	23.5%	+1.9%
Filipino	- 5/		12.8%	14.3%	8.4%	12.0%	NA	NA	20.0%	+10.9%
Other	11.1%		4.4%	1.6%	3.6%	3.7%	NA	NA	8.7%	+13.7%

1/ 1960, 1970, and 1980 Census data in Shuiliang Tung (Senior Economist, Economic Research Center, Guam Department of Commerce), "The Demographic Situation in Guam." Paper presented at Annual Meeting of Population Association of American, Washington, D.C., March 26-28, 1981.
2/ Main Report, p. 14.
3/ US Department of Commerce, Bureau of the Census. Report PC(1)-B54, 1960 Census of Population, General Housing Characteristics, Table 1. Based on ethnicity per household.
4/ US Department of Commerce, Bureau of the Census. 1970 Census of Population. General Population Characteristics, February 1972, Table 7. Note: Ethnicity based on place of birth.
5/ Filipinos mixed in with others.

30. Few other ethnic characteristics for Guam as a whole are known except as noted above in paragraph C-18. Unemployment in 1978 among the Chamorro was over twice that of the Filipinos and over ten times the rate among the White population according to 1981 Guam Annual Economic Review. The local Chamorro also have a fertility rate more than double that of the other ethnic groups in Guam. Unfortunately, this statistic is available only for 1960 (Tung, 1981). Except for the breakdown of median family income for Chamorros in 1974 described in paragraph 18 and income by ethnicity reported in the 1960 Census, there is no comparative measurement of income level by ethnicity. The nearest related statistic is for the districts using the 1960 and 1970 Census records and Guam Bureau of Labor estimates for 1978 (Jennison-Nolan, 1979a). Compared with an islandwide median family income in 1960 to $2,515, the median family income was $3,489 (139%) in Agat and $5,503 (219%) in Santa Rita. In 1970, the islandwide figure had risen to $7,886 compared to $7,669 (98%) in Agat and $7,435 (94%) in Santa Rita. In 1978, the estimated islandwide median family income was $15,954 compared with $11,500 (76%) in Agat and $17,500 (113%) in Santa Rita. The variances in Santa Rita may be due to the varying proportions of military residents in the district from decade to decade.

31. Recreation. The Agat-Santa Rita study area is a popular, local recreational area for boat-fishing, shore fishing, water skiing, swimming, diving and picnicking. According to 24 aerial surveys conducted by the Guam Department of Agriculture, Aquatic and Wildlife Resources Division in Fiscal Year 1978, the following activities (Table C-3), were observed in the area from Orote Point to Facpi Point.

32. As one of 12 survey areas around the island of Guam, the Agat Bay area is a particularly significant marine recreational resource for snorkeling, SCUBA divers, and dive boats. Hook and line and cast net fishing on the reef are also important fishing activities. The principal recreational facilities along Agat Bay consist of the improved territorial beach parks of Nimitz Beach (23 acres) and Aflleje Park at Rizal Beach (1 acre). Swimming, SCUBA diving, picnicking, and camping are permitted at each park (Guam Department of Parks and Recreation, 1980). Other recreation resources include the historic Taleyfac Spanish Bridge (see par. 3 above) and the Agat Invasion Beach Memorial, 4,000 feet northeast of Gaan Point. To attract tourists, local interests have also improved the Japanese defense works at Gaan Point, which will ultimately be improved as part of the newly-established War in the Pacific National Historic Park, Agat Unit. Offshore from Gaan Point within the National Historical Park are a number of submerged World War II artifacts, including an American landing craft, visible in the clear offshore waters. Most of southwest Guam, from just south of Taleyfac River to Merizo and Ajayan Bay may be designated as a possible National Seashore through a Congressionally-authorization to the National Park Service (NPS) which is to revise and update the NPS Study of Guam National Seashore (Public Law 95-625). Already 8,885 acres of fastland and 6,276 acres submerged land have been reserved and are being managed by the Government of Guam Department of Parks and Recreation as the Guam Territorial Seashore Park. The boundaries of the park extend northward to encompass Anae Island, which is about one mile southwest of the harbor site. Anae Island is the site of two surfing area, located north and south of the island. Another significant natural wonder of the seashore area is Facpi Point and Island, which is designated a National Natural Landmark.

Facpi Point is about 2.5 miles south of the Nimitz Beach harbor area and accessible most easily by boat. The objective of the Seashore Park and the National Seashore if established is to preserve a natural area containing significant natural and historical resources in a park-like setting, but to also encourage certain improvements to promote tourism. Having a Seashore Park with proper commercial development and preserving the integrity of the southern villages is viewed as a significant asset to the future of Guam's tourist industry (Jennison-Nolan, 1979a).

Table C-3. Participation in Inshore and Offshore Recreation for the Agat Bay Area, Fiscal Year 1978*

Inshore Fishing	Agat Bay Area	Islandwide	Percent of Total
Hook & Line	23	200	11.5
Cast Net	20	197	10.7
Gill & Surround Net	33	445	7.4
Spear (SCUBA)	0	7	0
(Snorkel)	34	154	22.1
Octopus Hunting	3	33	9.1
Clamming	0	11	0
Weir Tending	0	29	0
Sub-Total (persons)	113	1,060	10.7
Offshore Fishing			
Trolling boats	8	125	6.4
Bottom Fishing Boats	1	33	3.0
Dive Boats	37	86	43.0
Divers (SCUBA)	114	275	41.4
(Snorkel)	16	71	22.5
Sub-Total (Persons)	130	346	37.6
(Boats)	46	244	18.9
Non-Fishing			
Surfers	0	138	0
Picnickers	386	5,671	6.8
Other persons	13	124	10.5
Other boats	27	100	27.0
Sub-Total (Persons)	399	5,933	6.7
(Boats)	27	100	27.0
Total			
Persons	642	7,339	8.7
Boats	73	344	21.2

*Source: Guam, Department of Agriculture, Aquatic and Wildlife Resources Division. "Survey of Guam's Fish Population and Fishing Methods." Job No. F-1 in Job Progress Report. Federal Aid to Fish and Wildlife Restoration. Project No. FW-2R-15. Period Covered: July 1, 1977 to June 30, 1978. September 1978, Tables 14 and 15.

33. There are three boat launching areas in southwest Guam. The most popular one is at Merizo Pier Park which is regularly and heavily used for access to Cocos Lagoon for fishing, water skiing and diving. A boat launching site at Umatac Village is used only infrequently due to heavy seas. The boat launching area at Nimitz Beach is from the Nimitz Beach Park into Nimitz Channel and according to L.G. Eldredge (1979), is used periodically for medium-sized boats. Information gathered at a public workshop for the harbor project on 27 March 1980 indicated that approximately 12 to 15 boats were launched from Agat each day (US Army Engineer District, Honolulu, April 1980). Independent data gathered by the Guam Department of Parks and Recreation indicates that a daily weekend average of 10 to 15 boats are launched in the northern portion of Agat town near the "Burger Chef" restaurant. Most of the launchings are by fishermen. (Guam Department of Parks and Recreation, March 1980).

34. Nimitz Beach Park has approximately 1,800 linear feet of beach varying between 10 to 30 feet wide. It is one of the most popular local beaches on Guam, particularly on weekends, when the US Fish and Wildlife Service counted 32 cars in the parking lot at random on a Saturday in March 1980 (US Fish and Wildlife Service, October 1980). They reported the beach to be heavily used for recreational and subsistence fishing, shell collecting (see Appendix D), snorkeling and SCUBA diving and social gatherings. Swimming is quite popular as local residents also expressed a strong desire at the 27 March 1980 workshop for an enlarged Nimitz Beach "swimming hole" which, they felt, could be dredged simultaneously with the harbor dredging. Nimitz Beach Park is equipped with several picnic tables, but has no operating comfort stations. Guam Department of Parks and Recreation conducted a household survey in 1978 which sampled 15 percent of the Santa Rita and Agat households. The following figures, shown in Table C-4, are believed to represent average weekly usage of recreational facilities with a minimum of two-thirds of the use on the weekends. The Nimitz Beach area is used for most of these activities. Note that these figures do not correspond to those shown in Table C-3, the latter which represent an average of two aerial observations for each month during the week days. The Department of Parks and Recreation figures also included some double-counting or overlap between activities for each person in the Nimitz Beach Park area.

Table C-4. Average Weekly Participation in Seashore Recreation for the Agat Bay Area, Summer 1978.*

Activity	Total Average Weekly Participation	Estimated Total Average Weekend Participation
Boating	236	156
Canoeing	61	41
Sailing	7	4
Water Skiing	209	139
Fishing	787	525
Diving (Snorkeling, SCUBA)	357	238
Swimming	1,528	1,019
Surfing	61	41
Picnicking	1,447	965
Camping	209	139

*Source: Guam, Department of Parks and Recreation Letter of March 17, 1980.

35. According to an islandwide survey of 931 residents taken in January 1977 for the Guam Coastal Management study, a large majority (89 percent) of the respondents felt that there should be more recreational facilities and areas in Guam and that those that were available were dirty and littered (Guam Bureau of Planning Coastal Management Section, January 1977). This interest appears primarily aimed at beaches, swimming areas, and picnic spots, because in response to the question "Should the government spend tax money to build marinas and boat launching ramps?" the overall reaction was only 47 percent in favor, 32 percent against, and a relatively high 21 percent no opinion. Less residents of Southern Guam appeared to support locally-sponsored marinas than northerners. Yet, in contrast, more southerners still engage in fishing, 51 percent compared with only 29 percent in the north and 32 percent islandwide. A subsequent survey among only southwestern Guam residents in July 1979 likewise showed residents feeling that recreational opportunities in the south were inadequate for those that live there and as well as for tourists (Jennison-Nolan, 1979a). Most preferred many additional facilities such as boat charters, refreshment stands, handicrafts shops and the like which would be oriented to tourists. Eight-nine percent of the respondents indicated that they would like to see separate facilities and areas for such water activities as boating, swimming, diving, snorkeling, surfing and fishing in southwest Guam. The survey also showed that although Guam-born residents of southwestern villages had a statistically high valid regard for conservation and preservation of nature, they also favored more business and commercial development of southern Guam and that there is no statistical correlation between these two contrasting attitudes (Jennison-Nolan, 1979a).

36. A third survey conducted in the latter half of 1977 among Japanese tourists showed a strong preference for marine-oriented activities such as 36 percent of the respondents preferring the Cocos Island tour and another 29 percent favoring ocean and beaches in general (Warner, 1978). Asked which additional attractions or tourist activities Guam needs, 55 percent of the respondents had no answer but of the remaining, boat rentals and tours ranked fourth in preference with 4 percent behind electronic games (9 percent) and casinos (4 percent). Meeting these expressed needs of tourists as well as providing an economic base were reasons given in the Nolan report for constructing a small boat harbor at Agat, Guam. Based on the survey conducted among southwestern Guam residents, Nolan concluded that:

> Marina and boat ramp facilities are seen as currently inadequate and the needs of tourists, residents, and possible commercial fishing development will require expansion of these facilities. In Agat, there is currently an interest in building a boat harbor, which is seen as beneficial to residents and tourists alike. For Agat to compete in the tourist market, many residents believe a boat harbor is an absolute necessity. A boat harbor/marina complex at Agat is regarded as a necessity also if Agat hopes to attract commercial fishing enterprises. The acquisition of land for access to such as facility will have a bearing on perceptions of land use as well (Jennison-Nolan, 1979a).

37. Public Facilities and Services. All the basic utilities consisting of water, electricity, and wastewater treatment are available in the Nimitz Beach area. Potable water sources for the Agat-Santa Rita area are split between the US Navy's Fena Reservoir and Santa Rita Springs. Water for the Nimitz Beach area comes from the Fena Reservoir and is delivered to the Nimitz Beach Park and vicinity through an eight-inch pipeline (Guam Environmental Protection Agency, 1979, and Barrett, Harris & Associates, Inc., 1980). The Commander, US Naval Forces Marianas reported in 1978 that the Navy supplied almost 2 million gallons of potable water daily to the Agat-Santa Rita area mainly through an antiquated distribution system owned by the Government of Guam. In many locations the Navy reported that low water pressure and water outages were frequently experienced. They further suggested that if additional water requirements were required by an operating small boat harbor, cut-backs to other Navy-supplied civilian areas could be expected (US Navy, 1978). The 1980 "Water Facilities Master Plan" recommends additional storage facilities and a distribution system be constructed for the Pagachao Subdivision in the early 1990's (Barrett, Harris & Associates, 1980).

38. The Nimitz Beach area is on the southern border of the currently sewered area in Agat District (Guam Environmental Protection Agency, 1979). This area is serviced by the Agat-Santa Rita Sewage Treatment Plant operated by the Public Utilities Agency of Guam (PUAG) through an activated-sludge type treatment plant on Gaan Point capable of processing 0.75 million gallons per day (US Environmental Protection Agency, 1977). This wastewater system is currently undergoing $0.5 million in renovations (Guam Environmental Protection Agency, 1979).

39. Rescue services are available from the US Coast guard station at the Commercial Port of Guam, located about 11 nautical miles from Nimitz Beach. In addition, there is a fire substation located on the seaward side of Highway 2 at Gaan Point. Other public services within 1/4-mile of Gaan Point include a police substation, a community center and the district commissioner's office.

40. Primary access to Nimitz Beach is along Highway 2 which in 1973 had an average daily traffic volume of 7,800 vehicles south of Gaan Point and 10,000 vehicles at the back entrance to the Naval Station (Guam Department of Public Works, 1975). By 1988, the Department of Public Works projects 16,000 and 24,000 vehicles, respectively, for each location. More recent traffic counts conducted between 31 March and 6 April 1980 at the intersection of Highway 2A and 12, north of Agat Village, found an average daily traffic volume of 8,479 vehicle for a five-day week average and 9,085 vehicles for a 2-day weekend average (Guam Department of Public Works, Personal Communication, 22 April 1980). Even with these recent figures suggesting that the earlier projected increases were inflated, those projected figures indicated a 1988 ratio of projected level of peak-hour traffic to roadway capacity of nearly unity, suggesting there was little concern for traffic congestion. Despite those statistics, present conditions at the proposed harbor site, however, suggests that there may be a potential for future local intermittent traffic congestion on weekends due to north-south traffic associated with an increased use of Southern Guam as a primary tourist destination area, traffic into and out of a more fully developed Pagachao Subdivision, and increased levels of weekend visitors to Nimitz Beach Park and the Agat Cock Pit, which is located across the highway from the park.

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AGAT SMALL BOAT HARBOR

AGAT, TERRITORY OF GUAM

NATURAL RESOURCES AND FISH AND WILDLIFE COORDINATION

APPENDIX D

APPENDIX D

NATURAL RESOURCES AND FISH AND WILDLIFE COORDINATION

TABLE OF CONTENTS

APPENDIX D

NATURAL RESOURCES AND FISH AND WILDLIFE COORDINATION

SECTION I

AFFECTED RESOURCES

1. Terrestrial Resources. Information on the flora and fauna of the Nimitz Beach Area is provided through a survey conducted by the U.S. Fish and Wildlife Service in February-March 1980, bird counts conducted by Dr. Phillip Bruner, an ornithologist at Brigham Young University, Hawaii; and an archaeological survey conducted by Dr. Samuel Price of Pacific Studies Institute in April 1977. A 50- to 80-foot wide frontage strip between Highway 2 and the beach is grassed *Cyrodon* spp. and lined with coconut palms (*Cocos nucifera* or Niyuk). Nimitz Beach Park is planted primarily with coconut palms and ironwood (*Casuarina equisetifolia* or Gago). Typical beach plants include beach morning glory (*Ipomoea pes caprae* or Alahai-tasi) and beach magnolia (*Scaevola frutescens* or Nanasu).

2. Birds that may possibly be found in the Nimitz Beach area, primarily charadriiformes and ciconiiformes, include the following:

Scientific Name	Common Name	Local Name
Pluvialis squatarola	Black-bellied Plover	
P. dominica fulva	Pacific Golden Plover	
Heteroscelus incanus	Wandering Tattler	
H. brevipes	Grey-tailed Tattler	
Tringa hypolleucos	Common Sandpiper	
Numenius phaeopus variegatus	Whimbrel	
N. tahitiensis	Bristle-thighed Curlew	
Limosa lapponica baveri	Bar-tailed Godwit	
Calidris alba	Sanderling	
Arenaria interpres	Ruddy Turnstone	
Anous stolidus pileatus	Common Noddy	Fahan
Gygis alba candida	White Tern	Chunge
Egretta sacra	Reef Egret	Chuchuko

(Shallenberger (Ahuimanu Productions, Inc.) Personal Communication, 19 August 1977)

In addition, the U.S. Fish and Wildlife Service identified Black Drongo (*Dicrurus macrocercus*) and Eurasian Tree Sparrow (*Passus montanus*) along the shore (USFWS, Mar 1981). No endangered or threatened species were observed in the project area during the USFWS survey and the Service reports that it is unlikely that they use the area. The beach provides feeding and loafing habitat for shorebirds during periods of high tide. Simultaneously, the waters over the reef flat are used by feeding terns. At low tide, the reef flat provides feeding areas for shore and wading birds, depending on the degree of tidal exposure.

3. Marine Resources. There are numerous information sources for marine environmental and oceanographic data for the Nimitz Beach area between Bangi Point in the north and Anae Island and Taleyfac Bay in the south. The earliest study was prepared by H. G. Huddell, J. C. Willett and G. Marchand of the Naval Oceanographic Office in 1974. A report prepared by R.H. Randall and L. G. Eldredge of the University of Guam Marine Laboratory for the Government of Guam in 1976 provides reconnaissance-level descriptions of the substrate characteristics for all of Guam's coastline including the study area. Mitchell I. Chernin and others belonging to the University of Guam Marine Laboratory prepared a general marine reconnaissance study of the preliminary Corps harbor sites at Taleyfac Bay, Nimitz Beach and Bangi Point in 1977. The Chernin report is the principal source of marine environmental data for the study area. This survey was accomplished by recording names and relative abundance of species encountered during repeated random swims, using both SCUBA and snorkel equipment, through the major biotopes of each of three study areas. Detailed studies of fish eggs and larvae and zooplankton at selected sites including Nimitz Channel have been conducted by Steven S. Amesbury of the University of Guam Marine Laboratory in 1978. These studies included an analysis of the seagrass beds in the study area. The most recent work has been by the U.S. Fish and Wildlife Service in February-March 1980.

4. Marine Substrate. The entire Agat shoreline is bordered by a continuous fringing reef-flat with a maximum width of 2,680 feet at Bangi Point and a minimum width of 170 feet at Rizal Beach, north of Agat Village (Figure 2, Main Report). Four fringing reef biotope units have been recognized in the Agat-Taleyfac Bay region. In a shore to seaward sequence, these are the reef-flat platform, reef margin, reef front, and upper seaward slope (including associated submarine terraces) biotopes. The reef-flat in the study area varies between 1,700 and 2,300 feet wide and is characterized by the Nimitz Channel on the south which cuts entirely through the reef to Nimitz Beach and a large indentation about 1,000 feet to the north of Nimitz Channel. Just landward of the reef margin is a large depression about 250 feet in diameter and 20 feet deep. Based on surficial characteristics, the reef-flat platform can be divided into three zones: the inner zone, the intermediate zone or moat, and the outer reef-flat.

5. The inner zone is generally -1.0 feet (mean lower low water) and is characterized by a thin veneer of sand, gravel, coral-algal-mollusk rubble, and scattered boulders and exposures of reef rock. Within 100 feet of shoreline the top 2 inches of the surface materials are soft and silty due largely to the presence of red terrigenous materials washed in from streams and storm ditches. The U.S. Fish and Wildlife Service (March 1981) reports that the silt layer becomes suspended at the slightest disturbance (USFWS) October 1980. Some of this sediment may be eroding off the under-developed, but cleared Pagachao Subdivision. In future years when this area is developed, the amount of red sediment washing into the sea may decrease. The moat extends from about 700 feet offshore to about 1,200 feet offshore and averages about 1.4 feet MLLW. Surface materials in this zone consist of random, discontinuous coral limestone remnants surrounded and partially covered with cobble-boulder-gravel rubble. Shallow depressions are filled with sand. Seagrass abounds in the moat becoming patchy toward the inner zone. The outer reef flat averages -0.4 feet MLLW and is characterized by a

craggly, cavernous reef-rock pavement with scattered boulders and boulder tracts. In places, the roof structure bridging across voids and cavities has collapsed leaving irregular sharp-edged depressions 2-6 feet deep. Sands and gravels are trapped in these depressions and patches of live corals line their walls.

6. The reef-flat platform south of Nimitz Channel is more exposed at low tides and lacks the seagrass characteristic of the proposed harbor site. The southern reef-flat has centrally located, elevated boulder-rubble zone with the remaining platform monotonously flat with a thin veneer of sand and gravel to silt toward Taleyfac River.

7. The reef margin of all areas is completely emergent during low tides but still is constantly washed by waves. Low-profile coral development along the reef front and substratum virtually devoid of loose rubble and sand indicates periodic occurrence of destructive wave action. Nimitz Channel varies in depth from less than a meter at the beach face to nearly 60 feet deep at the mouth. The nearly vertical channel walls are characterized by large Porites coral heads and numerous algal species. The south channel wall has a greater number of crevices and overhangs than the north wall, particularly near the channel mouth. The channel bottom is sand and silt with low algal diversity and no coral because of lack of suitable substrate. Coral species diversity increases seaward with nearly 100 percent coverage at the channel mouth.

8. Corals. Among the three areas of Bangi Point, Nimitz Channel and Taleyfac Bay, the latter exhibits the highest diversity of coral species, 113 and 41 genera compared to 110 species and 42 genera recorded at Nimitz Channel and 69 species and 22 genera at Bangi Point (Chernin and others, 1977). The high diversity may be attributed to the extensive shallow reef-front and submarine terrace areas there and the Nimitz Channel. The FWS 2(b) report lists the species and their relative frequency at the Nimitz Channel area. Scattered colonies of Pocillopora damicornis and small micro-atolls of Porites lutea are interspersed among seagrass (Enhalus) beds on the inner reef-flat platform north of Nimitz Beach. Coral diversity increases further northward. The reef front north of Nimitz Channel exhibited nearly 100 percent coral coverage in localized areas. The dominant species here are the blue coral Heliopora coerulea, large micro-atolls of Porites lutea, Platygyra rustica and Pavona clavus. Richard Randall of the University of Guam Marine Laboratory recently described this zone as "one of the most diverse, protected leeward reef assemblages on Guam, an excellent area for SCUBA and snorkeling (Randall, 1980). Nimitz Channel exhibited a definite species diversity gradient with the lowest diversity occurring along the inshore channel slopes and the highest occurring on the outer slopes near the channel mouth. The north and south slopes along the inshore regions of the channel are dominated by Porites and Acropora species with occasional colonies of Pocillopora damicornis, Favia pallida, F. stelligera, Montipora verrucosa, and Platygyra rustica. Further seaward towards the mouth of the channel large colonies of Heliopora coerulea, Platygyra rustica, Porites lutea, Acropora humilis, A. palifera, A. formosa and Millepora platyphylla are common. The most conspicuous coral development along the channel walls was the presence of huge plates of Pachyseris speciosa and Porites (S.) iwayamaensis. The largest colony of Psammacora (S.) togianensis (3.6 m x 1.2 m x 1.8 m) ever observed on Guam was also observed here (Chernin and others, 1977).

9. About 2,000 feet southwest of Nimitz Channel is Anae Island patch reef terrace, which is included in the Guam National/Territorial Seashore Park. The submarine terrace between the patch reef and island and the adjacent fringing reef supports one of the richest and most diverse coral communities found in Guam's coastal waters (Stojkovich, Nov 1977). In these protected waters spectacular coral mounds, pinnacles and ridges, with their associated icthyofauna are separated by sandy floored channels and holes. The relief of these coral mounds is often 6-8 meters or more. The coral community along the inside patch reef edge consisted of smaller Acropora, Leptastrea and Porites colonies. Goniastrea retiformis was found in scattered patches. Sloping down towards the terrace, at a depth of 4-9 meters, the diversity and colony size increased tremendously. Huge Acropora palifera and hemispherical Porites colonies dominated creating a room and pillar effect in many place. Other notable species included Millepora platyphylla, Goniastrea pectinata, Leptoria phrygia and Pavona frondifera.

10. Marine Benthic Plants. Chernin and others (1977) collected or observed a total of 74 species and 48 genera of marine benthic plants (see 2(b) report). The reef platform north of Nimitz Channel, particularly the moat zone, is characterized by an extensive bed of the seagrass Enhalus acoroides becoming increasingly dense toward and at Bangi Point. Enhalus is most abundant on the loose substrate of inner reef areas that become exposed at lower low water (Guam Aquatic and Wildlife Resources Division, 1978). A thin film of the blue-green alga Schizothrix calicola and many individuals of the green alga Avrainvillea obscura are supported by the sand substrate within the main body of the Enhalus bed (Chernin and others, 1977). Individuals of Halimeda macroloba predominate on the seaward edges of the Enhalus bed. An extremely dense stand of the brown alga Sargassum polycystum extends several meters shoreward of the Enhalus bed with very few other macro-algal species observable. Nearer Nimitz Channel, numerous individuals of A. obscura and H. macroloba predominate. Along its southern border, the reef flat is dominated by a wide (10-30 meters) band of the red alga Galaxaura filamentosa which blends into "mats" of Amansia glomerata and H. opuntia towards the outer reef flat. At the reef margin, Lithophyllum moluccense and Chlorodesmis fastigiata are the most obvious species with G. oblongata dominating the immediate reef front.

11. The complex morphology of the walls of Nimitz Channel provide a varied environment for the 46 algal species recorded there. The lower walls of the inner channel are dominated by thick growths of the brown alga Dictyota bartayresii. The edge and upper most 1-2 meters of the channel walls are strongly dominated by a silky red algal turf composed primarily of a Polysiphonia species and several species of Ceramium included C. mazatlanense and C. fimbriatum. The upper slopes of the walls are marked by Caulerpa species and the lower slopes by the dominant H. incrassata. The red alga Dasyphila plumarioides occurs in abundance in well-shaded caves and overhangs of the south wall of Nimitz Channel. This species has been observed to be a food source for the listed federally threatened green sea turtle Chelonia mydas. The sand floor of the inner channel supports small clusters of H. macroloba, patches of Enhalus acoroides, and in most area a thin film of the blue-green alga S. calcicola. Metagoniolithon graniferum, considered a rare species has been observed in one of the Enhalus patches (Chernin and others, 1977).

12. Invertebrates. Observations of invertebrate populations are based on the random swims conducted for the Chernin report (1977) and on four transects run by Stojkovich and Smith (1978) on the outer reef flat, reef margin, reef front terrace at -6 m (MLLW), and marine terrace at -12 m (MLLW) immediately north of the entrance channel for Plans 1 and 2. The U.S. Fish and Wildlife Service also conducted a survey of rock epifauna in February 1980 (USFWS, March 1981). Figure 2 in that survey report (see Section 3, this appendix) shows the transects run to identify invertebrates in the study area. The Chernin reconnaissance report and U.S. Fish and Wildlife Service recorded 88 species and 64 genera of macro-invertebrates in the Nimitz study area (see 2(b) report). Species diversity decreases from Bangi Point south to Taleyfac Bay due to changes in reef flat morphology and to increased siltation at the Nimitz and Taleyfac Bay areas. Little diversity of species is found among the Enhalus bed on the inner reef flat and moat zone. These species include the holothurians Bohadschia bivittata, Holothuria atra, and Stichopus chloronotus; the starfish Linckia laevigata; the sea urchins Echinometra mathaei and Echinostrephis aciculatus; and the gastropods Cypraea moneta and C. isabella (under rocks) and Conus quercinus (common in the seagrass beds) (Chernin and other, 1977). Stojkovich and Smith (1978) report that the same seagrass beds are relatively abundant in the small, edible bivalve Ctena spp. but have few of the larger bivalves such as Quidnipagus palatum (see 2(b) report). Thousands of bivalves of the latter species were observed littering the beach in the harbor area, implying it may be heavily harvested there (USFWS, March 1978).

13. The U.S. Fish and Wildlife Service reports that the intertidal/subtidal zone in the project area does not appear rich in epibenthic marine life (USFWS, Mar 1981). However, the energy and nitrogen to support the rest of the system is derived from this area. The fauna was dominated by the gastropod Nerita granosa, the holothurian Holothuria atra, and two paguridians, Calcinus laevimanus, and Dardanus megistos. The snails and hermit crabs were patchily distributed, occurring almost exclusively on large pieces of coral rubble. Five large pieces of coral were sampled randomly with a quadrat. Results are shown in the FWS 2(b) report. Holothurians were sampled on a transect parallel to the shore and approximately 100 yards (90 m.) offshore. Density was 1.67 per meter^2. Infaunal samples were taken on two transects as shown on Figure 2 of the USFWS Report. Those organisms which could be identified at least to family are included in the FWS 2(b) report. For the north transect, the densities were: polychaetes 20.45 per square meter; clams 31.15 per square meter; gastropods 31.15 per square meter; and hemichoradates 8.76 per square meter. For the south transect, the densities were: polychaetes 44.30 per square meter; clams 61.34 per square meter; gastropods 23.85 per square meter; hermit crabs 4.54 per square meter; portunid crabs 4.54 per square meter; and hemichordates 2.27 per square meter.

14. Few invertebrates were noted along the Nimitz Channel bottom or slopes in nearshore waters, probably the result of heavy siltation (Chernin and others, 1977). The Chernin report noted the presence of common gastropods near the mouth of the channel and on the reef front such as Trochus niloticus, T. maculatus, Coralliophila violacea, Drupella cornus, and Vasum turbinellus; sea urchins such as Echinometra mathaei, Echinothrix diadema, and Heterocentrotus mammilatus; the holothurians Stichopus chloronotus and Holothuria edulis; the tiny starfish Linckia multifora; and the bivalve Tricacna maxima (Chernin and others, 1977). The quantitative Stojkovich and Smith (1978) study recorded

similarly-sized Trochus niloticus only on the outer reef flat, the reef margin, and the reef front terrace (-6 meters, MILLW). The U.S. Fish and Wildlife Service reports that some harvesting of Trochus is being conducted in the study area (U.S. Fish and Wildlife Service, 1980). Echinothrix diadema was the most abundant sea urchin species with mean densities per sampling quadrat ranging from 1.1 to 5.3 and coefficients of dispersion indicating clumped distributions (Stojkovich and Smith, 1978). Of the 400 m^2 area survey at Agat Bay (including south of Bangi Point) for the giant clam Tridacna maxima, only five individuals were located in the reef front zone.

15. Fishes. The Chernin study found the Nimitz area to possess the generally poorer fish fauna than Bangi Point or Taleyfac Bay (Chernin and others, 1977). During the June-July period of observation, 129 species and genera of fishes were recorded (see 2(b) report), but the total number of individuals were low. This, according to the authors, was due mainly to the depauperate nature of the fish fauna of the Nimitz Channel where the unconsolidated sand-mud floor appeared to support very few fishes. Survey conducted by the U.S. Fish and Wildlife Service during February-March 1980 found a much more diverse population of fishes with a total of 168 species being observed, including an undescribed moray eel (see Figure 2 of the USFWS report (Section III, this appendix). Most fishes in the channel belonged to the goby (Gobiidae) family while the mobile jacks (Carangoides) and majarras (Gerres) were also represented. Wrasses (labrids) and damselfishes (Pomacentrids) dominated the reef margin with species diversity decreasing toward shore. The seagrass Enhalus beds on the inner reef and moat provided cover for juvenile parrotfishes (Scarus spp.), rabbitfishes (Siganus argenteus and S. spinus), gobies (particularly Ptereleotris microlepis (Bleeker)), and several wrasses (Labridae).

16. An intensive study was also conducted by Amesbury (1978) in part to test the hypothesis that seagrass areas such as between Bangi Point and Nimitz Channel could be nursery areas for developing fishes. Two samples of fish eggs and larvae, zooplankton, and phytoplankton were taken in February, March, April, July, August and January, 1978-79 from Agayan Bay, Achang Bay, Manell Channel, Cocos Lagoon, Umatac Bay, and the Nimitz Channel area. Areas of particularly low densities of fish eggs were Nimitz Channel and Umatac Bay. Although fish larvae showed no consistent pattern of areal dominance, the highest density was recorded from the Nimitz reef front near Alutom Island (Bangi Point) and other high concentrations were recorded along the Nimitz reef front near the channel and in the Nimitz Channel (Amesbury, 1978). Amesbury concluded that the seagrass beds at Nimitz did not appear to be associated with high densities of fish larvae, but that the Enhalus may still be important for other fish species. The U.S. Fish and Wildlife Service has suggested that perhaps the Enhalus beds at Nimitz could be providing a significant nursery area for juvenile rabbitfishes, which Kami and Ikehara (1976) report do enter shallow reefs after the post-larval stage becoming herbivorous and developing adult coloration. The annual harvest of the juvenile Siganus argenteus and S. spinus generally in April and May is a traditional and significant village event in Guam (Kami and Ikehara, 1976). No studies have been conducted at Nimitz during the period rabbitfish harvest, but the species of algae most preferred by the two Siganidae species (Enteromorpha) are not found in the Enhalus bed at the Nimitz Channel area.

17. Water Quality. Guam's 1975 Water Quality Standards designated the waters of the Agat Bay area as class "A" for general use, into which discharge of pollutants must be controlled sufficiently to protect uses such as recreation, aesthetic enjoyment, propagation of aquatic and associated wildlife, and commercial, industrial, and navigational activities (Guam Environmental Protection Agency, 1975). Water quality standards are rarely violated in the study area. At Nimitz Beach Park, pollution levels (fecal coliform bacterial counts) are usually low with occasional runoff from a chicken farm which discharges through a storm drain about 1,500 feet north of the project area (Chernin and others, 1977). The Guam Environmental Protection Agency (G.E.P.A.) has maintained a marine water quality monitoring station immediately seaward of Pagachao Road in a location which would probably be within the proposed berthing area for the selected Plan 5. Records have been kept on a monthly, but intermittent basis between March 1978 and October 1980. Measurements for fecal coliforms (per 100 ml), turbidity (JTU), Nitrogen (mg/l), Phosphorus (mg/l) and suspended matter indicate that only rarely does water quality around the monitoring station exceed current ambient water quality standards for Guam (G.E.P.A., February 1981). Only once in the reporting period did the fecal coliform count exceed the standard of 70/100 ml for a thirty-day period and never did it exceed the 230 FC maximum. Turbidity levels were exceeded once and phosphorus only three times, each by very little. Suspended material exceeded the mean count of 20.4 mg/l nearly half the monitoring dates. An underwater inspection by Corps staff in July 1980 did find the water in the Nimitz Channel and on the reef flat very turbid with about five to ten feet visibility until well away from shore (Sullivan and Tamaye, 1980). They reported that there had not been any recent rains and there was no apparent cause for the turbidity. They also reported that ambient water temperatures decreased markedly below -3 feet, indicating poor mixing of surface and subsurface waters. One possible cause of the turbidity may be related to the strong subsurface seaward flow in Nimitz Channel that occurs during both rising and falling tides (Chernin and others, 1977). This current may be stirring up the soft, silty sediments in the bottom of the channel. Turbidity levels also increase after heavy rains discharge eroded soil through three storm drains in the immediate vicinity of the proposed alternative plans. With or without project, the constituents of runoff should change from naturally and agriculturally-derived to urban-derived as the Pagachao subdivision begins to fill out with residences.

18. Endangered and Threatened Species. The U.S. Fish and Wildlife Service reports that there are no federally-listed endangered or threatened species or critical habitats locate in the study area. The Guam Aquatic and Wildlife Resources Division has observed turtles (probably Green Sea Turtle *Chelonia mydas*, which is listed as a Federal threatened species) in the zone between Orote Point in the north and Facpi Point in the south during their annual aerial surveys (Guam Aquatic and Wildlife Resources Division, September 1978). Six turtles were observed during the total of 24 aerial surveys conducted during fiscal year 1978.

19. Fisheries. There are no commercial fisheries at Nimitz Channel or the reef flats north and south of the channel, but considerable recreational and possibly subsistence or semi-subsistence fishing and shelling does occur there (U.S. Fish and Wildlife Service, March 1981). Residents stated at a workshop held for this project on 27 March 1980 that the nearshore areas adjacent to Nimitz Beach are used for recreational and subsistence fishing by local

residents. They reported that fishing was not concentrated in any one place but was done "anywhere on the reef" (U.S. Army Engineer District, Honolulu, 2 April 1980). Corps staff also observed both net and pole fishermen on the reef fronting Nimitz Beach Park and north of Nimitz Channel on a weekday (U.S. Army Engineer District, Honolulu, 5 October 1979). The U.S. Fish and Wildlife Service personnel reported seeing thousands of Trochus niloticus shells on the beach along Highway 2 north of Nimitz Channel although no Trochus were observed on the reef flat or reef front (U.S. Fish and Wildlife Service, March 1980). It is uncertain whether the Trochus were harvested from the Nimitz Beach area, the shells were brought in by currents or the shells were harvested elsewhere and brought to Nimitz Beach for a party (Lennan, 1980).

It is probable that excess catches of fish and molluscs beyond that which are distributed to one extended family are sold commercially to local stores, bars and restaurants. However, Nimitz Channel is no different than other coastal areas in terms of use for semi-commercial, except that it is publicly accessible. There is also commercial collecting of the decorative Conus quercina shells, located in the Enhalus beds on the reef flat, and Acropora spp. of coral located on the reef front and on the walls of Nimitz Channel (Hedlund, 1977).

SECTION II

ENVIRONMENTAL IMPACTS

20. Introduction. This detailed analysis of effects primarily addresses the federal portion of the project as described in Section 3 of the main report and Appendix E in the accompanying detailed project report. Portions of the total small boat harbor or marina construction such as the dredging of berthing areas and provision of boat ramps, access, parking area, sewage pumpout facilities and other marina facilities and policies are the responsibility of the Government of Guam, which should devote early attention to preparation of a harbor master plan. The acreages of modified habitat below include both federal and local portions.

21. Habitat Modification and Loss. The alternative plans will modify the reef-flat platform evironment by covering or removing existing habitats thereby destroying resident marine organisms. The alternatives will also create new intertidal and subtidal habitats. Plan 1 would modify a total of 10.2 acres of reef-flat environment of which 4.9 acres would be destroyed by offshore structures, and 5.3 acres of most shallow reef-flat (-1 to 2 ft MLLW) habitat would be deepened to create new subtidal habitat. Plan 1 would also create about 0.5 acres of new rocky interstitial intertidal habitat on the protective harbor structures. Plan 2 would modify a total of 10.4 acres of reef-flat environment of which only 2.4 acres would be destroyed by shoreside and offshore harbor structures and 8.2 acres of shallow habitat would be converted to subtidal habitat. Plan 2 would also create almost 0.4 acres of new interstitial intertidal habitat. Under Plan 2, about 2.9 acres of vegetated shoreline between Highway 2 and the beach would be converted to shoreside facilities. Plan 3 would modify a total of 10.0 acres of reef-flat environment of which 4.7 acres would be destroyed and 5.8 acres of new subtidal habitat would be created. Plan 3 would also create over 0.4 acres of rocky interstitial intertidal habitat. Plan 4 would modify a total of 8.3 acres of reef-flat environment of which 4.0 acres would be destroyed and 4.3 acres of subtidal habitat would be created. Plan 4 would also create almost 0.5 acres of rocky interstitial intertidal habitat. Plan 5, the selected plan, will modify a total of 9.6 acres of reef-flat environment of which 2.2 acres will be destroyed and 7.4 acres of new subtidal habitat will be created. Plan 5 will create about 0.4 acres of new interstitial, intertidal habitat. Under Plan 5, about 2.5 acres of beach and vegetated shoreline will be converted to shoreside facilities. A relatively small portion of the new subtidal habitat for each alternative plan would be created from reef margin, reef front and upper seaward slope biotopes. The areas affected would be larger for Plans 1 and 2 (1.4 acres) than the other plans (up to 0.3 acres). Subtidal habitat created for the harbor berthing area from existing shallow reef-flat platform will probably be dredged after completion of the federal area which consists of the entrance channel, turning basin and access channel.

22. Dredging and filling on a portion of the reef-flat platform should not permanently alter the food chain production in the coastal marine environment. There may occur a net increase of habitat diversity compared with the existing and surrounding reef-flat platform because of the creation of new intertidal habitat on offshore structures and new subtidal habitats within the channels, basins and berthing areas, the latter including possible soft-bottom habitats.

New tidal habitats and exposed surfaces created by construction on the reef platform will be colonized by marine organisms, although the abundance and diversity of organisms will be lower as compared to neighboring reef areas. The fish fauna in the subtidal habitats will be temporarily dominated by transient forms, until biological recolonization provides shelter and food for a more diversified and stable fish population. Fish might be attracted temporarily to the dredged sites to feed on organisms stirred up, killed, or exposed by dredging. The entrance channel and boat basin for any of the alternatives could provide hook and line fishing opportunities by allowing pelagic fish to come closer to shore through the deeper waters of the channel and basin. Soft-bottom communities may colonize the bottoms of dredged areas once sedimentation processes provide adequate soft bottom habitat.

23. Species recovery rate could be slow and abundance and productivity low if species recruitment and replacement from surrounding reef areas is slow. Construction on the reef will destroy part of the shallow water habitat notably containing an Enhalus acoroides seagrass bed, which is valuable to fishery resources, mostly in the moat area. This portion of the reef platform may possibly be a natural marine spawning and nursery area (see para. 15 above) as the shallow waters protect smaller fish from larger predators. The destructive effects of Plan 5 will be mainly limited to the smothering effects of suspended dredged material sediments during the construction phase. It may be possible that the dredged portions of the reef and intertidal areas of the breakwaters can serve as eventual spawning/nursery areas by providing a food source for colonizing herbivorous organisms. The abundance of fish larvae along the reef front and in the Nimitz Channel suggests those areas may be more significant fish nurseries than the seagrass beds. Impacts in the former areas should be minimal due to relatively little dredging required there and the direction of dredging which will likely be seaward.

24. Much of the coral substrate and sediment that may escape from the dredging equipment will probably be contained within newly created channel areas and on the reef-flat platform, minimizing the amount of suspended material carried through Nimitz Channel and over the reef margin and reef front by tidal currents. The possible adverse effect of suspended material smothering corals cannot be determined; even the fact that the waters in Nimitz Channel are very often turbid does not necessarily mean that a small incremental increase in turbidity will not adversely impact on the coral species on the channel and reef front wall. Direct impacts to the corals on the channel wall for Plan 3, 4, and 5 are minimized by designing the entrance channel beginning at the -14-foot (MILLW) contour of the shoreward most part of the natural channel. Thus, none of the corals attached to the wall of the deep part of the channel towards the channel mouth will be physically removed.

25. Blasting on the outer one-third of the reef-flat platform may be necessary for the project and may kill marine life depending upon their location, resistance to the force of shock waves, size and type of charge, depth of water and substrate characteristics. Any live corals close to the detonations will be compressed or broken by shock waves. The impact of blasting may be reduced by using warning charges to frighten fishes away from blasting areas prior to detonation, using directional charges, and by timing explosions to be detonated on falling tides when portions of the reef are exposed and there are only minimum population densities of shore fishes.

Blasting in the existing channel, if required, will result in coral loss along both sides of the channel, especially where corals are attached to vertical or sloped surfaces. This effect will be minimized in Nimitz Channel because of the relatively lower areal coverage by coral at the proposed entrance channel for Plans 3, 4, and 5 compared with the outer channel and the reef front for Plan 1 and 2. Coral recolonization can be expected in time through recruitment from adjacent areas. Broken or fractured portions of the reef will be cemented by reef building algae, and some live coral will be able to survive and recover.

26. The armor stone of the revetted moles and breakwater structures for the project may be colonized by intertidal organisms. Crevices formed by the armor rock may provide habitats for cryptic or photophobic organisms. The composition of this benthic life is expected to differ in species diversity and abundance from that of the adjacent reef platform due to the difference in substrate composition, vertical relief and periods of inundation and exposure. The availability of intertidal organisms on these offshore structures will also provide feeding and perching habitats for seashore birds such as terns, Pacific golden plover and others. However, it is unlikely that such habitat is limiting to bird populations in the area or on the island as a whole.

27. <u>Water Circulation and Water Quality</u>. Water quality in the harbor will influence the recovery rate and composition of the marine environment and will be dependent upon tidal flow and winds. The tidal exchange on the remaining reef flat will be virtually unchanged since currents are not unidirectional and are strongly influenced by tides and winds. The deep-channel and basin areas of the alternative harbor designs are not expected to flush as well as the reef flat. Residence times were calculated for the 150-berth Plans 1, 2, and 3 (R = Volume of basin/volume rate of exchange); Plan 4 was was not analyzed due to obvious smaller size and thus lower residence time. The following assumptions were made: (a) volume rate of exchange is due to tide only and is equal to the surface area of the basins X tidal range over one tide cycle. Computations were made for two tide ranges based on a MLLW datum-- (1) a mean high water (MHHW) range of 2.4 feet and (2) a mean tide level (MTL) range of 1.45 feet; (b) inflow and outflow rates are equal because tidal flow is relatively unrestricted; and (c) there is complete mixing, meaning that all waters entering during one tidal cycle get completely mixed with the remaining basin waters prior to the next tidal exchange. Assumption (a) is believed to be conservative because of the relative importance of wind-driven current flows on the adjacent reef-flat platform and because of the anticipated strong ebb-tide flow seaward through the entrance channel. For Plans 1 and 3, residence time based on MHHW tide range (R_{MHHW}) calcuated to 2.4 days; R_{MTL} = 3.7 days. For Plan 2, R_{MHHW} = 2.2 days; R_{MTL} = 3.4 days. Residence time for the selected Plan 5 should be similar to and probably shorter than Plan 2 due to shorter length of Nimitz Channel and the artificial entrance channel combined.

28. Residence times may be affected by the provision of gaps between the revetted moles and breakwaters. These were provided for all five plans in lieu of circulation pipes or culverts due to low current velocities and to encourage wind-driven surface flows. Plans 1, 3, and 4 all provide for one to two culverts through the revetted access way which will permit continued passage of the weak flowing (0.2 knots) long-shore currents. Presence or

absence of these culverts is not expected to significantly affect the dispersion suspended terrestrial sediments that are occasionally discharged from the three stormwater culverts along this stretch of the coast after heavy storms. The water mass on the reef flat drains mostly over the reef margin during ebb tide and is not restricted to passage through Nimitz Channel.

29. Dredging and filling will temporarily increase turbidity around the project site, reducing light penetration in the water and creating stressful conditions for the photosynthetic and light sensitive organisms found there. The magnitude of turbidity and sedimentation stress will depend upon the method of dredging, the amount and size of fine sediment produced and suspended by dredging, and the rate of dispersion and deposition. All of these factors to some extent are dependent upon water currents and wave action. Large particles will settle out within or close to the work areas. Finer and lighter particles will settle more slowly and be dispersed quickly out of the harbor area and are not anticipated to create significant stress problems. (See Paragraph 23 above in this appendix for further discussion of these effects.) The magnitude and duration of environmental stress caused by construction can be lessened by constructing the structures and dredging simultaneously. Another approach would be to construct part of the offshore breakwater with dredged material taken from the turning basin and access channel to provide an immediate barrier to escaping suspended sediments from the remaining dredging operation. Dredging will also require construction of some temporary moles, which will cause impacts similar to the permanent offshore structures, except that recolonization will occur on the natural sea bottom following removal rather than on rocks and other surfaces comprising the permanent mole. It may be possible to perform dredging from the partially completed revetted moles or breakwaters, if these are constructed before or during dredging.

30. Effects of Harbor Operation on Water Quality. This discussion is drawn from "The Environmental Impacts of Marinas and Their Boats: A Literature Review with Management Considerations" by Gail L. Chmura and Neil W. Ross of the Rhode Island Department of Environmental Management and the University of Rhode Island Marine Advisory Service (1978). Harbor or marina waters are principally affected by boat sewage, outboard motor exhaust and boat maintenance (involving petrochemicals and heavy metals). The U.S. Environmental Protection Agency and the U.S. Coast Guard have promulgated regulations, as authorized by the Clean Water Act of 1977, which requires that all vessels with permanently installed heads be equipped with marine sanitation devices (MSD). Those boats in marine or navigable waters may utilize devices which release treated sewage (Types I and II MSD's) if the effluent meets certain water quality specifications. Type I and II MSD's are permitted by Guam Water Quality Standards providing the MSD's have been approved by the Guam Environmental Protection Agency. Boats are more likely to utilize the less expensive Type III MSD's which consist of holding tanks designed to prevent any discharge of the sewage. The local sponsor does plan to eventually construct toilet facilities at the marina as sewer lines do already exist; however, until that time and even with the existence of public toilets, boaters will occasionally discharge sewage into the harbor either by accident or on purpose. This discharge is illegal under both Federal and Territorial regulations. Nevertheless, Chmura and Ross report that there is no epidemiological evidence that boat wastes cause disease, except the

possibility that raw sewage might transmit disease by concentration in shellfish. Shellfish beds do occur in the immediate vicinity of the proposed harbor. For this reason, some state-level health departments restrict the harvesting of shellfish in areas proximate to marinas, even without proof of water contamination.

31. The good flushing characteristics of Plan 5 are anticipated to reduce the hazard associated with discharge of raw sewage near shellfish beds and swimming areas. Moreover, when all boats meet MSD standards (as of 1980) and boaters faithfully dispose of Type III holding tanks into toilets or pumpout facilities, the potential for contaminating shellfish will be sharply reduced or eliminated (Chmura & Ross, 1978). Shellfish quality should, however, be routinely monitored in and adjacent to marine waters to provide the basis for marine closure when necessary. Boat toilet use can also be reduced if the marina does provide shoreside restrooms. These restrooms should be convenient to the docks, provide hot showers and wash basins, and be well maintained (Chmura & Ross, 1978).

32. In two-cycle outboard motors, which prevail over four-cycle engines, unburned fuel can be released with exhaust gases into the water. Some lubricating oil is also discharged into the water, but post-1972 motors have significantly reduced this output of oil by use of "scavanger" devices to recycle crankcase drainage back into the fuel system. Once exhausts are released into the water, some hydrocarbons become suspended in the water at propeller depth, while other concentrate at the surface, where they may evaporate (see Chmura & Ross, 1978). Almost all lead discharged eventually reaches bottom sediments. In the tropics, evaporating of aromatic hydrocarbons is likely to be significantly higher than the temperate zones where most investigations have occurred. Lead is becoming less of a concern due to the currently greater use of unleaded marine fuels. Studies including an EPA/Boating Industry study, generally show that outboard motor emissions under normal field conditions do not significantly affect aquatic systems or seriously degrade water quality (Chmura & Ross, 1978). It can be anticipated that in a marine environment with excellent flushing characteristics, such as at Nimitz Channel, similar effects will prevail.

33. Petroleum pollutants may also be introduced into a marina by the emptying of bilge water or by runoff from shoreside fuel dock facilities. Chmura & Ross (1978) suggest that oil pollution from bilge water can be controlled by the use of oil filtration devices on boat bilge pumps, or devices such as commercial oil-absorbent pads placed in the bilge to soak up fuel and oil before bilge water is discharged. Although pollution by visible oil may be controlled, some petroleum compounds may be dissolved in bilge water and transferred unnoticed to aquatic ecosystems. In commenting on the Draft report and EIS, the U.S. Coast Guard recommended that the Agat Marina have a waste oil facility for boaters installed in the dockside area for boaters who wished to empty their oil (U.S. Coast Guard, 23 February 1981). They also recommended that a small scale oil-spill clean-up capability be provided in case a spill did occur. According to the Section 208 Guam Water Quality Management Plan (1979), the Marine Safety Office of the U.S. Coast Guard, in cooperation with a number of Federal offices, Government of Guam offices, and local business organizations had developed a Guam Oil Spill Contingency Plan for cleaning up local spills within navigable waters where the responsible party was either unwilling or unable to do so. This plan should be extended to Agat Small Boat Harbor/marina when the marina becomes operational.

34. Copper is the most common heavy metal used in anti-fouling paints and is found in high levels in sea-water, sediments, and fouling communities in marinas (Chmura & Ross, 1978). Pending additional general research on the effect of copper and the use of anti-fouling paints in marinas, Chmura and Ross suggest that marina operators can reduce copper levels by not painting non-boat surfaces and by collecting and removing paint particles from boat scraping and painting areas. Until reasonable alternatives to existing anti-fouling paints are available, prudent use can continue. Detergent introduced into marina waters from the washing of boats can cause increased nutrient levels and eventually could conceivably cause a decrease in the dissolved oxygen concentration. Chmura and Ross (1978) suggest that whenever possible, boat owners and marina operators limit their using detergents, or use non-polluting detergents. At the Nimitz Beach site, the probable excellent harbor flushing under Plan 5 should eliminate any significant amounts of detergents or other chemicals from being trapped within the harbor.

35. Other Construction-Related Effects. During construction, heavy equipment and blasting will increase noise and air pollution levels above the relatively quiet and clean ambient conditions. The major effect would be on the scattered residences in Pagachao Subdivision immediately inland from the construction area and on operations of the C&H Chicken Farm, which is about 2,500 feet northeast of the project site. The blasting is expected to be infrequent and each noise impulse of very short duration, causing insignificant disruption, providing adequate warning is given. The use of noise suppression devices conforming to occupational-industrial safety standards and emission control devices could minimize noise and air impacts. Quarry stone will probably be obtained from commercial sources near Fadian Point in Central Guam.

36. The project will not require ocean disposal of dredged material. Plans 1 through 5 would utilize about 69, 25, 50, 33, or 29 percent respectively of the dredged coralline material from the federal project for core or fill material in construction of the breakwaters and interior revetment. The volume of excess dredged material from the federal project area (total federal and territorial area in parentheses) amounts to 20,454 cubic yards (CY) (68,933 CY) for Plan 1; 92,613 CY (145,600 CY) for Plan 2; 30,864 CY (83,146 CY) for Plan 3; 43,445 CY (90,145 CY) for Plan 4; and 67,250 CY (119,350 CY) for the selected Plan 5. All excess dredged material required by the plan will be stockpiled on land at a disposal site in the Namo River flood control project construction area as designated by the Guam Department of Parks and Recreation.

III. FISH AND WILDLIFE COORDINATION

37. Fish and Wildlife Coordination Act of 1958. In accordance with the Fish and Wildlife Coordination Act of 1958 (P.L. 85-624) the US Fish and Wildlife Service was officially consulted. The Service conducted field studies at Nimitz Beach and prepared a Planning Aid Letter in March 1980 which was used during preliminary planning. A Preliminary Section 2(b) Report was subsequently submitted in October 1980 to the Corps of Engineers which was used in the plan formulation process and in the preparation of the Draft Report and Environmental Impact Statement. Based on the tenatative selection of Plan 5 as the recommended plan, the Service then prepared and submitted their final 2(b) report in March 1981. Plan 5, which was not included in the Draft Detailed Project Report, was assessed and evaluated. The final 2(b) report indicating plan 2 as the least environmentally damaging plan is provided in this appendix.

38. Discussion of Fish and Wildlife 2(b) Recommendations. The U.S Fish and Wildlife Service final 2(b) report recommends Plan 2 be the selected plan principally because of its lack of adverse effect on the recreational activities occurring in and adjacent to Nimitz Channel. The Service also objects to the use of filled reef-flat and shoreline area for the parking of automobiles under both Plans 2 and 5 when adjacent land-based areas are already available for parking. The U.S. Army Corps of Engineers concedes that there will be adverse effects on recreational and subsistence fishing, shell collecting, snorkeling, and SCUBA diving mainly originating from Nimitz Beach Park. Conflicts between boaters and swimmers can be minimized by providing strict controls over the velocity of vessels passing through the entrance channel and Nimitz Channel, by providing a warning system wherein both boaters and swimmers may be made aware of each other's presence, and by providing lifeguards to monitor activity within the Nimitz Channel area. Fishing and shell collecting may still proceed on both sides of Nimitz Channel except that access to the northern half of the channel will be sightly impeded although not blocked by the harbor structure. Certain types of net fishing may be restricted in Nimitz Channel if it interferes with the navigability of the natural channel.

39. If other factors such as the area of affected coral cover and affected seagrass habitat are taken into consideration in assessing the tradeoffs between Plan 2 and 5 (see Table EIS-II; Table 16; and Paragraph 21 above), Plan 5 may be seen as exhibiting less adverse marine biological impacts than Plan 2. The tradeoffs between the two plans regarding water quality are less clear and probably insignificant. Plan 2 would permit dispersal of harbor waters with potential petroleum-product contaminants out through a channel well away from recreational waters but the configuration of the long channel could impede harbor flushing. Harbor flushing under Plan 5 is anticipated to be very good and residence time probably lower than Plan 2. However, the harbor waters would pass through an area used for recreational swimming. The effects of potentially contaminated harbor waters on fishery and coral resources appear to be similar no matter whether Plan 2 or 5 is recommended. Based on the marine biological and water quality/circulation factors which contribute to the P&S attributes of Environmental Quality component, the U.S. Army Corps of Engineers continues to recommend Plan 5 as the least-environmentally damaging plan.

40. The U.S Fish and Wildlife Service recommendation to reduce parking space on fill land has merit and has been independently recommended by the local sponsor, the Guam Department of Parks and Recreation. The parking lot in Nimitz Beach Park may be utilized until such time that user demand in the marina justifies construction of a permanent parking lot by local interests in the 3.6 acre parcel across Route 2 from the harbor/marina.

41. The U.S. Army Corps of Engineers concurs with the Service's standard construction procedures to assure that:

a. Extreme care will be taken to insure that no debris, petroleum products, or other deleterious material be allowed to flow, fall, leach, or otherwise enter the water.

b. Water quality standards will be maintained in accordance with Federal and State water quality regulations.

c. All construction activities within and adjacent to the water be conducted so as to minimize turbidity and control erosion.

d. If a bucket dredge is used, there shall be no stockpiling of materials in the water to obtain full buckets.

42. U.S. Fish and Wildlife Service Final 2(b) Report.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P. O. BOX 50167
HONOLULU, HAWAII 96850

IN REPLY REFER TO:
ES
Room 6307

March 10, 1981

Colonel Alfred J. Thiede
U.S. Army Engineer District Honolulu
Building 230
Fort Shafter, Hawaii 96858

Re: Agat Small Boat Harbor
Nimitz Beach, Territory
of Guam

Dear Sir:

This is the final report of the U.S. Fish and Wildlife Service on the proposed U.S. Army Corps of Engineers small boat harbor project for the Nimitz Beach area of Agat Bay, Territory of Guam. It has been prepared under the authority of and in accordance with the provisions of Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and other authorities mandating the Department of the Interior's concern for environmental values. It is also consistent with the intent of the National Environmental Policy Act.

The report is based on data gathered from existing published and unpublished documents, and on Service field investigations from February 26 through March 4, 1980. Project engineering features and specifications were taken from drawings and other data supplied to the Service by the Corps of Engineers on September 18, 1980, October 21, 1980, and February 12, 1981.

This project is authorized by Section 107 of the River and Harbor Act of 1960.

Project Area Description

The Territory of Guam is the largest and most southernly of the Mariana Islands, although not politically part of the Commonwealth of the Northern Mariana Islands (CNMI). It is located at 13°28'N latitude and 144°45'E longitude. The Island is approximately 30 miles (51 km.) long and varies between 3½ and 11½ miles (6-18½ km.) wide. The average temperature is approximately 80°F (27°C) and average rainfall is approximately 90 inches (2.3 m.) per year. The dominant winds are the trades which blow from the east or northeast. Guam is subjected to numerous typhoons, some of which have caused extensive damage.

According to the 1980 census, Guam has a population of approximately 105,800. A sizeable proportion of the population is military from Anderson Air Force Base and the various Naval installations throughout the island. Approximately one-third of Guam's total area of 209 square miles (336 km.^{2}) is controlled by the Federal government (Anonymous, 1971).

It is estimated there are approximately 1,000 private boats on Guam, about 60 percent of which are trailer mounted. Hobie Cat type sailboats comprise about 10 percent of the total, and other sailboats another 10 percent (J. Eads, Personal Communication).

The Nimitz Beach project site is in the southern part of Agat Bay; a shallow indentation of the west coast extending approximately 4 miles (6½ km.) from Tipaloa Bay south to Taleyfac Bay (Figure 1).

The shoreline in the project area roughly parallels the highway (Route 2). Between the road and shore is a narrow strip of mowed grass, approximately 35 to 65 feet wide. There is a line of palm trees on the grass strip at 15 to 40 feet intervals. The grassy strip slopes seaward from approximately 1:20 to approximately 1:10.

The beach morphology varies. Close to the three storm drains there is a mixture of silt, cobble and coral rubble radiating out in an alluvial fan. The rest of the beach is sand/coral rubble.

The shallow intertidal zone near the storm drains was covered with a layer of red terrigenous silt which became suspended at the slightest disturbance. This was probably due to the very heavy rain (8 inches in 24 hours) which occurred on February 25, 1980.

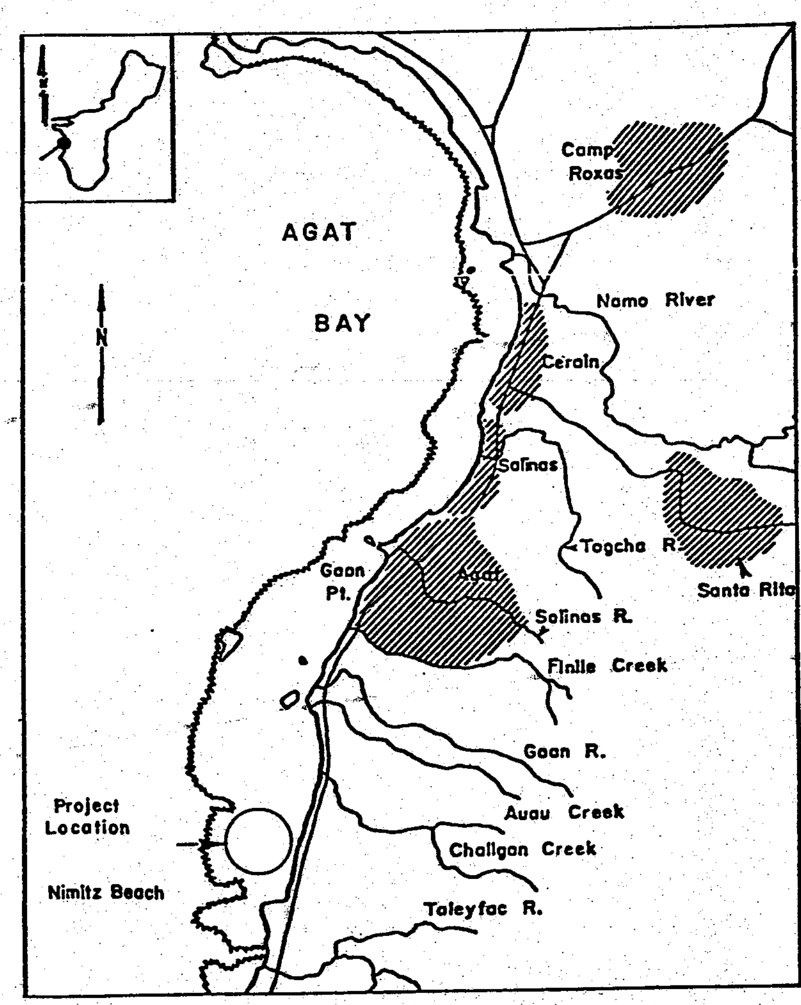
Seaward, the reef margin varies between 600 to 900 yards offshore (550 m. - 820 m.). Between the shore and reef margin is a reef flat consisting of a thin sand layer over reef rock with scattered boulders and coral rubble and occasional small coral heads such as *Pocillopora damicornis*. The central portion of the reef flat is dominated by an extensive bed of the seagrass *Enhalus acoroides* (Figure 2).

Project Description

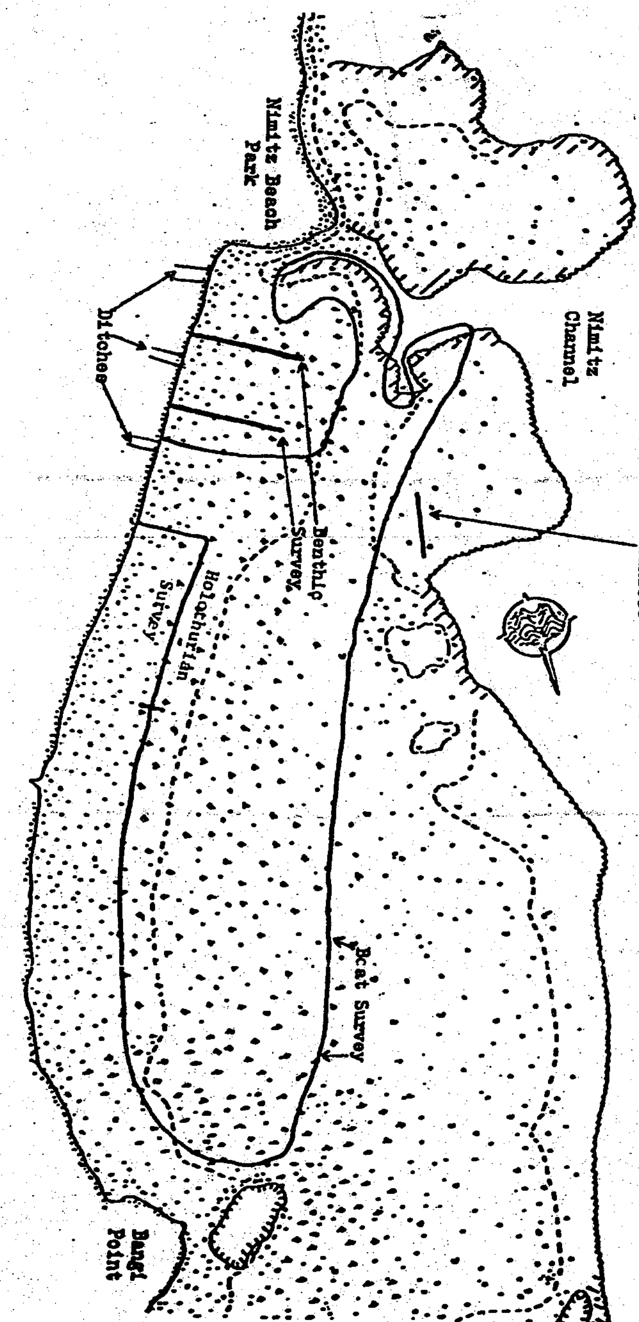
Originally, four alternative plans for the Nimitz Beach site were evaluated with respect to their probable environmental impacts. The present selected plan was not one of the four, although it is similar to Plan 2 (Figure 5 & 6).

PLAN 5 150 Berths Figure 3 & 4

The plan consists of dredging a 900-foot long, 120 to 150-foot wide, and 15-foot deep entrance channel leading into the existing Nimitz Beach Channel, a 150-foot square and 12-foot deep turning basin, and a 500-foot long, 75-foot wide, 10-foot deep main access channel; and constructing a



Agat Bay, Guam and vicinity.

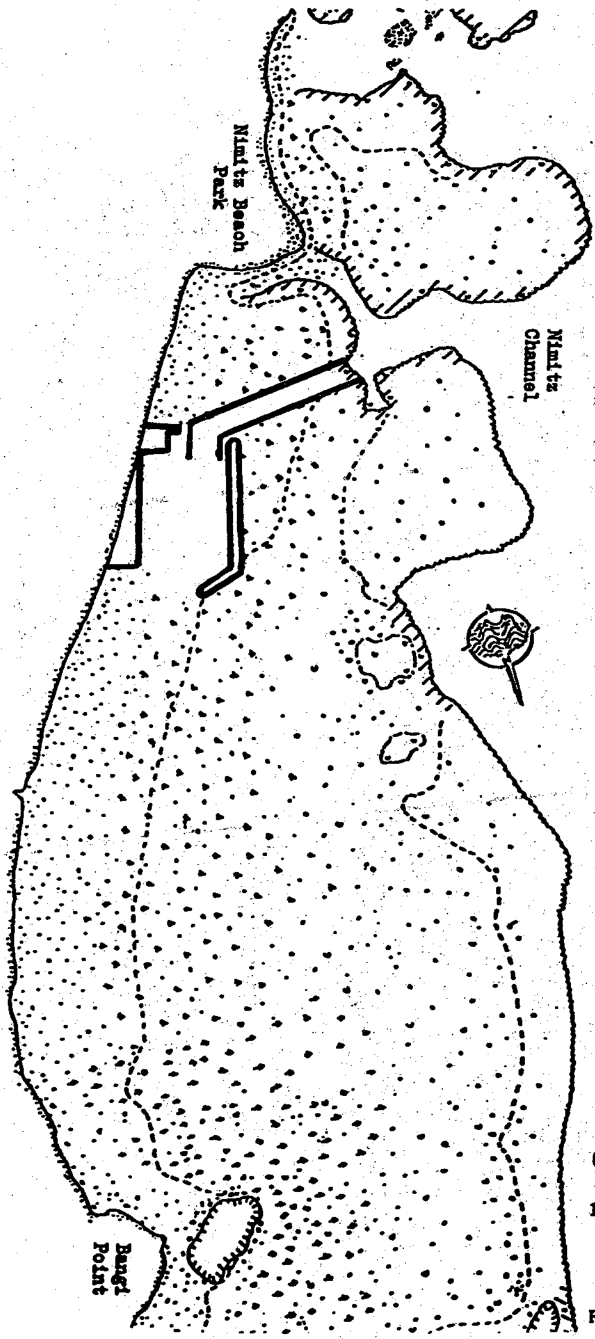


Scale (1:7600)

Agat Bay
Nimitz Beach
Small Boat Harbor
Study Area

FIGURE 2

5



Scale (1:7600)

PLAN 5
(The Selected Plan)

150 Berths
95 Total Parking Spaces

FIGURE 3

6

PLAN 5

150 Berths
75 Car Stalls
20 Car/Trailer Stalls

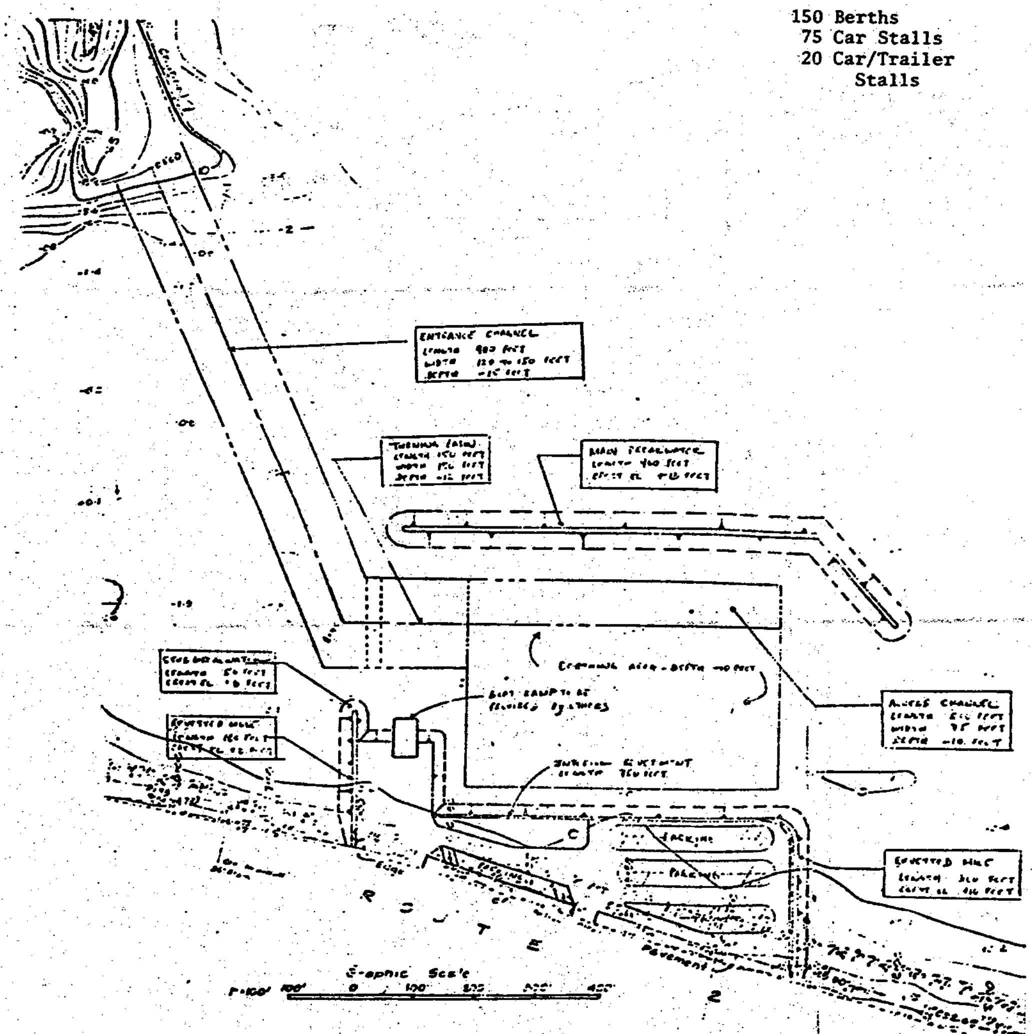
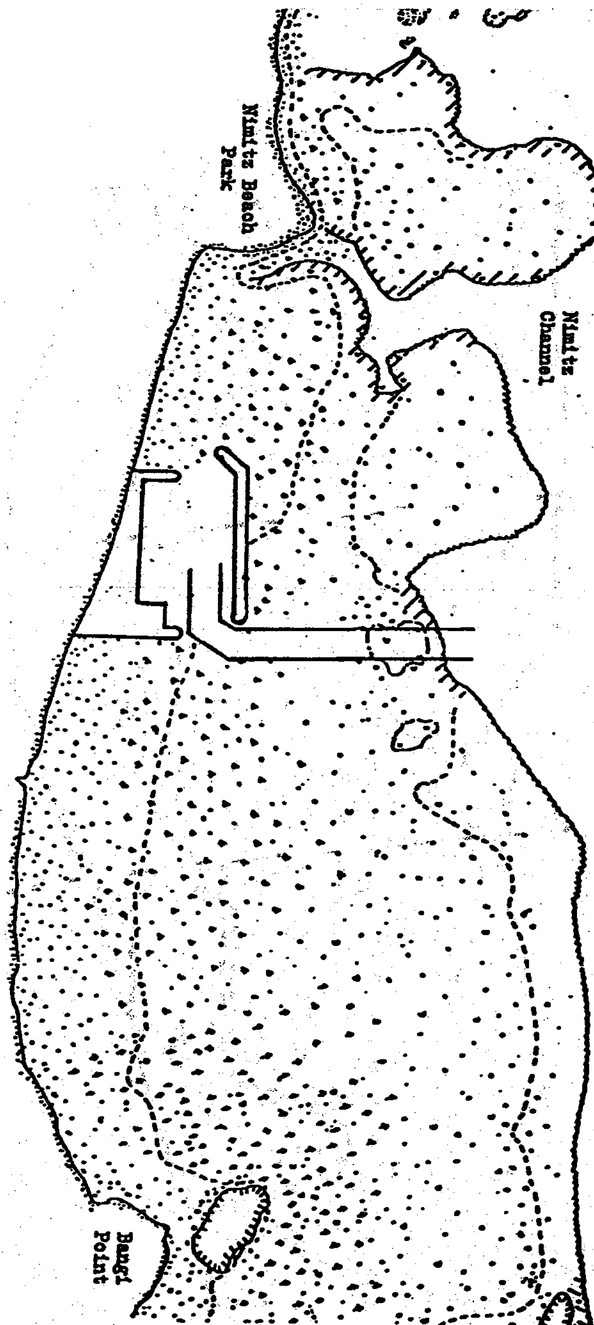
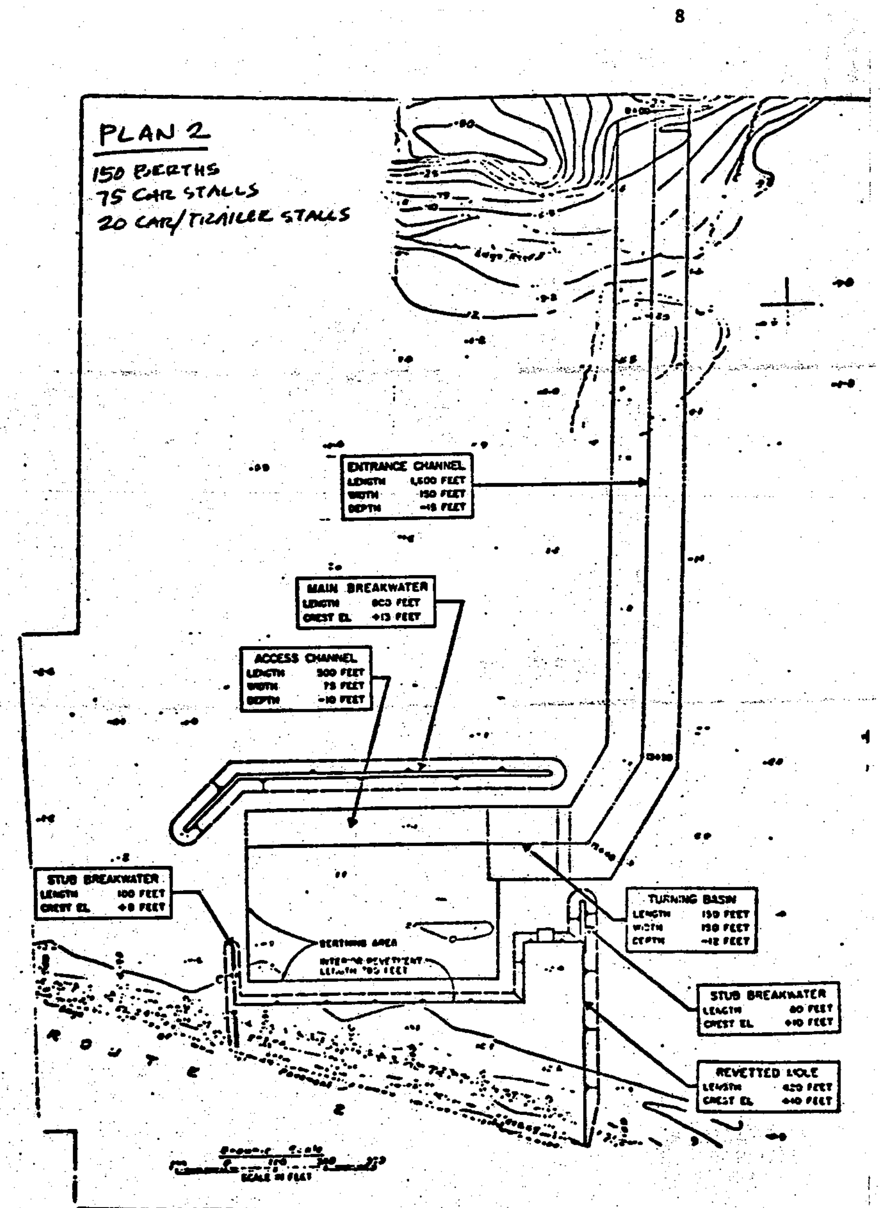


FIGURE 4



Plan 2
150 Berths

FIGURE 5



900-foot long main breakwater with a +8-foot crest elevation and a 100-foot long stub breakwater with a +8-foot crest elevation, and a 420-foot long revetted mole with a crest elevation of +10 feet. It would be constructed contiguous to the existing shoreline approximately 1,200 feet north of Nimitz Beach Park. Plan 5 would provide berthing space for approximately 150 boats, and some filling on the reef flat for support facilities including a two-lane launch ramp and parking for approximately 75 cars and 20 cars with boat trailers.

Fishery Resources

Without the project

The intertidal/subtidal zone in the project area does not appear rich in epibenthic marine life. However, the energy and nitrogen to support the rest of the system is derived from this zone (Wiebe, 1976). The fauna was dominated by the gastropod *Nerita granosa*, the holothurian *Holothuria atra*, and two paguridians, *Calcinus laevimanus*, and *Dardanus megistos*. The snails and hermit crabs were patchily distributed, occurring almost exclusively on large pieces of coral rubble. Five large pieces of coral were sampled randomly with a quadrat. Results are shown in Table 1. Holothurians were sampled on a transect parallel to the shore and approximately 100 yards (90 m.) offshore. Density was 1.67 per meter^2. Infaunal samples were taken on two transects as shown on Figure 3. Those organisms which could be identified at least to family are included in Table 2. Table 2 also contains a checklist of invertebrates adapted from Chernin *et al.* (1977). For the north transect, the densities were: polychaetes 20.45 per square meter; clams 31.15 per square meter; gastropods 31.15 per square meter; and hemichordates 8.76 per square meter. For the south transect, the densities were: polychaetes 44.30 per square meter; clams 61.34 per square meter; gastropods 23.85 per square meter; hermit crabs 4.54 per square meter; portunid crabs 4.54 per square meter; and hemichordates 2.27 per square meter.

A fish survey was conducted on a transect as shown on Figure 3. Abundance of each species is contained in Table 3, which is a combination of the survey reported by Chernin *et al.* (1977) and the Service survey. The abundance code from Chernin *et al.* was used for all species which were seen on both surveys. A total of 168 species were observed between the two surveys, including an undescribed moray eel (J. Randall, Personal Communication).

Corals and marine plants have been extensively surveyed by Chernin *et al.* (1977) and their results are reported in Tables 4 and 5. The approximate position of the *Enhalus* bed is shown on Figure 2.

TABLE 1: Rock Epifaunal Survey by Fish and Wildlife Service, February 29, 1980

Rock Number	Organism	Abundance
1	Unidentified anemone	$400/m^2$
	Nerita granosa	$40/m^2$
	Dardanus megistos	$12/m^2$
2	*Nerita granosa*	$384/m^2$
	Dardanus megistos	$160/m^2$
	Calcinus laevimanus	$32/m^2$
3	*Nerita granosa*	$132/m^2$
	Unidentified anemone	$4/m^2$
4	*Nerita granosa*	$160/m^2$
	Dardanus megistos	$142/m^2$
	Unidentified anemone	$32/m^2$
5	*Nerita granosa*	$224/m^2$
	Dardanus negistos	$100/m^2$
	Calcinus laevimanus	$32/m^2$

TABLE 2: Checklist of invertebrates (excluding corals) collected or observed at the Nimitz Beach site, Agat Bay, Guam. (Adapted from Chernin et al., 1977, and FWS survey February 29 - March 2, 1980)

ANNELIDA

Polychaeta
Dorvilleidae
Kesun sp.
Oenone sp.
Sabellidae

ARTHROPODA

Anomura
Calcinus laevimanus (Randall)
Dardanus megistos (Herbst)

Brachyura
Calappa hepatica (Linnaeus)
Eriphya sebana Rathbun
Grapsus sp.
Majidae sp.
Portunidae sp.
Xanthidae sp. 2

Macrura
Callianassidae sp.

CHORDATA

Ascidea gemmata Sluiter

ECHINODERMATA

Asteroidea
Culcita novaguineae Muller and Troschel
Linckia laevigata (Linnaeus)
Linckia multiflora (Lamarck)

Echinoidea
Diadema savignyi Michelin
Echinometra mathaei (de Blainville)
Echinostrephus aciculatus A. Aggasis
Echinothrix calamaris (Pallas)
Echinoghrix diadema (Linnaeus)
Heterocentrotus mammilatus (Linnaeus)

Holothuroidea
Actinopyga echinites (Jaeger)
Actinopyga mauritiana (Quoy & Gaimard)
Bohadschia argus (Jaeger)
Bohadschia bivittata (Mitsukuri)
Holothuria atra Jaeger
Holothuria edules Lesson
Holothuria hilla Lesson
Holothuria leucospolota Brandt
Holothuria nobilis (Selenka)
Holothuria pervicax Selenka
Stichopus chloronotus Brandt
Stichopus horrens Selenka
Synopta maculata (Chamisso & Eysenhardt)
Thelenota ananas (Jaeger)

ECHIURA

Ochetostoma erythrogrammon Leuckart & Ruppel

HEMICHORDATA

Enteropneusta
Ptychodera sp.

MOLLUSCA

Amphinura
Unknown sp.

Gastropoda
Astraea rhodostoma (Lamarck)
Cantharus fumosus (Dillwyn)
Certhium nodulosum Bruguiere
Cerithium sp.
Conus catus Bruguiere
Conus chaldeus (Roding)
Conus flavidus Lamarck

Conus lividus Bruguiere
Conus miliaris Bruguiere
Conus quercinus Solander
Conus rattus Bruguiere
Conus sanguinolentus Quoy & Gaimard
Conus sponsalis Bruguiere
Conus virgo Linnaeus
Conus vitulinus Bruguiere
Coralliophila violacea (Kiener)
Cypraea caputserpentis Linnaeus
Cypraea isabella Linnaeus
Cypraea moneta Linnaeus
Drupa ricinus (Linnaeus)
Drupella cornus (Roding)
Imbricaria olivaeformis (Swainson)
Lambis lambis (Linnaeus)
Latirus sp.
Mitra sp.
Rhinoclavis asper (Linnaeus)
Strombus gibberulus (Roding)
Tectus pyramis (Born)
Terebra subulata (Linnaeus)
Trochus niliticus Linnaeus
Turbo argyrostomus Linnaeus
Vasum turbinellus (Linnaeus)
Verillum sp.

Pelecypoda

Arca ventricosa Lamarck
Codakia punctata (Linnaeus)
Codakia tigerina (Linnaeus)
Dosinia ef. D. japonica (Reeve)
Fragum fragum (Linnaeus)
Gafrarium pectinatum (Linnaeus)
Glycodonta marica (Linnaeus)
Pinna muricata Linnaeus
Quidnipagus palatam Iredale
Scutarcopagia scobinata (Linnaeus)
Septifer bilicularis (Linnaeus)
Spondylus sp.
Tridacna maxima (Roeding)

PORIFERA

Cinahyra australiensis

SIPUNCULA

Sipunculus indicus Peters

TABLE 3 Checklist of fishes identified from the Nimitz Beach site for the Agat Small Boat Harbor (A = abundant, C = common, O = occasional, R = rare) (Adapted from Chernin et al., 1977; and FWS survey on March 1, 1980)

ACANTHURIDAE	
Acanthurus glaucopareius Cuvier	U
Acanthurus lineatus (Linnaeus)	O
Acanthurus nigrofuscus (Forskaal)	O
Acanthurus triostegus (Linnaeus)	O
Acanthurus xanthopterus (Cuvier & Valenciennes)	R
Acanthurus sp. 1.	O
Acanthurus sp. 2.	C
Ctenochaetus binotatus (Randall)	O
Ctenochaetus striatus (Quoy & Gaimard)	O
Naso literatus (Bloch & Schneider)	O
Naso unicornus (Forskaal)	O
Naso vlamingi (Valenciennes)	U
Zebrasoma flavescens (Cuvier & Valenciennes)	O
Zebrasoma scopas (Cuvier)	R
Zebrasoma veliferum (Bloch)	O
ALUTERIDAE	
Oxymonacanthus longirostris (Bloch & Schneider)	U
APOGONIDAE	
Apogon novaeguineae Valenciennes	O
Apogon novemfasciatus Cuvier	C
Apogon nubilus Garman	U
Apogon sp.	R
Apogon taeniatus Cuvier	R
Cheilodipterus macrodon (Lacepede)	C
Cheilodipterus quinquelineatus Cuvier	C
AULOSTOMIDAE	
Aulostomus chinensis (Linnaeus)	O

BALISTIDAE	
Balistipus undulatus (Mungo Park)	U
Rhinecanthus aculeatus (Linnaeus)	O
Rhinecanthus rectangulus (Bloch & Schneider	O
Sufflamen chrysopterus (Bloch & Schneider)	O
BLENNIIDAE	
Aspidontus tainiatus Quoy & Gaimard	R
Entomacrodus sp.	O
Meiacanthus atrodorsalis (Gunther)	C
Petroscirtes breveceps (Valenciennes)	R
Plagiotremus tapeinosoma (Bleeder)	O
Salarias fasciatus (Bloch)	U
Unidentified blenny	U
CARANGIDAE	
Carangoides malabaricus (Bloch)	C
CHAETODONTIDAE	
Chaetodon auriga Forskaal	O
Chaetodon citrinellus Cuvier & Valenciennes	O
Chaetodon ephippium Cuvier & Valenciennes	O
Chaetodon kleini Bloch	R
Chaetodon lunula (Lacepede)	O
Chaetodon mertensii Cuvier & Valenciennes	C
Chaetodon ornatissimus Cuvier & Valenciennes	O
Chaetodon punctatofasciatus Cuvier	O
Chaetodon reticulatus Cuvier & Valenciennes	R
Chaetodon trifasiatus Mungo Park	O
Chaetodon ulietensis Cuvier & Valenciennes	O
Chaetodon unimaculatus Bloch	R
Heniochus acuminatus (Linnaeus)	O
Heniochus chrysostomus Cuvier & Valenciennes	R
CIRRHITIDAE	
Cirrhitus pinnulatus (Bloch and Schneider)	U
ELEOTRIDAE	
Eleotroides strigatus (Broussonet)	O

FISTULARIIDAE	
Fistularia petimba Lacepede	O
GOBIIDAE	
Acentrogobius ornatus (Ruppell)	C
Amblygobius albimaculatus (Ruppell)	C
Asteropteryx semipunctatus Ruppell	A
Calumina sp.	U
Cryptocentrus koumansi (Whitley)	A
Ctenogobius pomastictus Lubbock & Polunin	A
Ctenogobius sp.	A
Eviota sp.	U
Fusigobius sp.	C
Gnatholepis sp.	C
gobiid sp. 3	O
gobiid sp. 4	C
Lotilia graciliosa Klausewitz	U
Ptereleotris microlepis (Bleeker)	O
Ptereleotris tricolor Smith	A
HOLOCENTRIDAE	
Adioryx tiere (Cuvier & Valenciennes)	O
Flammeo sammara (Forskaal)	A
Myripristis adustus Bleeker	O
Myripristis kuntee Cuvier	C
LABRIDAE	
Anampses twisti Bleeker	O
Bodianus axillaris (Bennet)	O
Cheilinus chlorourus (Bloch)	O
Cheilinus rhodochrous Gunther	C
Cheilinus trilobatus Lacepede	O
Cheilio inermis (Forskaal)	O
Epibulus insidiator (Pallas)	O
Gomphosus varius Lacepede	O
Halichoeres centiquadrus (Lacepede)	O
Halichoeres margaritaceus (Cuvier & Valenciennes)	O
Halichoeres marginatus Ruppell	O
Halichoeres trimaculatus (Quoy & Gaimard)	C
Hemigymnus fasciatus (Bloch)	R
Hemigymnus melapterus (Bloch)	O
Labrichthys unilineata (Guichenot)	O
Labroides bicolor Fowler & Bean	R
Labroides dimidiatus (Cuvier & Valenciennes)	O
Macropharyngodon meleagris (Cuvier & Valenciennes)	U

Pseudocheilinus hexataenia (Bleeker)	R
Stethojulius bandanensis (Bleeker)	O
Stethojulius strigiventer (Bennett)	O
Thalassoma amblycephala (Bleeker)	R
Thalassoma hardwickei (Bennet)	C
Thallassoma lutescens (Lay & Bennett)	O
Thallassoma purpureum (Forskaal)	O
Thallassoma quinquevittata (Lay and Bennett)	O
LETERINIDAE	
Gnathodintex aureolineatus (Lacepede)	R
Lethrinus harak (Forskaal)	O
Lethrinus sp.	R
LUTJANIDAE	
Aphareus furcatus (Lacepede)	O
Lutjanus fulvus (Bloch & Schneider)	C
Lutjanus monostigma (Cuvier & Valenciennes)	U
MONACANTHIDAE	
Oxymonacanthus longirostris (Bloch & Schneider)	O
Prevagor melanocephalus (Bleeker)	R
MUGULIDAE	
Liza vaigiensis (Quoy & Gaimard)	O
MULLIDAE	
Mulloidichthys flavolineatus (Lacepede)	C
Mulloidichthys vanicolensis (Cuvier & Valenciennes)	O
Parupeneus barberinus (Lacepede)	O
Parupeneus bifasciatus (Lacepede)	O
Parupeneus cyclostomus (Lacepede)	O
Parupeneus pleurostigma (Bennet)	U
Parupeneus spilurus (Bleeker)	O
Parupeneus trifasciatus (Lacepede)	C

MURAENIDAE	
Echidna nebulosa (Ahl)	R
Gymnothorax nebulosa (Ahl)	R
Gymnothorax pictus (Ahl)	U
Gymnothorax sp. (not yet described)	R
NEMIPTERIDAE	
Scolopsis cancellatus (Cuvier)	U
PEMPHERIDAE	
Pempheris oualensis Cuvier & Valenciennes	C
PERIOPTHALMIDAE	
Periophthalmus koelreuteri (Pallas)	A
PLESIOPIDAE	
Plesiops corallicola Bleeker	U
POMACANTHIDAE	
Centropyge flavissimus (Cuvier & Valenciennes)	O
Pygoplites diacanthus (Boddaert)	R
POMACENTRIDAE	
Abudefduf coelestinus (Cuvier & Valenciennes)	C
Abudefduf septemfasciatus Cuvier & Valenciennes	O
Abudefduf sexfasciatus (Lacepede)	U
Amblyglyphidon curacao (Bloch)	C
Amphiprion melanopus Bleeker	R
Amphiprion perideraion Bleeker	R
Chromis caerulea (Cuvier)	C
Dascyllus trimaculatus (Ruppell)	O
Glyphidodontops biocellatus (Quoy & Gaimard)	C
Glyphidodontops glaucus (Cuvier)	O
Glyphidodontops leucopomus (Lesson)	C
Glyphidodontops traceyi (Woods & Schultz)	C
Plectroglyphidodon dickii (Lienard)	O
Plectroglyphidodon lacrymatus (Quoy & Gaimard)	R

Pomacentrus pavo (Bloch)	C
Pomacentrus vaiuli Jordon & Seale	C
Stegastes albifasciatus (Schlegel & Muller)	O
Stegastes cf. fasciolatus (Ogilby)	R
Stegastes lividus (Bloch & Schneider)	O
Stegastes nigricans (Lacepede)	O

PRIACANTHIDAE

Priacanthus hamrur (Forskaal)	R

SCARIDAE

Scarus chlorodon Jenyns	C
Scarus frenatus Lacepede	O
Scarus juvenile (plain brown-grey)	O
Scarus juvenile (striped)	R
Scarus juvenile (yellow face)	R
Scarus rhoduropterus (Bleeker)	U
Scarus sordidus Forskaal	O
Scarus sp. 2	C
Scarus sp. 3	O
Scarus venosus Cuvier & Valenciennes	U

SCOLOPSIDAE

Scolopsis cancellatus (Cuvier & Valenciennes)	O

SCORPAENIDAE

Scorpaenodes guamensis (Quoy & Gaimard)	R

SIGANIDAE

Siganus argenteus (Quoy & Gaimard)	C
Siganus spinus (Linnaeus)	C
Signanus guttatus (Bloch)	O

SYNGNATHIDAE

Corythoichthys intestinalis (Jordan & Seale)	O

SYNODONTIDAE

Saurida gracilis (Quoy & Gaimard)	O

TETRAODONTIDAE

Canthigaster amboinensis (Bleeker)	U
Canthigaster bennetti (Bleeker)	O
Canthigaster solandri (Richardson)	C
Canthigaster valentini (Bleeker)	R

ZANCLIDAE

Zanclus cornutus (Linnaeus)	U

TABLE 4 Checklist of corals identified from the Nimitz Beach site for the Agat Small Boat Harbor. (D = dominant, A = abundant, C = common, O = occasional, U = uncommon, R = rare) (Adapted from Chernin et al., 1977)

ACROPOIDAE	
Acropora brueggemanni (Brook)	U
Acropora delicatula (Brook)	O
Acropora echinata (Dana)	R
Acropora formosa (Dana)	O
Acropora humilis (Dana)	O
Acropora hystrix (Dana)	O
Acropora nasuta (Dana)	O
Acropora palifera (Lamarck)	O
Acropora surculosa (Dana)	C
Astreopora gracilis Bernard	U
Montipora ehrenbergii Verrill	O
Montipora foliosa (Pallas)	D
Montipora hoffmeisteri Wells	O
Montipora lobulata Bernard	C
Montipora sp. 1 (tuberculate)	U
Montipora sp. 2 (papillate)	U
Montipora tuberculosa (Lamarck)	C
Montipora verrilli Vaughan	A
Montipora verrucosa (Lamarck)	C
AGARICIIDAE	
Leptoseris hawaiiensis Vaughan	U
Leptoseris incrustans (Quelch)	O
Pachyseris speciosa (Dana)	C
Pavona clavus (Dana)	D
Pavona minuta Wells	O
Pavona (Polyastra) obtusata (Quelch)	U
Pavona (Pseudocolumnastraea) pollicata Wells	O
Pavona (Polyastra) sp. 1	O
Pavona (Polyastra) venosa Ehrenberg	U
Pavona varians Verrill	C
ASTROCOENIIDAE	
Stylocoeniella armata (Ehrenberg)	O

CARYOPHYLLIDAE	
Desmophyllum sp. 1	C
Euphyllia glabrescens (Chamisso & Eysenhardt)	O
Plerogyra sinuosa (Dana)	U
Polycyathus verrilli Duncan	U
FAVIIDAE	
Cyphastrea sp. 1	R
Echinopora lamellosa (Esper)	O
Favia favus (Forskaal)	U
Favia pallida (Dana)	O
Favia speciosa (Dana)	O
Favia stelligera (Dana)	A
Favites flexuosa (Dana)	O
Favites virens (Dana)	U
Goniastrea parvistella (Dana)	O
Goniastrea pectinata (Ehrenberg)	O
Goniastrea retiformis (Lamarck)	C
Hydnophora microconos (Lamarck)	O
Hydnophora tenella Quelch	O
Leptastrea purpurea (Dana)	A
Leptastrea transversa (Klunzinger)	O
Leptoria phrygia (Ellis & Solander)	C
Oulophyllia crispa (Lamarck)	O
Platygyra pini (Milne Edwards & Haime)	O
Platygyra rustica (Dana)	D
Plesiastrea sp. 1	U
Plesiastrea versipora (Lamarck)	O
FUNGIIDAE	
Fungia fungites (Linnaeus)	O
Fungia (Pleuractis) paumotuensis (Stutchbory)	U
Fungia (P.) scutaria (Lamarck)	O
HELIOPORIDAE	
Heliopora coerulea (Pallas)	A
MERULINDAE	
Merulina ampliata (Ellis & Solander)	O

MILLEPORIDAE	
Millepora dichotoma Forskaal	C
Millepora exaesa Forskaal	C
Millepora platyphylla Hemprich & Ehrenberg	C
MUSSIDAE	
Acanthastrea echinata (Dana)	U
Acanthastrea sp. 1	U
Lobophyllia corymbosa (Forskaal)	O
Lobophyllia costata (Dana)	O
Lobophyllia hemprichii (Ehrenberg)	U
PECTINIIDAE	
Echinophyllia asper Ellis & Solander	O
Mycedium sp. 1	U
POCILLOPORIDAE	
Pocillopora damicornis (Linnaeus)	O
Pocillopora danae Verrill	O
Pocillopora elegans Dana	U
Pocillopora ligulata Dana	O
Pocillopora meandrina Dana	O
Pocillopora setchelli Hoffmeister	C
Pocillopora verrucosa (Ellis & Solander)	C
Seriatopora hystrix (Dana)	O
Stylophora mordax (Dana)	C
PORITIDAE	
Alveopora verrilliana Dana	O
Goniopora arbuscula Umbgrove	O
Goniopora columna Dana	U
Goniopora sp. 1	U
Goniopora sp. 2	R
Porites andrewsi Vaughan	A
Porites australiensis Vaughan	O
Porites cocosensis Wells	C
Porites lichen Dana	C
Porites lobata Dana	C
Porites lutea Milne Edwards & Haime	D
Porites matthai Wells	C
Porites murrayensis Vaughn	O

Porites sp. 1	U
Porites sp. 2	O
Porites sp. 3	O
Porites (Synaraea) convexa Verrill	C
Porites (Synaraea) hawaiiensis Vaughn	O
Porites (Synaraea) horizontalata Hoffmeister	O
Porites (Synaraea) iwayamaensis Eguchi	C
Porites (Synaraea) monticulosa (Dana)	U
OCULINIDAE	
Acrhelia horrescens (Dana)	R
Galaxea clavus (Dana)	O
Galaxea fascicularis (Linnaeus)	C
SIDERASTERIDAE	
Coscinaraea columna (Dana)	R
STYLASTERIDAE	
Distochopora sp. 1	O
THAMNASTERIIDAE	
Psammocora contigua (Esper)	O
Psammocora (Plesioseris) haimeana Milne Edwards & Haime	O
Psammocora profundacella Gardiner	O
Psammocora (Stephanaria) togianensis Umbgrove	C
TUBIPORIDAE	
Tubipora musica (Linnaeus)	U

TABLE 5 Checklist of marine benthic plants identified from the Nimitz Beach site for the Agat Small Boat Harbor. (A = abundant, C = common, O = occasional, R = rare) (Adapted from Chernin et al., 1977)

CHLOROPHYTA	
Avrainvillea lacerata Gepp	O
Avrainvillea obscura J. Ag.	A
Boergesenia forbesii (Harv.) Feldmann	R
Boodlea composita (Harv.) Brand	C
Caulerpa cupressoides (West) C. Ag.	O
Caulerpa racemosa (Forskaal) J. Ag.	O
Caulerpa sertularioides (Gmel.) Howe	O
Caulerpa taxifolia (Vahl) C. Ag.	C
Caulerpa verticillata J. Ag.	C
Chlorodesmis fastigiata (C. Ag.) Ducker	C
Cladophora sp.	O
Dictyosphaeria cavernosa (Forskaal) Boerg.	R
Dictyosphaeria versluysii Weber van Bosse	O
Halimeda discoidea Decaisne	C
Halimeda gigas Taylor	R
Halimeda incrassata (Ellis) Lamx.	A
Halimeda macroloba Decaisne	C
Halimeda opuntia (L.) Lamx.	A
Halimeda velasquezii Taylor	O
Neomeris annulata Dickie	C
Neomeris vanbosseae Howe	C
Rhizoclonium samoense Setchell	O
Tydemannia expeditionis Weber van Bosse	O
Udotea argentea Zanard	C
Udotea palmetta Decaisne	C
CYANOPHYTA	
Hormothamnion enteromorphoides Bornet & Flahault	O
Microcoleus lyngbyaceus (Kutz.) Crouan	C
Schizothrix calcicola (Ag.) Gomont	A
Schizothrix mexicana Gomont	C

PHAEOPHYTA	
Dictyota bartayresii Lamx.	A
Dictyota friabilis Setchell	O
Lobophora variegata (Lamx.) Womersley	C
Padina jonesii Tsuda	R
Padina tenuis Bory	A
Sargassum polycystum C. Ag.	A
Turbinaria ornata (Turner) J. Ag.	C
RHODOPHYTA	
Acanthophora spicifera (Vahl) Boerg.	R
Acrochaetium sp.	R
Actinotrichia fragilis (Forskaal) Boerg	C
Amansia glomerata C. Ag.	A
Amphiroa foliacea Lamx.	C
Amphiroa fragilissima (L.) Lamx.	C
Asparagopsis taxiformis (Delile) Collins & Harvey	O
Ceramium fimbriatum Setch. & Gard.	O
Ceramium huysmansi Weber van Bosse	O
Ceramium mazatlanense Dawson	C
Ceramium sp.	O
Chondria polyrhiza Collins & Harvey	R
Daspyhila plumarioides	A
Desmia hornemanni Lyngbye	C
Galaxaura fasciculata Kjellman	O
Galaxaura filamentosa Chou	A
Galaxaura oblongata (E. & S.) Lamx.	C
Gelidiella acerosa (Forskaal) Feldm. & Hamel	O
Gelidiopsis intricata (Ag.) Vickers	C
Gracilaria arcuata Zanard	C
Gracilaria edulis (Gmelin) Silva	R
Hydrolithon reinboldii (W. v. Bosse & Foslie) Foslie	C
Hypnea pannosa J. Ag.	O
Jania capillacea Harvey	C
Lithophyllum kotzchyanum (Unger) Foslie	O
Lithophyllum moluccense Foslie	C
Metagoniolitithon graniferum (Harv.) Weber van Bosse	R
Neogoniolithon frutescens (Foslie) Setchell & Mason	C
Polysiphonia sp.	A
Porolithon onkodes Foslie	O
Pterocladia parva Dawson	O
Sporolithon schmidtii (Foslie) Gordon, Masaki & Akioka	O
Tolypiocladia glomerulata (Ag.) Schmitz	O
Corallinaceae sp. 1	C
Corallinaceae sp. 2	O
SEA GRASSES	
Enhalus acoroides (L. F.) Royle	A
Halophila minor (Zool.) Hartog	C

The project area is essentially rural and probably will not become heavily urbanized due to its distance from the commercial sections of the island. Without the project, no significant new environmental stresses are anticipated and, therefore, the floral and faunal composition of the area probably will continue at current levels for the foreseeable future.

With the Project
Construction of Plan 5 will result in the destruction of invertebrate populations and marine plants within the project area. A total of approximately 14.4 acres would be destroyed by the plan. Additional invertebrates will be destroyed by construction caused turbidity near the project area.

Most of the fish populations in the project area would not be directly destroyed, but would be displaced. They may or may not find unoccupied suitable habitat. It is probable that many of the small cryptic fishes like blennies and gobies would be killed by the construction process.

Once construction activities have been completed, recolonization will begin. The species composition of the population of benthic organisms will probably change due to changes in substrate and water circulation resulting from the project construction. If water quality is maintained, the entrance channel will probably be colonized by corals and may eventually have a diverse coral growth similar to the Nimitz channel. However, such colonization by coral, if it occurs, will be a very slow process and may result in a fish fauna vastly different from that which now exists on this portion of the shallow reef flat.

Wildlife Resources

Without the Project
Within the project area, the shore and intertidal area provides some feeding habitat for various bird species. The dominant terrestrial bird was the Eurasian tree sparrow (Passer montanus). Other birds seen in the area were the golden plover (Pluvialis dominica), wandering tattler (Heteroscelus incanus) and black drongo (Dicrurus macrocercus). Other birds doubtlessly use the area, however, it is not believed to be a location of high use for any species. No endangered or threatened species were seen in the project area during our survey, and it is unlikely that they use the area.

The vegetation between the road and beach is primarily mowed grass (Cyrodon sp.), and there is a strip of beach morning glory (Ipomea pes-caprae) 5-10 feet wide, 10-20 feet above the beach line defined by the sand-grass interface (Stone, 1970). A row of palm trees (Cocos nucifera) has been planted parallel to the shore about 20 feet above the grass-sand line (Stone, 1970). The trees are small, from 2 to 7 feet high, planted at

intervals of 15 to 40 feet. There are also several mature palms at irregular intervals along the shore.

With the Project
The construction activity will prevent the birds from using those areas in which work is actively occurring. However, such displacement should be of minimal significance in view of the small population being affected.

The vegetation in the immediate construction area will be destroyed. However due to the ype of vegetation involved, this will not adversely affect the bird population, nor is it of significance to the overall populations of affected plants.

Immediately after completion of construction, food organisms for the shore and wading birds will be virtually non-existent. Until intertidal organisms recolonize and populations increase, food in this area will be drastically reduced. The Service does not believe this reduction will have a significant effect on the affected bird populations.

Discussion/Recommendations

The Service is primarily concerned wth three probable impacts which apply to this plan. These are the impacts on: 1) recreational use of the fish and wildlife resources at Nimitz Beach and Nimitz channel; 2) the reduction of shallow reef flat habitat with its associated fauna; and, 3) water circulation and quality in the harbor and vicinity, including the Nimitz Beach/Nimitz channel area.

The Nimitz Beach/Nimitz channel area is used heavily by the residents of Guam for recreational and subsistence fishing, shell collecting, snorkeling, and SCUBA diving. A random count on March 2, 1980 (Saturday) showed 32 cars in the parking lot. It is probable that use of the Nimitz channel as the harbor entrance would have a serious adverse effect on this use. The Service recommends, therefore, that this aspect of the plan be dropped from further consideration, and that Plan 2 be reinstated and made the selected plan (Figure 5 & 6), without the extensive parking area.

Both Plan 5 and the original Plan 2 contain parking space for both cars and car/trailers on fill land. The Service objects to this feature since the parking of automobiles is not a water-dependent activity and filling for that purpose unneccesarily destroys reef flat habitat. Most importantly, parking space is available at Nimitz Beach Park and on unoccupied land across Route 2. This latter location is reportedly owned by the Government of Guam and could be developed as a parking lot. We would not object to 3-5 car/trailer spaces at the launch ramps to be used by those waiting to launch or recover boats. Vehicle access to the berthing areas also is acceptable to facilitate loading and unloading supplies and equipment.

Additionally, we recommend the following standard procedures be required of the construction agency:

1. Extreme care will be taken to insure that no debris, petroleum products, or other deleterious material be allowed to flow, fall, leach, or otherwise enter the water.

2. Water quality standards will be maintained in accordance with Federal and Territorial water quality regulations.

3. All construction activities within and adjacent to the water be conducted so as to minimize turbidity and control erosion.

4. If a bucket dredge is used, there shall be no stockpiling of materials in the water to obtain full buckets.

We appreciate this opportunity to comment.

Sincerely yours,

William B. Lennan II

William B. Lennan II
Acting Deputy Project Leader
for Environmental Services

Enclosures

cc: OEC, Washington, D.C. (2)
ARD-E, Portland (2)
Public Affairs Office, Portland
ES Field Offices, Region 1
Boise
Olympia
Sacramento
Laguna-Niguel
EPA, San Francisco and Guam
National Marine Fisheries, HI
Guam Aquatic and Wildlife Resources
Guam Board of Planning

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AGAT SMALL BOAT HARBOR

AGAT, TERRITORY OF GUAM

ENGINEERING INVESTIGATIONS AND DESIGN ANALYSIS

APPENDIX E

APPENDIX E

ENGINEERING INVESTIGATIONS AND DESIGN ANALYSIS

TABLE OF CONTENTS

APPENDIX E

SECTION I. DESIGN ANALYSIS

Table of Contents

List of Figures

List of Tables

I. DESIGN ANALYSIS

GENERAL

1. A navigation project design analysis requires the determination of the following elements:

   a. Design Vessel

      (1) Dimensions

      (2) Maneuverability

      (3) Channel frequency of use

   b. Weather and Hydraulic Conditions

      (1) Wind

      (2) Waves

      (3) Currents

      (4) Tides

      (5) Littoral Processes

The harbor structures were designed for stability under severe storm conditions since the requirement for structural integrity should not be compromised. Navigation features, however, were designed for usability under all but storm conditions since vessels would not leave the harbor during weather conditions which cause unsafe navigation at sea.

WATER LEVELS

2. Minimum water levels were used to determine the entrance channel design. Maximum water levels were computed for design of the harbor protective structures. All of the structures would be constructed on the reef flat, therefore design wave height calculations were based on controlling depth criteria or diffraction analysis. The maximum stillwater level includes the astronomical tide, atmospheric pressure reduction due to tropical typhoons, storm surge due to wind stress, and wave setup on the reef flat. The parameters for calculating the resultant maximum stillwater level are based on Typhoon Pamela (May 1976), one of the most destructive typhoons to hit Guam in recent times:

Maximum sustained wind speed = 120 knots

Minimum sea level pressure = 930 mb

Pressure reduction from normal = 83 mb = 2.77 inches of mercury

Radius of maximum winds = 20 nautical miles

Radial distance from storm center to site at closest point of approach = 0 (assume 1 nautical mile)

The computed rise in water level due to atmospheric pressure reduction is 3.1 feet, the storm surge is 1.2 feet, and the estimated wave setup is 0.5 feet. Based on the mean higher high water tide of +2.4 feet, the maximum still water level is +7.2 feet MLLW.

WAVE CLIMATE AND REFRACTION ANALYSIS.

3. The study area is sheltered by the island mass from the prevailing easterly waves. The geometric exposure to deep water waves, assuming a straight line approach, is from approximately south-southwest clockwise to north-northwest. However, refraction and diffraction of approaching waves is estimated to increase the wave exposure to between due south clockwise to due north. Figure E-1 depicts the exposure to deepwater waves. Hindcasts of tropical storms and typhoons in the Western North Pacific during the period 1975-1979 were performed and the number of hours of wave activity affecting Guam within given wave height, direction, and period classes were cummulated. Yearly statistics were developed by dividing by the number of hours in the year and converting to percent. This data indicates a greater incidence of waves approaching from the exposed sector than indicated by data contained in the Summary of Synoptic Meteorological Observations (SSMO) prepared by the National Climatic Center. The SSMO data, obtained through direct synoptic observation by shipboard personnel, represents average local wind wave conditions (sea), while the hindcasted storm wave data represents storm generated waves (swell). Table E-1 summarizes the annual percent of occurrence of deepwater wave height versus direction and Table E-2 summarizes the annual percent of occurrence of wave period versus direction for the project site. The data represents only the percent of occurrence for the directions south clockwise to north, but does not preclude the percentage of time when deepwater waves approach Guam from other directions. Simultaneous occurrence of local wind waves from the easterly direction and storm generated swell from the westerly directions is probable.

TABLE E-1

ANNUAL PERCENT OF OCCURRENCE OF WAVE HEIGHTS[1/]
VERSUS DIRECTION

WAVE HEIGHT (FT)	WAVE DIRECTION (FROM WHICH WAVES APPROACH) S		SW		W		NW		N		TOTAL
	SEA[2/]	SWELL[3/]	SEA	SWELL	SEA	SWELL	SEA	SWELL	SEA	SWELL	
0-2	2.0	0.1	1.8	0.3	1.9	6.5	1.2	9.4	2.9	2.7	28.8
2-4	1.5	0	2.1	0	0.9	3.1	0.5	4.1	2.1	1.5	15.8
4-6	0.8	0	0.8	0	0.5	2.2	0.3	3.3	1.5	2.1	11.5
6-8	0.7	0	0.9	0	0.5	1.7	0.1	2.3	0.9	1.1	8.2
8-10	0.1	0	0	0	0	1.5	0	1.7	0.1	0.8	4.2
10-12	0	0	0.1	0	0.2	1.8	0	1.7	0.1	0.4	4.3
12-14	0.1	0	0.1	0	0.1	0.4	0	0.7	0.1	0.5	2.0
14-16	0	0	0	0	0	0.9	0	0	0	0	0.9
16	0	0.5	0	0	0	0.3	0	0.3	0	0	1.1
TOTAL	5.2	0.6	5.8	0.3	4.1	18.4	2.1	23.5	7.7	9.1	
	5.8		6.1		22.5		25.6		16.8		76.8

1/ The sea and swell are assumed to be mutually exclusive. This is conservative, as there will be some joint occurrence.

2/ Data Source: Summary of Synoptic Meteorological Observations (SSMO), Hawaii and selected North Pacific island coastal marine areas, Volume 5, Area 15, prepared by the National Climatic Center.

3/ Data Source: Hindcasts of tropical storms and typhoons in the Western North Pacific, 1975-1979, based on data obtained from Annual Typhoon Reports published by US Fleet Weather Central.

TABLE E-2

ANNUAL PERCENT OF OCCURRENCE OF STORM WAVE PERIOD VERSUS DIRECTION[1/]

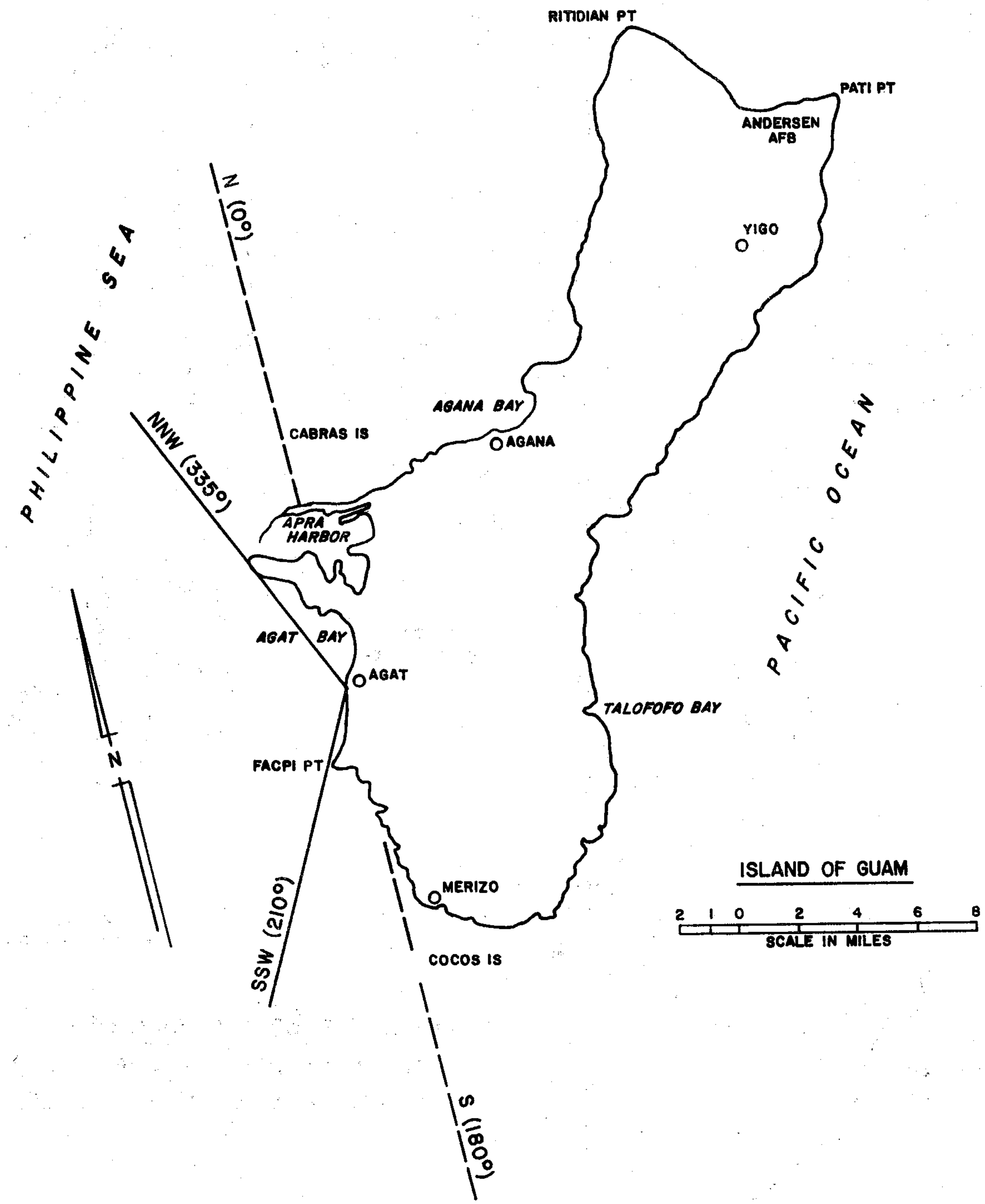
WAVE PERIOD (Sec)	WAVE DIRECTION (FROM WHICH WAVES APPROACH) S	SW	W	NW	N	TOTAL
0-6	0	0.3	11.4	18.0	6.9	36.6
6-8	0	0	3.1	4.5	1.6	9.2
8-10	0	0	1.8	4.0	2.1	7.9
10-12	0	0	2.4	3.8	2.1	8.3
12-14	0	0	4.0	5.2	1.8	11.0
14-16	0	0	2.4	2.9	1.4	6.7
16-18	0	0	1.1	1.8	0.8	3.7
18	0	0.2	2.4	2.3	0.8	5.7
TOTAL	0	0.5	28.6	42.4	17.6	89.1

1/ Data Source: Hindcasts of tropical storms and typhoons in the Western North Pacific, 1975-1979, based on data obtained from Annual Typhoon Reports published by the US Fleet Weather Central.

4. Computer assisted wave refraction analysis was performed to define the characteristics of the waves which affect the site. Limited bathymetry data restricts refraction analysis to water depths less than 60 feet. Wave approach from the southwest, west, and northwest is assumed to reasonably represent incident wave direction at the 60 foot contour. Based on the wave climate data, the analysis was performed for the following wave parameters:

Deepwater Wave Direction	Wave Period (sec)
270^0 (west)	5, 9, 15, 18
315^0 (northwest)	5, 9, 15, 18

Analysis was not performed for the southwest direction of wave approach as the data shows that the southerly directions represent a relatively small percentage of waves and generally of small amplitude. Computer plots of the analysis are shown in Figs. E-2 to E-9. The analysis indicates that the

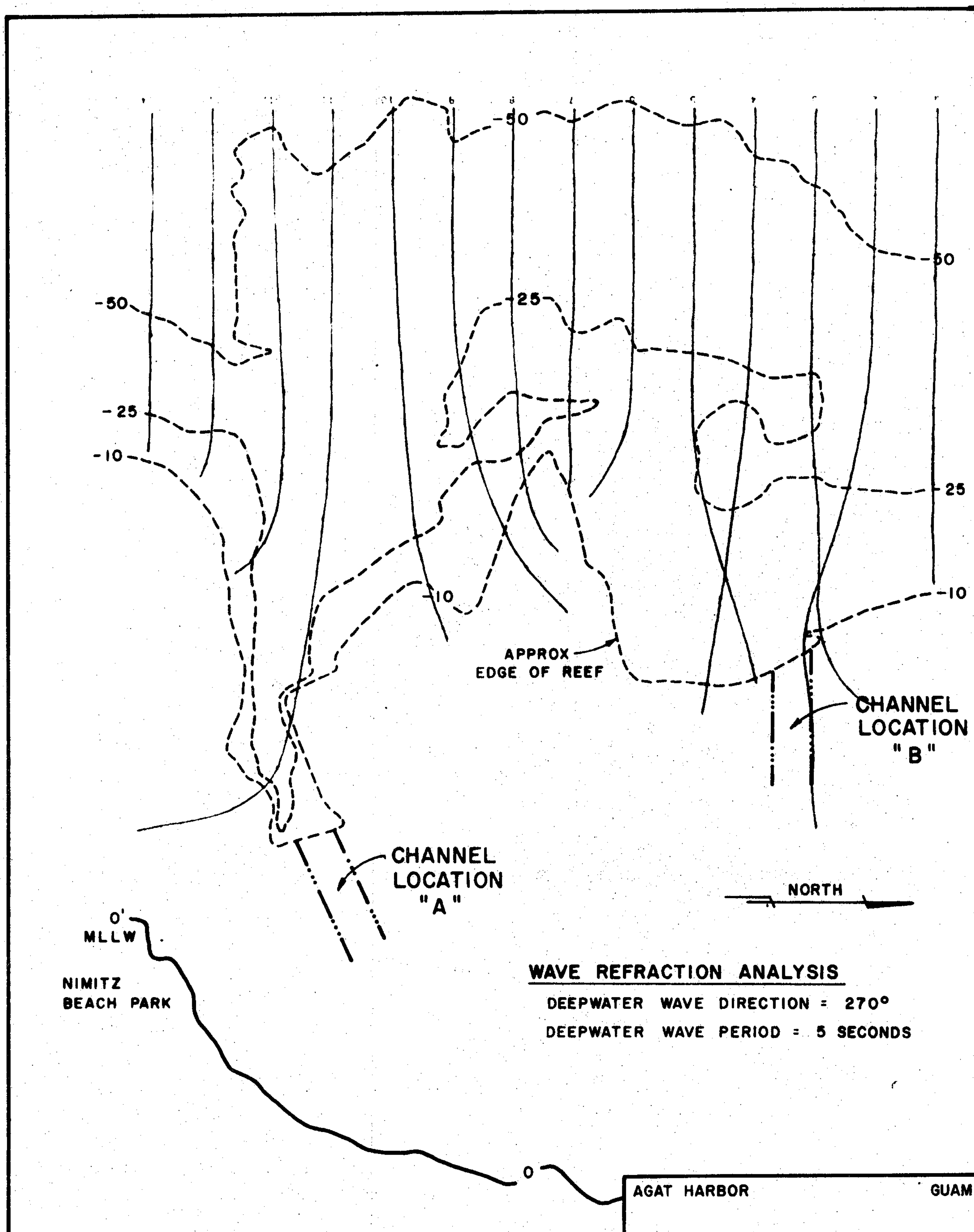


AGAT HARBOR GUAM

DEEPWATER WAVE EXPOSURE

U.S. ARMY ENGINEER DISTRICT, HONOLULU

FIGURE E-1



AGAT HARBOR GUAM

REFRACTION DIAGRAM

U.S. ARMY ENGINEER DISTRICT, HONOLULU

FIGURE E-2

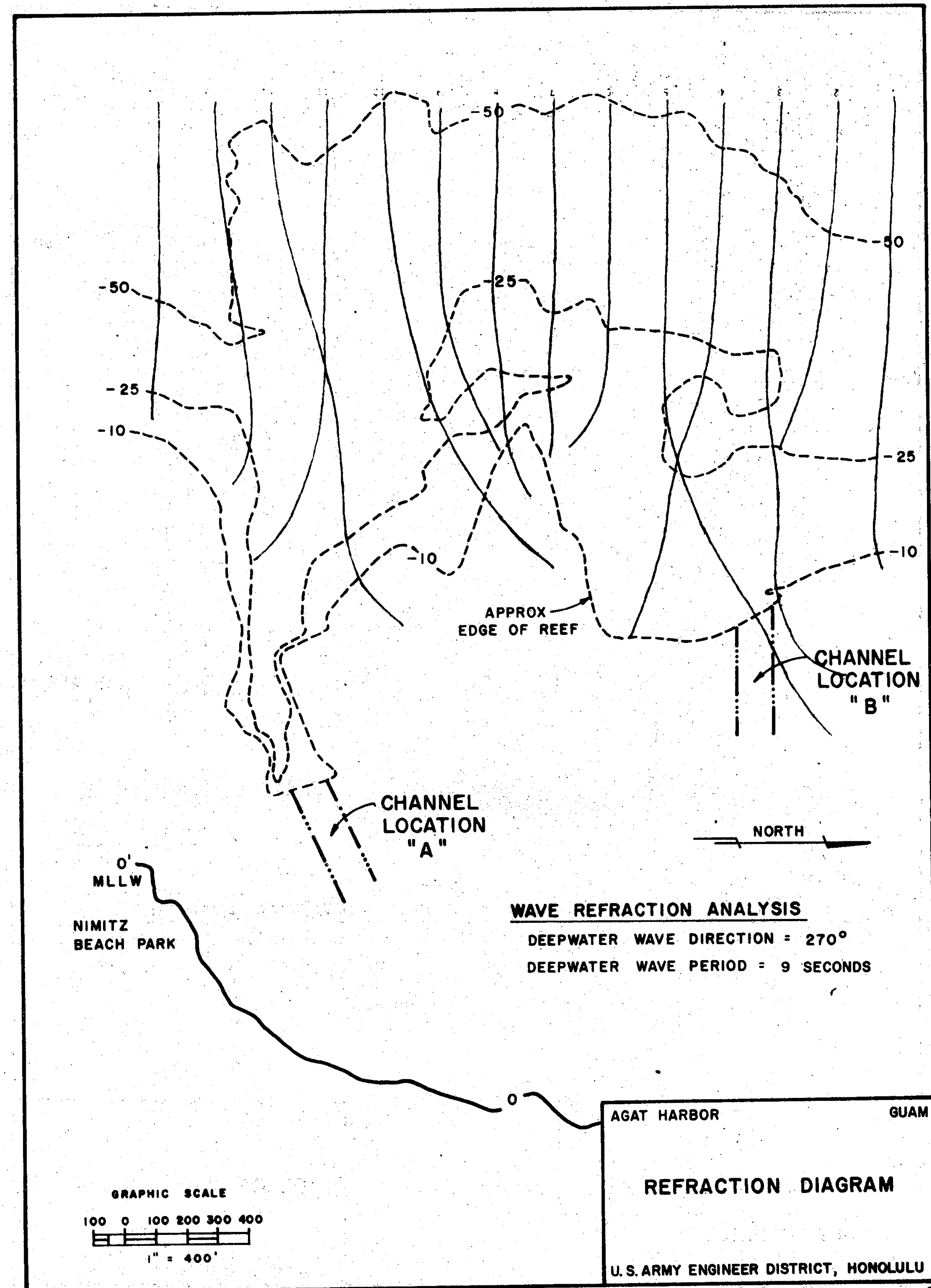
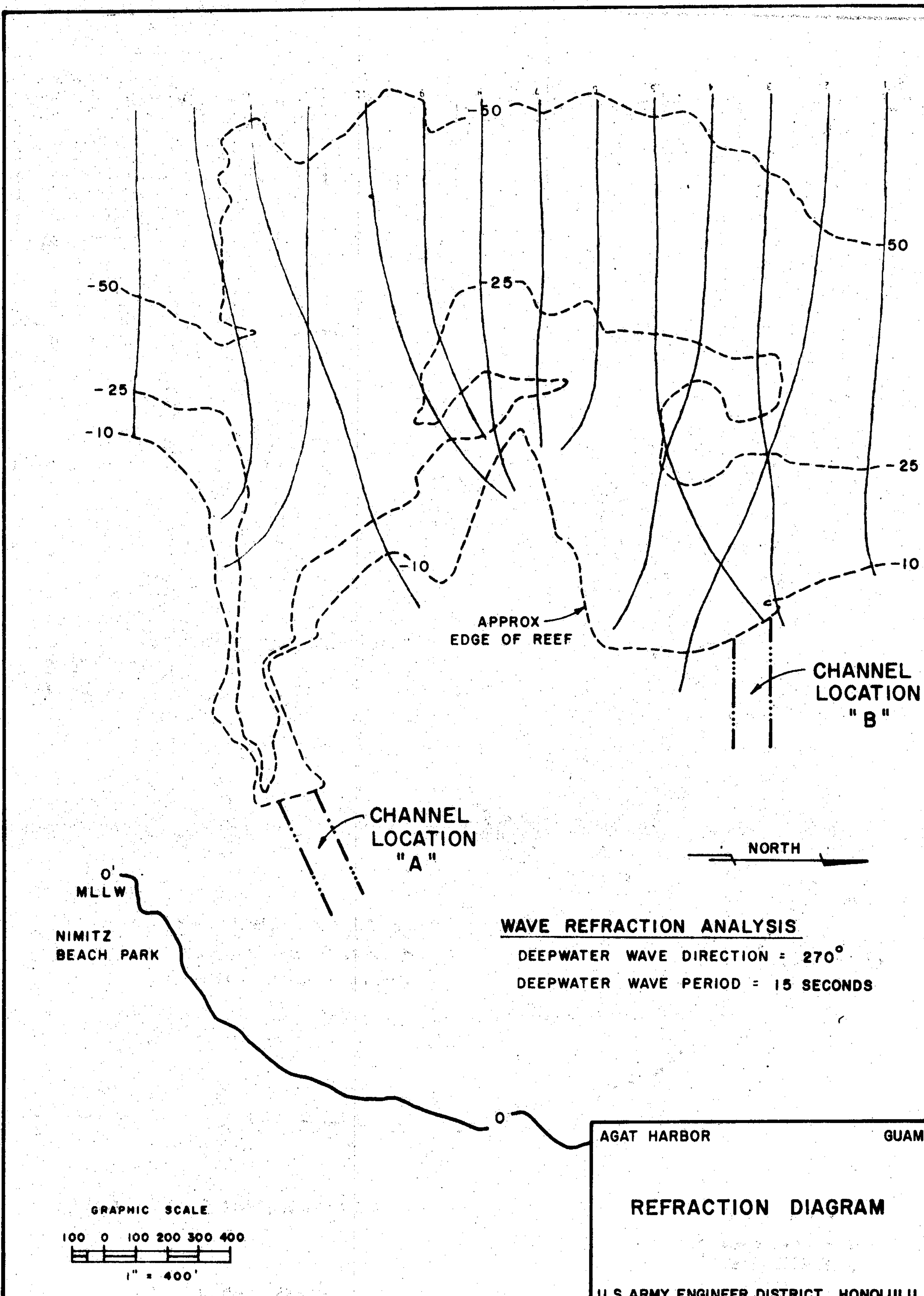

-50
-50
-50
-25
-25
-25
-10
-10
-10
APPROX
EDGE OF REEF
CHANNEL
LOCATION
"B"
CHANNEL
LOCATION
"A"
NORTH
0'
MLLW
NIMITZ
BEACH PARK
0
WAVE REFRACTION ANALYSIS
DEEPWATER WAVE DIRECTION = 270°
DEEPWATER WAVE PERIOD = 9 SECONDS
GRAPHIC SCALE
100 0 100 200 300 400
1" = 400'
AGAT HARBOR
GUAM
REFRACTION DIAGRAM
U. S. ARMY ENGINEER DISTRICT, HONOLULU

FIGURE E-3

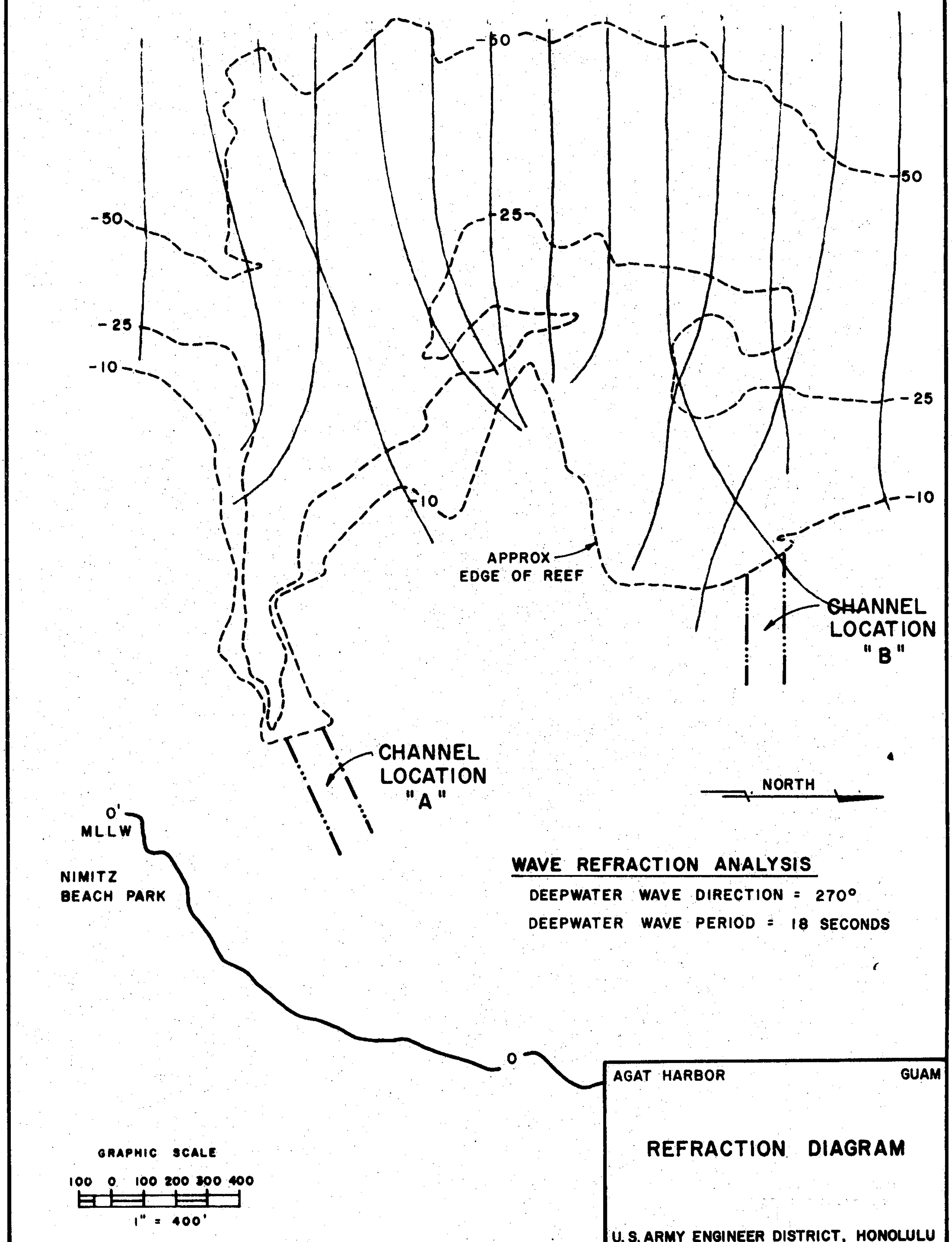


AGAT HARBOR GUAM

REFRACTION DIAGRAM

U.S. ARMY ENGINEER DISTRICT, HONOLULU

FIGURE E-4



WAVE REFRACTION ANALYSIS

DEEPWATER WAVE DIRECTION = 270°

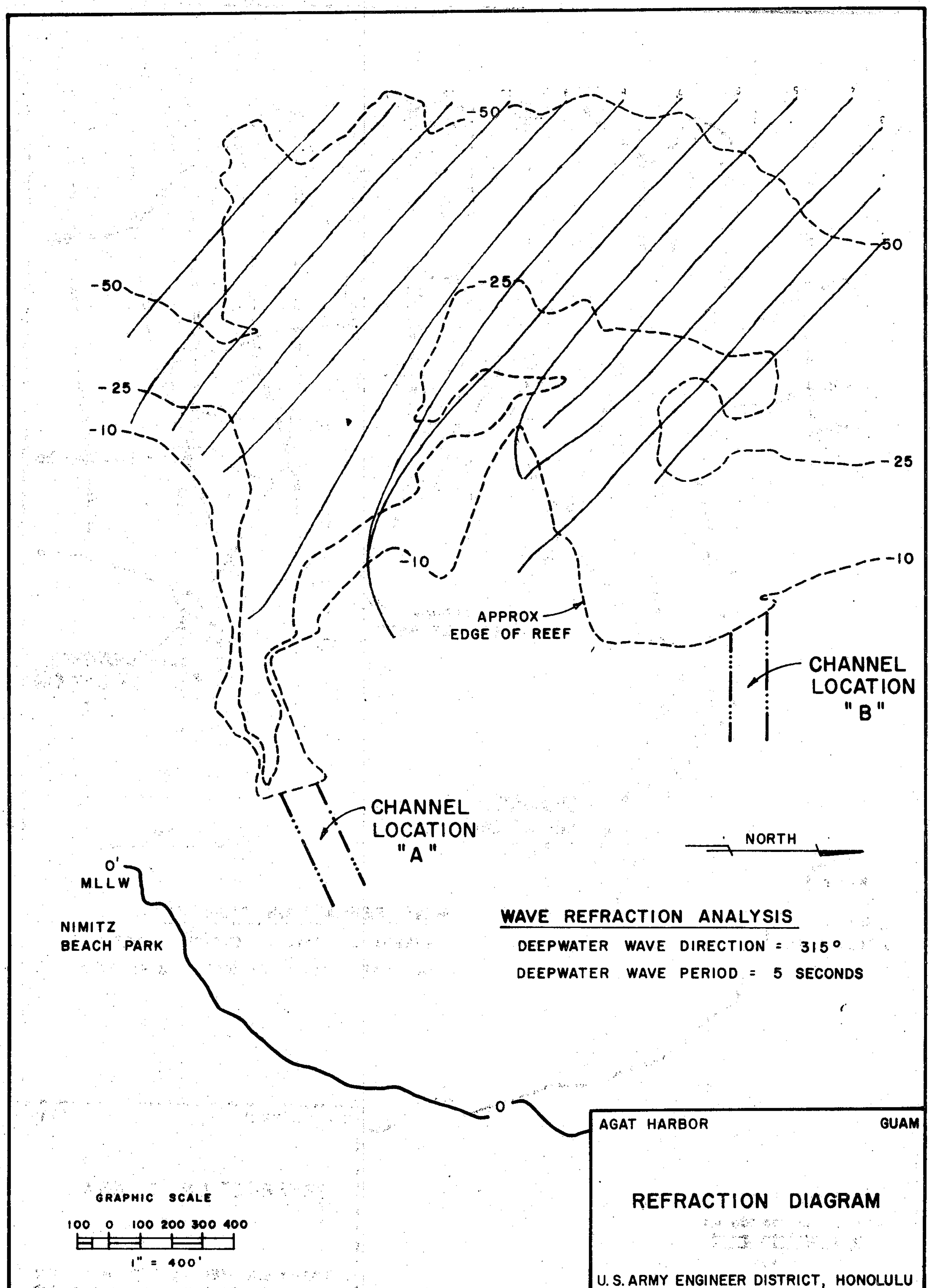
DEEPWATER WAVE PERIOD = 18 SECONDS

AGAT HARBOR	GUAM

REFRACTION DIAGRAM

U.S. ARMY ENGINEER DISTRICT, HONOLULU

FIGURE E-5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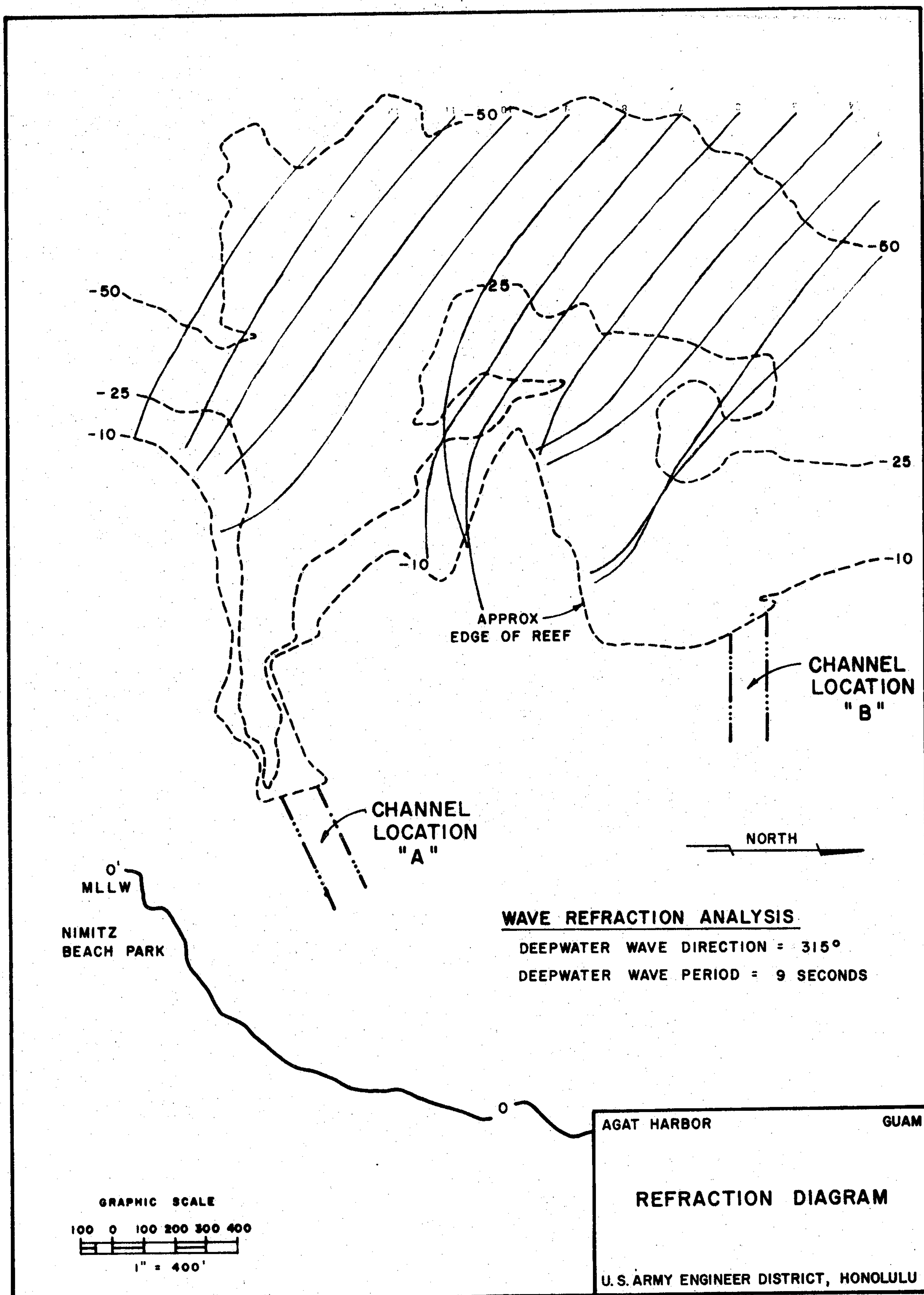
-50
-50
-25
-25
-10
-25
-10
-10
APPROX
EDGE OF REEF
CHANNEL
LOCATION
"B"
CHANNEL
LOCATION
"A"
NORTH
0'
MLLW
NIMITZ
BEACH PARK
WAVE REFRACTION ANALYSIS
DEEPWATER WAVE DIRECTION = 315°
DEEPWATER WAVE PERIOD = 5 SECONDS
0
GRAPHIC SCALE
100 0 100 200 300 400
1" = 400'
AGAT HARBOR
GUAM
REFRACTION DIAGRAM
U.S. ARMY ENGINEER DISTRICT, HONOLULU

FIGURE E-6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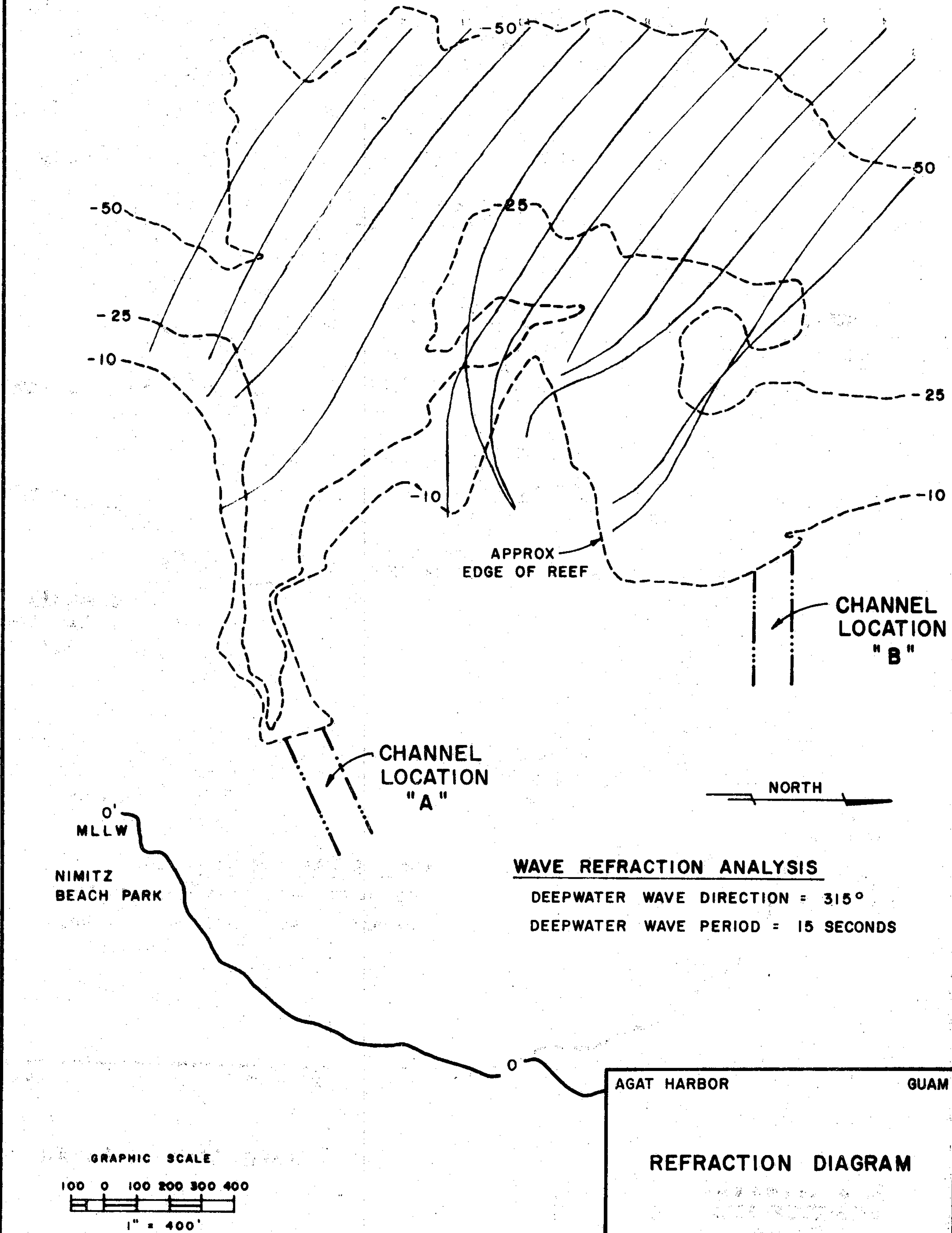
-50
-50
-25
-25
-25
-10
-10
-10
APPROX
EDGE OF REEF
CHANNEL
LOCATION
"B"
CHANNEL
LOCATION
"A"
NORTH
0'
MLLW
NIMITZ
BEACH PARK
0
WAVE REFRACTION ANALYSIS
DEEPWATER WAVE DIRECTION = 315°
DEEPWATER WAVE PERIOD = 9 SECONDS
GRAPHIC SCALE
100 0 100 200 300 400
1" = 400'
AGAT HARBOR
GUAM
REFRACTION DIAGRAM
U.S. ARMY ENGINEER DISTRICT, HONOLULU

FIGURE E-7



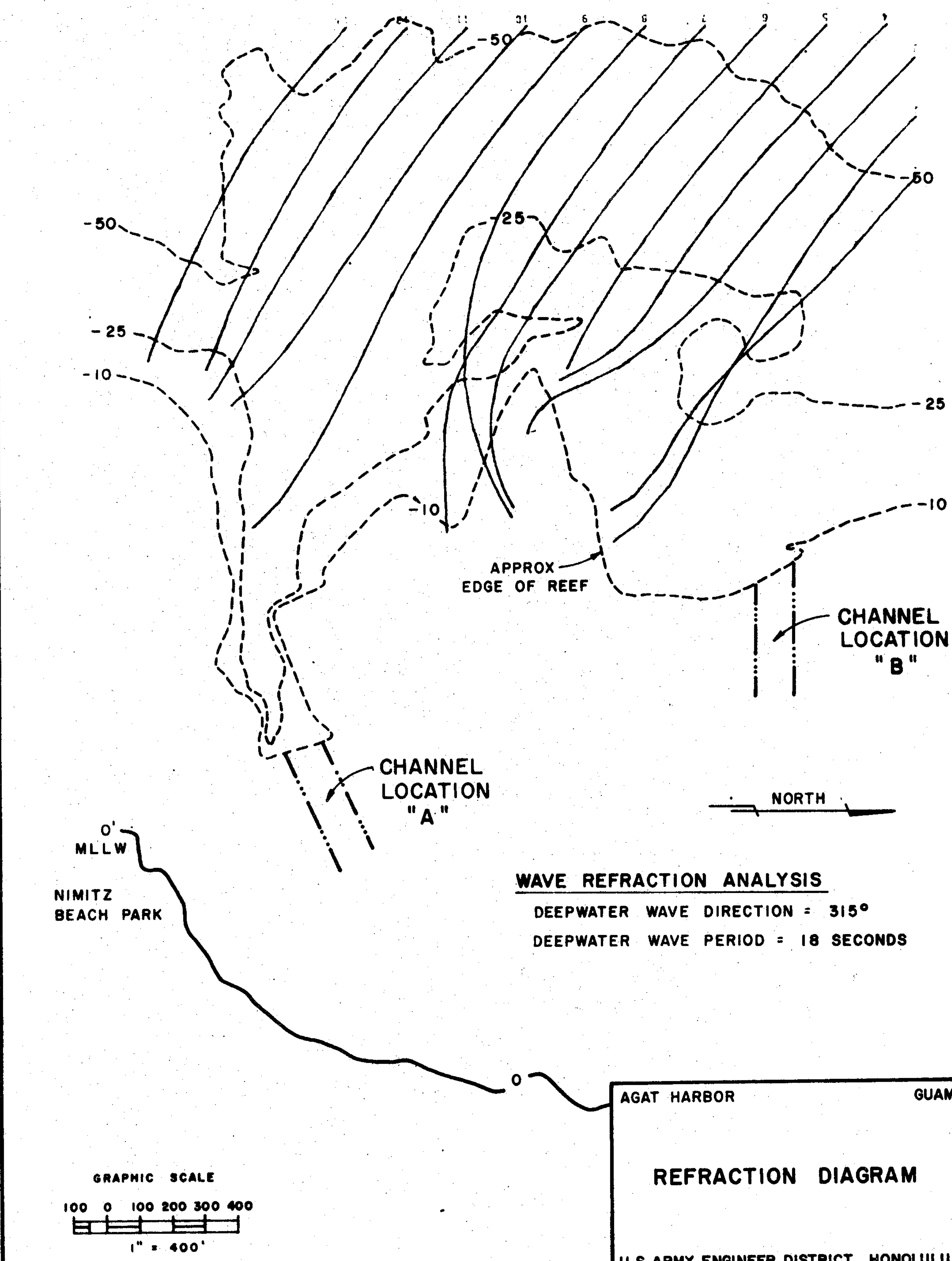
WAVE REFRACTION ANALYSIS

DEEPWATER WAVE DIRECTION = 315°

DEEPWATER WAVE PERIOD = 15 SECONDS

AGAT HARBOR	GUAM
REFRACTION DIAGRAM	
U. S. ARMY ENGINEER DISTRICT, HONOLULU	

FIGURE E-8



WAVE REFRACTION ANALYSIS

DEEPWATER WAVE DIRECTION = 315°

DEEPWATER WAVE PERIOD = 18 SECONDS

AGAT HARBOR	GUAM
REFRACTION DIAGRAM	
U.S. ARMY ENGINEER DISTRICT, HONOLULU	

FIGURE E-9

existing Nimitz Channel (designated channel location A) is a more suitable location for the entrance channel than the area to the north (designated channel location B). The contours offshore of the natural channel causes waves to diverge away from the channel and towards the shallower regions adjacent the channel to the north and south. This phenomenon is not quite so pronounced to the north offshore channel location, where irregular offshore contours cause much confusion of approaching waves. The wave rays represent the direction of propagation of an approaching wave and are drawn perpendicular to the wave front. A wave front physically cannot "cross over" on itself, as the plots seemingly indicate. Convergence of adjacent wave rays results in instability of the wave and breaking. The method of analysis, unfortunately, cannot resolve this type of situation. For practical purposes, we can assume that the wave will peak and break at the first crossing point of adjacent rays as it propagates shoreward. The analysis indicates that waves will shoal in various locations offshore channel location B, depending on the wave period and direction of approach. Limited bathymetry data limits the refraction analysis for channel location B for waves approaching from the northwest. Boats approaching the entrance channel at location B may find navigation difficult due to the irregular bathymetry ($\leq$ 15 feet in some spots) and the confused nature of wave approach.

DESIGN WAVE HEIGHTS

5. Since the structures would be located on the reef flat, the design of the structural elements was based on controlling depth criteria which determines the maximum wave height to which the structure might reasonably be subjected. The design of the interior revetment protection and determination of maximum waves in the berthing basin were based on diffraction analysis.

6. Based on the wave climate data, the highest one percent of waves affecting the site have a deepwater wave height of $\geq$ 16 feet and period of 18 seconds. Based on an offshore slope m = 0.1 to 0.04 seaward of the reef edge, the breaking wave height would be approximately 27 feet, the depth at breaking is between 22 and 42 feet, and the breaker travel distance is approximately 90 feet. Therefore, large incident waves will break completely seaward of the structures since they are located well landward of the reef edge. The maximum wave on the inner reef flat is 6.4 feet based on a controlling depth of 8.2 feet.

7. The reef gap at the mouth of the entrance channel and the protective structure(s) at the harbor entrance provide a double diffractive effect on incident waves propagating up the entrance channel. Based on previous analysis peformed for similar projects and model studies, it is estimated that incident wave heights will be reduced by 50% before reaching the harbor entrance. Based on an entrance channel depth of 15 feet and maximum still water level of 7.2 feet, it is assumed that the maximum wave incident to the channel entrance is a broken and reformed wave of 17 feet. Therefore, the maximum wave at the harbor entrance would be 8.5 feet. Further diffraction around the protective structure(s) at the harbor entrance will reduce wave heights in the inner basin area to less than 2 feet. (See para 24 for a detailed analysis of design wave heights for plan 5.)

CHANNEL AND TURNING BASIN DESIGN

8. The entrance channel, turning basin, and access channel are designed to provide safe navigation of vessels having a length of 60 feet, beam of 15 feet, and draft of 6 feet. These criteria represent the dimensions of a large commercial charter boat which is the largest vessel anticipated to be a regular user of the harbor. The features are designed to provide safe navigation during all but storm conditions. An incident deepwater wave height of 8 feet was chosen for design purposes since vessels would not leave the harbor in > 8-foot sea conditions. Based on the wave climate data, wave heights greater than 8 feet would occur 12.3% of the time in an average year.

9. Entrance Channel Design. The entrance channel width of 120 feet and depth of 14 feet were computed as follows:

Minimum Width = 5 x Design Vessel Beam x 1.5 to allow for navigation thru waves.
= 112.5'
Use: 120' due to consideration of reef platform (This minimum width will permit two-way boat traffic)

Minimum Depth:	Draft	6'
	Clearance	3'
	Squat	1'
	Wave Allowance	4'
	Total	14'
	Use:	14'

10. Turning Basin Design. The basin length and width of 150 feet and depth of 11 feet to permit sufficient maneuverability of the design vessel were computed as follows:

Minimum Length & Width = 2.5 x Design Vessel Length
= 150'
Use: 150'

Minimum Depth:	Draft	6'
	Clearance	2.5'
	Wave Allowance	2'
	Squat	0.5
	Total	11'
	Use:	11'

11. Access Channel Design. The access channel width of 75 feet and depth of 9 feet to provide access to the berthing areas were computed as follows:

Minimum Width	=	5 x Design Vessel Beam	
	=	75'	
Use:		75'	
Minimum Depth:	Draft		6'
	Clearance		2'
	Wave Allowance		1'
		Total	9'
		Use:	9'

12. Channel Alignment. The orientation of the shoreline allows the entrance channel to be aligned with the predominant direction of wind approach. Hence, boats navigating the channel will be subject to head or tailwinds and quartering winds which are much favorable than beam winds. The larger the surface area exposed to the winds, the greater the force exerted on the boat and the more difficult to maintain a given heading. The entrance channel located at the existing Nimitz channel (location A) is more favorable than that located further to the north (location B) with respect to wave approach. As discussed previously, boats approaching the entrance channel at location B may find navigation difficult due to the confused nature of wave approach. In addition, the deep waters of the existing channel will reduce the problem of sudden shoaling at the channel entrance through the reef flat, as may exist at channel location B.

PROTECTIVE STRUCTURES DESIGN

13. Stability Requirements. The Coastal Engineering Research Center's (CERC) Shore Protection Manual (SPM) design formulas were used to determine the weight of the stones and the thickness of the stone layers required for stability. The following factors were used in the armor layer design computations:

Unit weight of stone:	W_r = 145 pcf
Design wave height:	H_b = 6.4 feet
Stability coeffficient:	K_D = 3.5 structure trunk
	= 2.5 structure head
Specific gravity of armor unit relative to seawater:	S_r = 2.27
Cotangent of structure slope:	$\cot \theta = 2$
Layer coefficient:	k = 1.15 for n = 2
Layer thickness:	n = 2
Armor stone size:	$= \dfrac{W_r \, H_b^3}{K_D(S_r - 1)^3 \cot \theta}$
	= 2650 lbs. structure trunk
	3710 lbs. structure head

An acceptable range of armor stone size is $\pm$ 25% of the calculated weight.

$$\text{Armor layer thickness} = nk \left(\frac{W}{W_r}\right)^{1/3}$$

$$= 6.3' \text{ structure trunk}$$
$$7.0' \text{ structure head}$$

14. The underlayer stone size is based on one tenth the weight of the armor stone and the underlayer thickness was calculated using the above formula. The bedding layer is based on one-twentieth the weight of the underlayer stone and the bedding layer thickness is a minimum of 1.5 feet. Table E-3 summarizes the stone weight and layer thickness required for stability.

TABLE E-3 - STONE WEIGHT AND LAYER THICKNESS

	Stone Weight (pounds)	Layer Thickness (feet)
Armor		
Structure trunk	2,000 - 4,000	6.3
Structure head	3,000 - 5,000	7.0
Underlayer		
Structure trunk	200 - 400	3.0
Structure head	300 - 500	3.2
Bedding Layer	1 - 20	1.5

15. The crest width was calculated using the same formula for determining armor layer thickness. For a 3-stone crest width, n = 3 and k = 1.10:

$$\text{Crest width} = nk \left(\frac{W}{W_r}\right)^{1/3}$$

$$= 9.0' \text{ structure trunk}$$
$$= 10.0' \text{ structure head}$$

16. Stone size requirements for the interior revetment and revetted mole accessway are based on the following factors:

Unit weight of stone:	W_r = 145 pcf
Design wave height:	H = 2 feet
Stability coefficient:	K_D = 3.5
Specific gravity of stone relative to Seawater:	S_r = 2.27
Cotangent of structure slope:	$\cot \theta = 2$
Interior revetment stone size:	$= \dfrac{W_r H^3}{K_D (S_r-1)^3 \cot \theta}$
	= 81 lbs.

An acceptable range of stones is ± 25% of the calculated weight or 60 to 100 lbs. A range of 60 to 200 lbs will be specified to permit more flexibility in the construction. The 2-stone layer thickness for the revetment is 2.2 feet and will be underlain by a 1.5 foot-thick bedding layer of 1 to 20 lb stones. (See para 25 for detailed stability requirements for plan 5)

17. Runup and crest elevations. The maximum runup occurs when the incident wave crests approach parallel to the structure. When the wave strikes at an angle to the structure, the effective surface area available for wave energy dissipation is increased, thereby decreasing the wave runup. Therefore, the crest elevations vary from +13.0 feet to +10.0 feet.

18. The runup was based on criteria contained in the SPM and further refined by data contained in CERC's Coastal Engineering Technical Aid (CETA) publications #78-2 and #79-1 and data obtained from model tests conducted for similar structures. Based on a breaking wave height of 6.4 feet, wave period of 8 seconds, stillwater level of +7.2 feet MLLW, and 1V on 2H sideslopes, the runup for a smooth slope (CETA #78-2) was computed at 9.7 feet. The runup was corrected for a rough slope (CETA #79-1) by a factor.

$$r = \frac{R \text{ rough slope}}{R \text{ smooth slope}} = 0.44$$

resulting in a runup of 4.3 feet. The nonovertopping crest elevation would be equal to the runup plus stillwater level or 11.5 feet. Based on model tests conducted for similar structures, with breaking wave height of 6.65 feet and wave period of 8 seconds, a runup to breaker height ratio of 1.2 was indicated. The resultant runup for a breaker height of 6.4 feet would be 7.7 feet and the nonovertopping crest elevation would be 15 feet. In consideration of the above data, the maximum crest elevation was set at +13.0 feet.

19. The crest elevation for the landward structures not exposed to direct wave attack was set at +10.0 feet. The crest elevation for the interior revetment protection and revetted accessway was set at +8.0 feet which is the elevation of the fill area. The crest elevation for the detached breakwater in Plan 1 was set at +9.0 feet and will be constructed entirely of armor stone. The structure will be subject to minor overtopping during severe wave conditions.

LITTORAL PROCESSES

20. Littoral studies and site investigations indicate that littoral processes at the site are typically not dynamic or significant except possibly during storm conditions. Typical wave heights on the broad reef flat are less than 1 foot. Waves break at the seaward reef edge, reform, and lose much of their energy propagating over the shallow reef flat due to dissipative effects. Typical winds are offshore and do not contribute to wave regeneration. The shoreline is relatively stable and vegetated with grass down to the high waterline. Storm wave erosion is evidenced by scarps and undermined coconut trees along a short stretch of shoreline adjacent the culvert approximately 700 feet north of Nimitz Beach Park and along the northern park shoreline. Analysis of sand samples indicate a net southerly littoral transport along the project shoreline, based on predominantly greater percentage of non-calcareous material in samples collected south of storm drains compared to samples collected north of the discharge points. However, there is no evidence of significant volumes of littoral material being transported alongshore. The littoral material is

generally poorly sorted and there is considerable variation in grain-size distribution along the shore. Small intertidal deltas are formed at the culvert discharges consisting of mud, silt, and basalt and coral cobbles. The nearshore reef flat towards Nimitz Beach Park is covered with alluvial mud and silt. The calcareous content of the littoral material increases with distance from culvert discharges. North of the Chaligan River, the material covering the inner reef flat is clean calcareous sand.

21. The currents on the reef flat are typically weak and influenced by the tide and winds. Current speeds measured during a 1.5 foot tide range and 3-8 mph tradewinds were less than 10 centimeters per second (.2 knot). During flood tide, the currents generally move inshore through the existing channel and northerly on the reef flat, against the prevailing wind. During ebb tide, the currents flow approximately downwind and seaward. Apparently, the water mass on the reef flat drains over the reef margin during ebbing tide and is not restricted to passage through the deeper channels. In the existing channel, the surface waters moved seaward during the ebbing tide while the subsurface waters (deeper than 15 feet) were stationary. Figure E-10 depicts the circulation pattern on the reef flat.

22. A harbor facility constructed on the reef flat is anticipated to have little impact on the existing littoral environment and hence, will not induce significant shoreline changes. Net littoral transport is in the southerly direction towards Nimitz Beach Park, however, the material transported is primarily alluvial mud and silt which is easily moved by the typically small waves. Impact on circulation on the reef flat will be minor since the currents are not unidirectional and are influenced by the tides and winds. However, due to the relatively low current velocities, consideration should be given to allow sufficient circulation and flushing of the harbor basin. Design of the harbor facility is accomplished to permit maximum utilization of the driving forces to the circulation pattern in providing for adequate flushing. Gaps between structures are provided in lieu of circulation pipes or culverts due to the low current velocities and to encourage wind-driven surface flows.

23. Shoaling in the entrance channel and harbor basin is not anticipated to be a significant problem due to the typically nonsignificant nature of the littoral processes at the site. Due to the orientation of the harbor and channel, shoaling will occur primarily by transport of materials by currents on the reef flat. Typical currents are too weak to initiate sediment movement. Assuming that sediment transport occurs primarily during storms, when setup on the reef flat may generate strong currents, it is estimated that 0.5 cubic yards of material per year is transported per foot of reef flat width.

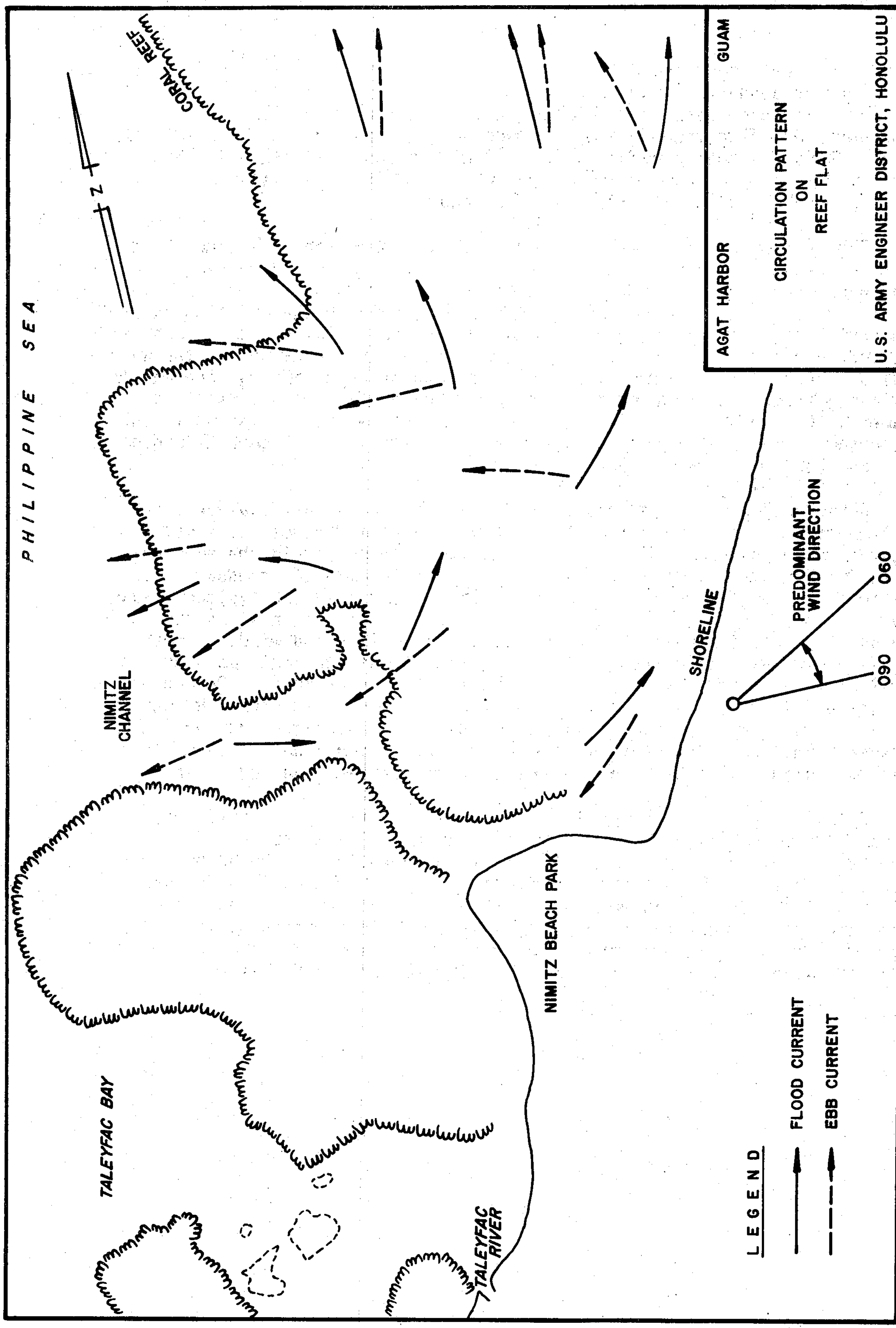


FIGURE E-10

FIGURE E-10

APPENDIX E

SECTION II. DESIGN ANALYSIS OF SELECTED PLAN (PLAN 5)

Table of Contents

List of Figures

List of Tables

II. DESIGN OF ANALYSIS OF SELECTED PLAN (PLAN 5)

DESIGN WAVE HEIGHTS

1. Diffraction analysis was performed to determine the maximum waves in the interior harbor areas. Contours of equal diffraction coefficient are shown in Figure E-11. Since the harbor is open on both the north and south ends, analysis was based on the most probable directions of wave approach resulting in maximum wave heights within the basin. The angle of wave approach is 270° at the harbor entrance and 290° at the north end of the breakwater. Maximum wave height incident to the breakwater on the north end is 6.4 feet based on controlling depth criteria. Maximum wave height incident to the harbor entrance on the south end is 6.8 feet. This is based on a 60% reduction of the maximum wave at the channel entrance, assumed to be 17 feet. Table E-4 gives the theoretical maximum wave heights for various locations in the harbor. Design wave heights for the landside structures are summarized in Table E-5.

PROTECTIVE STRUCTURES

2. Stability requirements for the landside structures are summarized in Table E-6, based on the diffracted design wave heights.

Table E-4. Theoretical Wave Heights

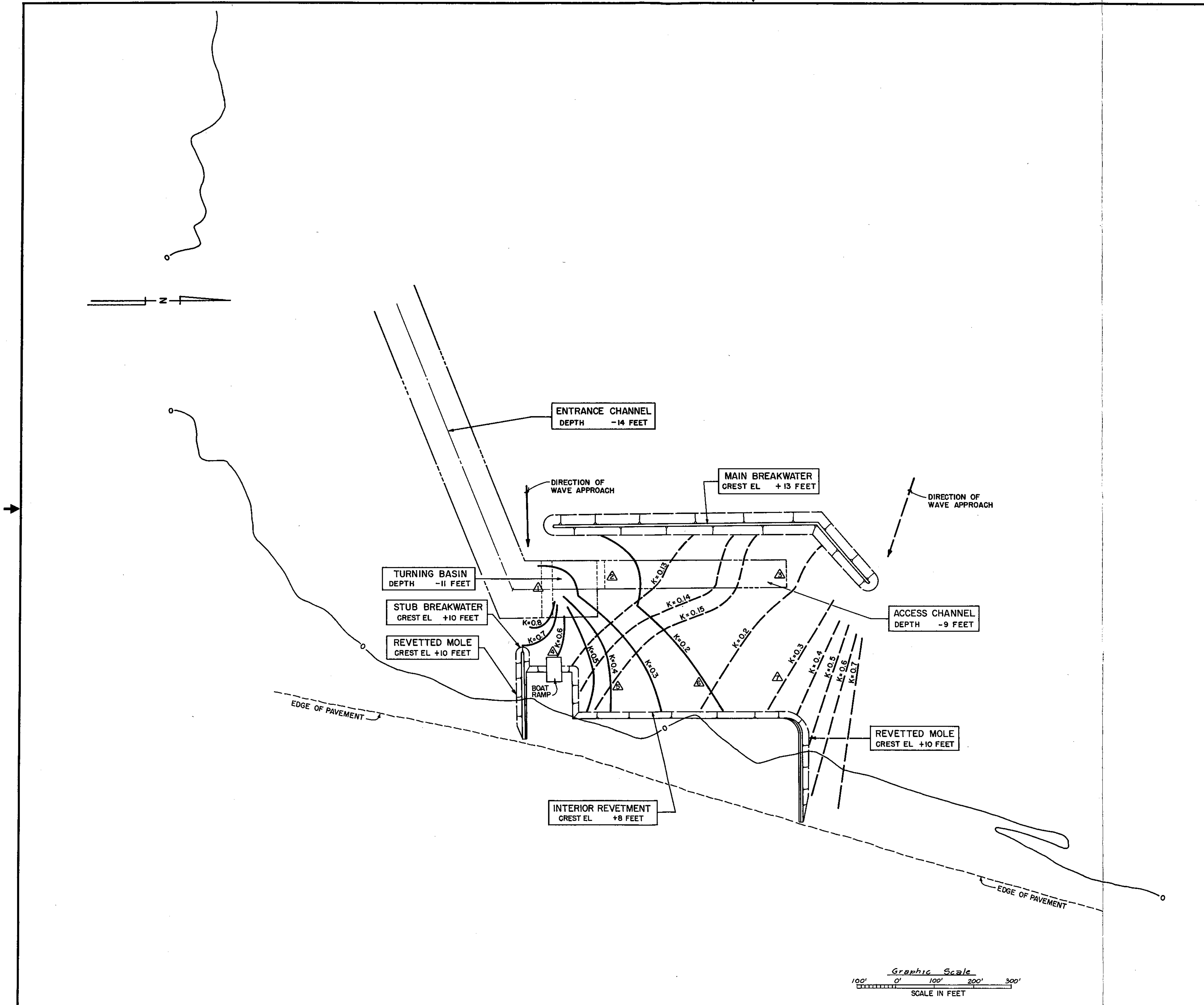
Location	Map Location (see Fig. E-11)	Diffraction Coefficient North1/	Diffraction Coefficient South2/	Wave Hgt (ft) North1/	Wave Hgt (ft) South2/
Entrance to harbor	1	-	1.0	-	6.8
South end access channel	2	-	0.25	-	1.7
North end access channel	3	0.18	-	1.2	-
Boat ramp	4	-	0.6	-	4.1
Southeast corner basin	5	0.15	0.4	1.0	2.7
Center east side of basin	6	0.18	0.2	1.2	1.4
Northeast corner basin	7	0.3	-	1.9	-

1/ Based on most probable direction of work approach for north end of harbor basin resulting in max diffracted wave height.

2/ Based on most probable direction of work approach for south end of harbor basin resulting in max diffracted wave height.

Table E-5. Design Wave Heights for Landside Structures

Structure	Wave Height (ft)
Main Breakwater	6.4
Stub Breakwater	5.0
North Revetted Mole	4.0
South Revetted Mole	5.0
Interior Revetment	
Sta 0+00 to 4+00	2.0
Sta 4+00 to 7+20	3.5
Sta 7+60 to 8+20	4.5



AGAT HARBOR GUAM

WAVE DIFFRACTION DIAGRAM

U.S. ARMY ENGINEER DISTRICT, HONOLULU

FIGURE E-11

Table E-6. Stability Requirements for Landside Structures

Structure	Stone Weight (pounds)			Layer Thickness (Feet)			Crest Width (Feet)
	Armor	Underlayer	Bedding	Armor	Underlayer	Bedding	
Stub Breakwater	1700-3000	-	10-300 (core)	5.8	-	-	8.4
North Revetted Mole	600-1000	50-100	1-10	4.1	2.0	1.5	5.9
South Revetted Mole	1300-2000	100-200	1-10	5.2	2.3	1.5	7.4
Interior Revetment							
Sta 0+00-4+00	60-250	-	1-10	2.2	-	1.5	-
Sta 4+00-7+20	300-600	30-60	1-10	3.4	1.5	1.5	-
Sta 7+60-8+20	700-1200	50-100	1-10	4.3	2.0	1.5	-

BERTHING LAYOUT

3. A possible berthing layout is shown in the main report (Figure 13). This layout will accommodate 150 vessels with the following percentage distribution by length:

Length	# Boats	%
16-25'	118	79
26-39'	26	17
40-60'	6	4
	150	100%

The larger vessels are accommodated nearer the entrance to the harbor where wave heights are less attenuated than within the inner basin area. This arrangement will also reduce conflicts associated with mixed usage of the harbor by keeping the larger commercial charter vessels away from the smaller non-commercial vessels and minimizing congestion by locating the larger vessels nearer the harbor entrance.

BOAT RAMP

4. The boat ramp is provided for adjacent to the turning basin. This configuration will minimize shoreside congestion by isolating the launch area from the general parking ara. The location at the harbor entrance exposes the ramp to larger waves than expected within the inner basin. The maximum wave based on the diffraction analysis is 4.1 feet. However, boats would not put to sea in storm conditions. Based on the 8-foot deepwater wave used for design of the navigation features, the resultant wave height at the ramp would be less than 2 feet. Based on the wave climate data, wave conditions resulting in greater than 2-foot waves at the ramp would occur 12.3% of the time in an average year. Another potential problem may be ship waves from vessels entering and leaving the harbor. Compliance with speed limits and a courteousness on the part of fellow boaters will minimize the problem.

AGAT HARBOR
NIMITZ BEACH

APPENDIX E

SECTION III. GEOLOGY, FOUNDATIONS AND MATERIALS

Table of Contents

List of Figures

List of Tables

III. GEOLOGY, FOUNDATIONS AND MATERIALS

REGIONAL GEOLOGY

1. Guam is one of the largest of several volcanic islands comprising the Marianas chain. The islands are the high points of submarine ridges that are bowed to the east and flanked by deep parallel trenches. The major geologic provinces of Guam can be broadly defined by two groups -- the Northern Limestone Province and the Southern Volcanic Province. The Northern Limestone Province is highly permeable and contains a basal fresh water lens. The Southern Volcanic Province is composed of relatively impermeable weathered volcanic rocks.

2. Guam was formed in Middle Tertiary Period when volcanic activity spewed out lava and pyroclastic materials and formed Mt. Alutum. Intermittent volcanism and rise and fall of sea level formed the remainder of the island and deposited large limestone deposits.

3. Marine coral growths developed in calm waters after the island was formed and encircled the island. Fringing reefs were formed, behind which lagoonal sediments were deposited.

SITE GEOLOGY

4. The proposed harbor is located on reef flats north of the existing Nimitz Beach. Highway 2 parallels the shoreline along the proposed project, passing within 50 to 80 feet of the waters edge. The narrow frontage strip between the oceanside shoulder of Highway 2 and the shoreline is grassed and landscaped with a row of coconut trees.

5. At the shoreline is a narrow beach 20' to 30' wide. The beach consists of medium grain coral sand and gravel with cobbles and boulders scattered randomly along the surface. A few isolated outcroppings of coral limestone (reef remnants or recemented masses by calcification) are present along the shoreline.

6. Several 36-inch diameter storm drains cross Highway 2 and empty into Agat Bay in the vicinity of the project. Erosion is evident at the outlet end of some of the culverts. Across one of the culverts located approximately 600' north of Nimitz Beach, terrigenous brown sandy silt has been deposited in the shape of an alluvial fan. The alluvial fan is roughly semi-circular in shape with a radius of approximately 150 feet. The terrigenous deposit ranges in thickness from 2 to 8 inches. Lesser amounts of terrigenous materials are found along the remainder of the shoreline.

7. The fringing reef flat is approximately 1700' wide at the project site. A well developed inner reef flat composed of a thin veneer of sand, gravel, and coral rubble with scattered boulders and exposed reef rock can be found in the project area. The outer reef flat is reef rock pavement with scattered boulders. Intertidal reef flat is primarily coral rubble and outcrops of intermittent reef rock pavement.

SEISMICITY

8. From a seismic or earthquake risk standpoint, the island of Guam is in an active seismic belt relative to movements on the deep underthrust. One or more of the faults, such as the Adelup, visible on the island have been active within recent times but the amount of displacement has been small. The Guam observatory lists 83 earthquakes since 1902 with magnitudes of 6 or greater on the Richter scale. Because the area is seismically active, it is reasonable to assume that earthquakes of this magnitude or greater will occur again. Government design manual TM 5-809-10, dated April 1973, shows Guam located in seismic probability Zone 3 and recommends that a maximum acceleration of 0.33 g. and a corresponding approximate magnitude of 7 on the Richter scale be used for building design. Engineering Regulation 1110-2-106 recommends that a seismic coefficient of 0.10 be used in pseudostatic seismic stability analyses for dams located in seismic probability Zone 3.

SUBSURFACE INVESTIGATIONS

9. Eleven borings (B-1 to B-11 on Figure E-12) were performed by the Government during August-September 1980 to evaluate stable cut slopes and excavatability of the entrance channel and turning basin and to assess the foundation of the proposed breakwater, mole, and revetted accessway. Logs of the borings are shown on Figure E-13. Borings were advanced by standard penetration sampling, core drilling (4" X 5") and washing.

LABORATORY TESTING

10. Routine laboratory tests were performed on samples obtained during the subsurface investigations to determine characteristics of the in-situ materials and develop soil parameters for design. No Atterberg tests were performed in view of the nonplastic, cohesionless nature of the materials. Core samples of coral limestone and coral limestone breccia were too short or too irregular to perform compression tests. Test results on unconsolidated clastic sediments are shown on Table E-4.

ADOPTED DESIGN PARAMETERS

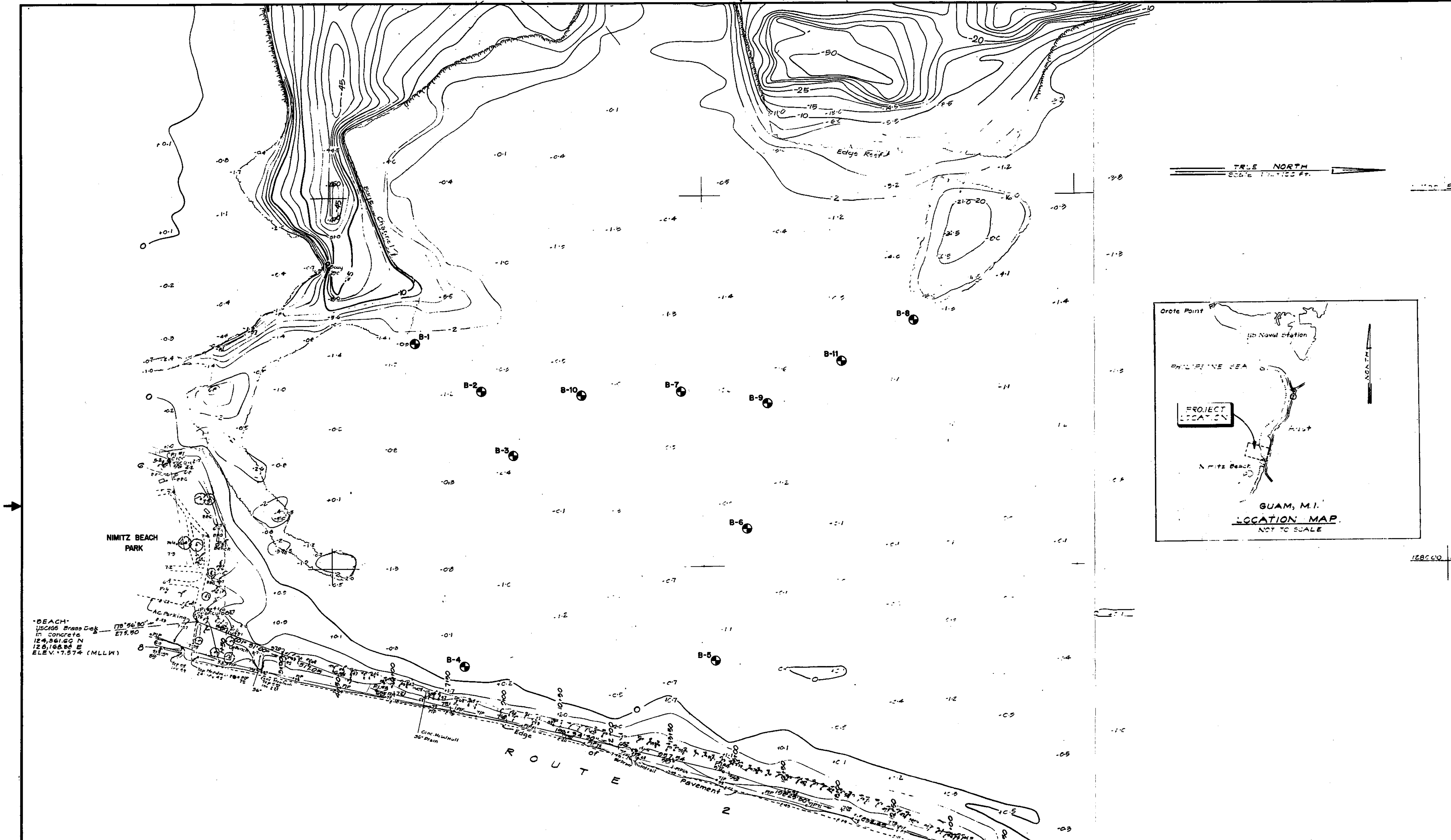
11. Design parameters adopted for this project are as follows:

<u>Stone Revetment (Mass)</u>

Unit weight (saturated) = 126 pcf
Unit weight (moist) = 107 pcf
Angle of internal friction = 42^{o}
Cohesion = 0 psf

<u>Dredged Fill (Compacted)</u>

Unit weight (saturated) = 115 pcf
Unit weight (moist) = 105 pcf
Angle of internal friction = 34^{o}
Cohesion = 0 psf



Notes:
1. Coordinates are referred to GGTN.
2. Elevations are referred to MLLW, the elevation of which is 0.00 feet.
3. All stations are marked with iron pins unless otherwise noted.
4. For boring logs see figure E-14.

LEGEND:

B-6 ⊕ BORING LOCATION AND NUMBER

Graphic Scale

100 0 100 200 300

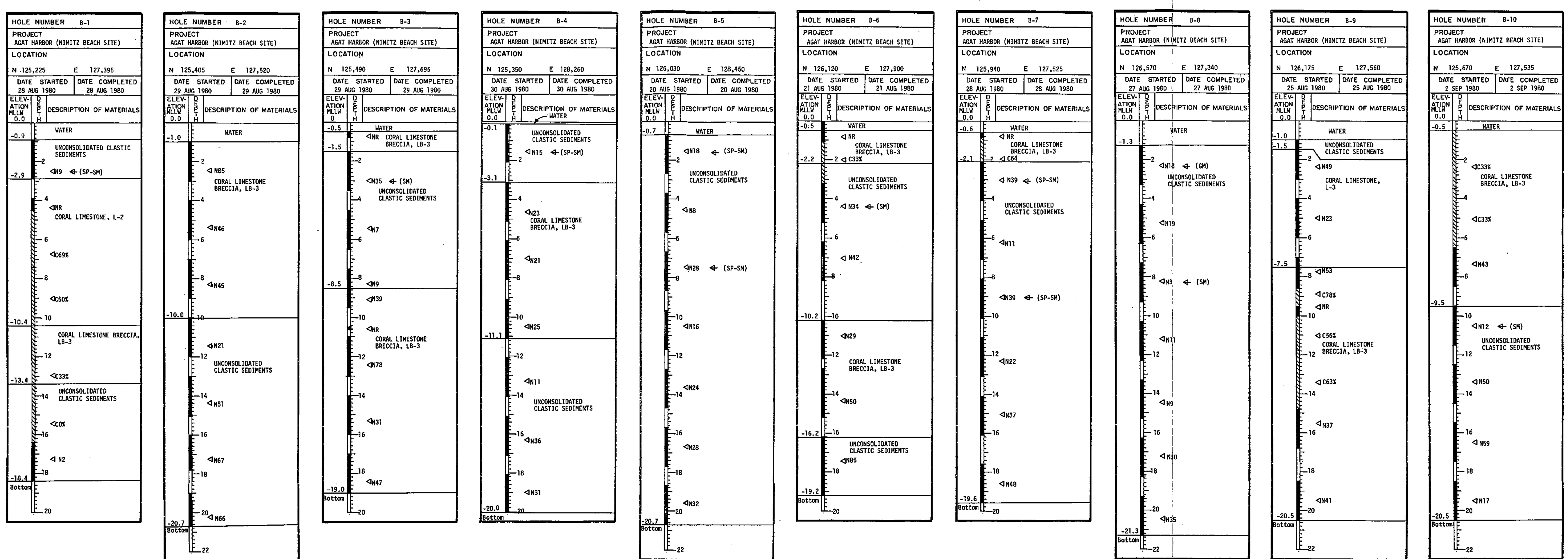
SCALE IN FEET

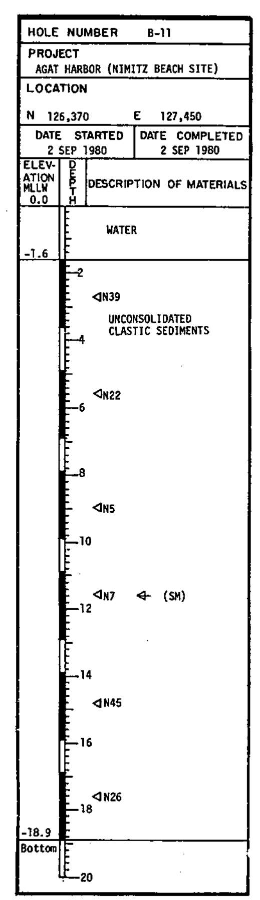
AGAT HARBOR — GUAM

BORING LOCATION PLAN

U. S. ARMY ENGINEER DISTRICT, HONOLULU

FIGURE E-12





GENERAL DESCRIPTION OF MATERIALS

UNCONSOLIDATED CLASTIC SEDIMENTS: WHITE, GRAY AND SHADES OF BROWN, DEPENDING UPON COMBINATION OF SEDIMENT MIXTURES WHICH CONSIST OF FRAGMENTS OF CORAL LIMESTONE MIXED WITH ALLUVIUM; GRADATION, SHAPE AND TEXTURE VARIES WIDELY DEPENDING UPON THE AMOUNT OF SORTING AND THE DISTANCE PIECES HAVE BEEN MOVED BY WAVES, CURRENTS, AND STREAMS; SEDIMENTS RANGE IN SIZE FROM CALCAREOUS CLAY-SILT TO FRESHLY BROKEN, ANGULAR GRAVEL, COBBLE AND BOULDER SIZE PIECES WITH ROUGH SURFACES; SOIL COMPONENTS ARE SOFT AND CONSIST OF CELLULAR CALCITE AND ARAGONITE (THREE ON MOH HARDNESS SCALE) WITH MARINE SHELLS AND CALCAREOUS FOSSIL-SKELETAL PARTS; COMPACTNESS GENERALLY RANGES FROM VERY LOOSE TO DENSE; CLASSIFICATION INCLUDES DECOMPOSED CORAL LIMESTONE BRECCIA TOO SOFT TO CORE.

CORAL LIMESTONE: WHITE TO TAN, SINGLE CALCAREOUS FOSSIL UNIT WITH UNIFORM CELLULAR TEXTURE AND LACY FABRIC; CELLS RANGE IN SIZE FROM MICRO TO MACRO AND MAY BE FILLED WITH SECONDARY CALCIUM CARBONATE; BRECCIA (ANGULAR FRAGMENTS) AND SANDSTONE MAY CONSTITUTE UP TO 25 PERCENT OF THE MASS (VISUAL ESTIMATE); MATERIAL HAS A SUGAR OR CRYSTAL CANDY APPEARANCE.

L-2: HARD TO MODERATELY HARD, EASY TO SCRATCH WITH KNIFE, DULL THUD WHEN STRUCK WITH HAMMER; CORE PIECES GENERALLY 0.5 FOOT AND LONGER; SPECIFIC GRAVITY 2.0 AND HEAVIER; 16 PERCENT TO 30 PERCENT ESTIMATED VOIDS ON SURFACE OF CORE; MINOR EVIDENCE OF DISSOLUTION AND WEATHERING SUCH AS OXIDE STAINS, SOLUTION CHANNELS, SOFT CEMENTING MATRIX AND DETRITAL CLAY; COMPRESSIVE STRENGTH 300 PSI OR GREATER; REQUIRES BLASTING OR EQUIVALENT EFFORT FOR EXCAVATION.

L-3: TAN TO LIGHT GRAY, MOTTLED RED AND BROWN; SOFT, WEATHERED, SKELETAL CORAL; CRUMBLES UNDER HAND PRESSURE; CAN BE EXCAVATED WITHOUT MUCH EFFORT.

CORAL LIMESTONE BRECCIA: WHITE TO TAN, MOTTLED BROWN (DARKER AREAS INDICATE WEATHERING AND SOFTER ROCK); ANGULAR FRAGMENTS RANGE FROM SAND AND GRAVEL TO COBBLE SIZES; CALCAREOUS FOSSILIZED SKELETAL PARTS (POLYPS, TENTACLES, COLUMELLA, TESTS, SPINES, SHELLS) CEMENTED SAND SIZE PIECES BOTH ROUNDED AND ANGULAR, ALL IN A FINE GRAINED CEMENTING MATRIX OF CALCIUM CARBONATE; SECONDARY GROWTHS OF CALCITE AND ARAGONITE CRYSTAL; WHITE LIME SECONDARY COATING ON WALLS OF VOIDS AND CRACKS; DEGREE OF CEMENTATION AND NUMBER OF SURFACE CAVITIES (VOIDS) VARIES AND IS INFLUENCED BY WEATHERING, EXPOSURE TO AIR, DISSOLUTION, PRECIPITATION RATES OF CALCIUM CARBONATE, ETC.

LB-3: SOFT, WEATHERED; MATRIX CEMENTING MATERIAL DECOMPOSED; MATERIAL CRUMBLES UNDER PRESSURE; CAN BE EXCAVATED WITHOUT MUCH EFFORT.

LEGEND

CORE DRILLING (4" x 5")

◁C33% PERCENT CORE RECOVERY

STANDARD PENETRATION TEST, ASTM D 1586

◁N36 PENETRATION RESISTANCE IN BLOWS PER FOOT

◁NR REFUSAL, PENETRATION RESISTANCE IN EXCESS OF 50 BLOWS PER 6 INCHES

◁(SP-SM) LABORATORY CLASSIFICATION IN ACCORDANCE WITH ASTM D 2487

NOTES TO BORING LOGS

1. COORDINATES REFERRED TO GUAM GEODETIC TRIANGULATION NETWORK (1973).
2. ELEVATIONS AND DEPTHS MEASURED FROM MEAN LOWER LOW WATER (MLLW) DATUM.
3. BOREHOLES DRILLED WITH A CONCORE PORTABLE SKID-MOUNTED DRILLING RIG.
4. DESCRIPTION OF MATERIALS SHOWN ON THE LOGS ARE BASED ON VISUAL CLASSIFICATION OF SAMPLES IN THE FIELD.
5. HIGH STANDARD PENETRATION TEST N-VALUES SHOWN FOR UNCONSOLIDATED CLASTIC SEDIMENTS ARE ATTRIBUTED TO THE PRESENCE OF COBBLES AND BOULDERS AND ARE GENERALLY NOT INDICATIVE OF THE ACTUAL DENSITY OF THE MATERIAL.
6. FOR LOCATION OF BORINGS, SEE FIGURE E-11

AGAT HARBOR GUAM

BORING LOGS

U. S. ARMY ENGINEER DISTRICT, HONOLULU

FIGURE E-13

TABLE E-7. SUMMARY OF SUBSURFACE INVESTIGATION TEST DATA

BORING NO./ SAMPLE NO.	SOIL CLASS	MLLW ELEVATION (FT)	CUMULATIVE % PASSING												APPARENT SPECIFIC GRAVITY
			1-1/2	1	3/4	1/2	3/8	4	8	16	30	50	100	200	
B-1/34	SP-SM	-0.9 to -2.9	100	93	89	78	71	59	51	43	30	21	14	10	
B-3/45 & 46	SM	-1.5 to -6.5	100	97	90	83	77	63	52	45	36	26	17	13	2.78
B-4/52	SP-SM	-0.1 to -2.1	100	97	90	79	67	56	46	38	26	16	11	8	2.79
B-5/1	SP-SM	-0.7 to -2.7	100	93	81	71	68	56	46	37	28	20	13	9	2.79
B-5/3 & 4	SP-SM	-6.7 to -11.7	100	98	96	93	92	86	74	56	31	17	9	5	2.82
B-6/9 & 10	SM	-3.2 to -8.2				100	99	92	65	45	32	25	19	15	2.78
B-7/28 & 29	SP-SM	-2.1 to -7.1	100	98	95	91	87	72	58	50	38	25	16	11	
B-7/30 & 31	SP-SM	-8.1 to -13.1	100	99	99	95	93	82	65	50	33	24	17	12	
B-8/20 & 21	GM	-1.3 to -6.3	100	90	83	74	67	56	46	40	34	27	18	13	
B-8/22 & 23	SM	-7.3 to -12.3	100	97	95	87	83	76	69	64	53	36	20	14	2.80
B-10/60 & 61	SM	-9.5 to -14.5	100	96	93	86	78	63	52	45	39	30	17	13	2.79
B-11/64 & 65	SM	-1.6 to -6.9	100	98	93	84	76	63	52	43	35	28	18	13	
B-11/67	SM	-10.9 to -12.9	100	95	85	82	80	76	67	56	46	36	25	18	

Unconsolidated Clastic Sediments (In-Situ)

Unit weight (saturated) = 110 pcf
Unit weight (moist) = 100 pcf
Angle of internal friction = 30^{0}
Cohesion = 0 psf

DESIGN CONSIDERATIONS

12. Dredgeability. Excavation can be accomplished from a floating plant using a clamshell bucket, backhoe excavator, or cutterhead dredge. As an alternative, excavation can also be accomplished using land based equipment to build temporary causeways and excavate shoreward removing the causeway as excavation progresses. The excavation by causeway was used successfully for Agana Small Boat Harbor. Drilling and blasting will be required to loosen or break larger masses of reef rock and coral heads for easy removal. A crawler tractor with a ripper tooth can also be used for breaking and loosening shallow reef crust rock.

13. Breakwater Toe Protection. Toe of the breakwater will be imbedded below the anticipated depth of scour. A bedding layer will be provided beneath and 5 feet beyond the toe. Toe protection will not be required where the breakwater rests on reef rock or other nonerodible material.

14. Excavation Slopes and Setbacks. Based on the nature of the subsurface materials, excavation slopes of 1V on 3H are recommended for the entrance channel, turning basin and access channel. Slope stability analyses (end of construction case) confirm that side slopes of 1V on 3H are stable for the excavations. Stability investigations included pseudostatic seismic analyses using a seismic coefficient of 0.10 applicable to Seismic Probability Zone 3.

15. Stability analyses do not account for wave and current forces which could eventually flatten the unrevetted excavation slopes in unconsolidated clastic sediments to approximately 1V on 5H. Accordingly, to preclude long term sloughing from endangering the breakwater structures, these structures should be set back a minimum of 10' beyond the point where an imaginary 1V on 5H slope projected from the toe of the excavation daylights at the reef surface.

16. Breakwater Slopes. Breakwater slopes no steeper than 1V on 1.5H are recommended for this project. Slope stability analyses (end of construction case) confirm that 1V on 1.5H slopes are stable for the breakwater structures. Stability investigations included pseudostatic seismic analyses using a seismic coefficient of 0.10 applicable to Seismic Probability Zone 3.

17. Revetted Mole Slopes (Access Way). Side slopes of 1V on 2H are recommended for the revetted mole and accessway based on slope stability analyses (end of construction case). Stability investigations included pseudostatic seismic analyses using a seismic coefficient of 0.10 applicable to Seismic Probability Zone 3.

18. Concrete Quality. The only concrete structures on this project are the circulation culverts through the revetted accessway. The culverts will be in constant contact with sea water. In accordance with EM 1110-2-2000, a maximum water cement ratio of 0.50 by weight with Type II Portland cement is recommended for hydraulic or waterfront structures exposed to sea water. Concrete compressive strengths in excess of 3,500 psi are attainable using crushed aggregate and a water-cement ratio of 0.50.

SOURCES OF CONSTRUCTION MATERIALS

19. General. The U.S.G.S. reports on the Military Geology of Guam contain comprehensive data on construction materials. In summary, entirely different topography and rocks are found in the northern and southern halves of the island. The northern half is a gently undulating limestone plateau bordered on its seaward edges by steep cliffs. The plateau slopes generally southwestward from elevations of 600 feet in the north to less than 100 feet at the narrow mid section of the island. The plateau in the north is composed principally of limestone which lies unconformably on an irregular surface eroded in extrusive volcanic rocks. The contact between the limestone and volcanic rocks is below sea level. Rocks for construction purposes are generally limited to the northern half of Guam. The rocks of the southern half consist of a complex assortment of pyroclastic rocks, lava-basalt and other noncalcareous rocks and sediments derived from igneous sources. The thick layer of soil and earthy residual deposits over much of the southern half of the island preclude the possibility of finding and developing igneous rocks for construction purposes.

20. Fill Materials. Sands and gravels excavated from the entrance channel, turning basin and access channel may be used for fill. Additional materials are available from existing commercial sources (quarries and borrow pits).

21. Armor Stone and Bedding Materials. Armor stone and bedding materials are available at the Hawaiian Rock Products' quarry. This quarry is located off Highway 15 at Taguan Point in Barrigada, approximately 17 miles from the proposed small boat harbor. The rock available from this quarry is compact, recrystallized and massive coral limestone. The rock breaks in angular blocks up to 20-ton pieces. Blasting is required. The face is 800 feet long and 20 to 100 feet high and the quarry is about 300 feet above the ocean. The bulk specific gravity ranges from 2.3 to 2.5. Armor stones for Agana Small Boat Harbor were obtained from this quarry.

CONCRETE MATERIALS INVESTIGATION

22. Approximately 95 cubic yards of 3,500 psi compressive strength concrete will be required for construction of the circulation culverts provided through the revetted accessway. The culverts will be in constant contact with sea water.

23. Trial design batches and testing to meet requirements of the class of concrete specified will be the responsibility of the contractor. Specifications will indicate the maximum permissible water-cement ratio.

Prior to commencing operations, the contractor shall submit for approval the mix proportions of all ingredients that will be used in the manufacture of concrete. The statement shall be accompanied by test reports and all test results, including aggregate gradation and blending, water-cement ratio strength curves, unit weight and slump.

24. All concrete will be measured and paid on a job price basis, complete, accepted in-place, including cement, aggregate, reinforcement, waterstops, forms, finishing, curing and protection.

25. Cementitious Materials conforming to ASTM C 150, Type II will be specified in view of seawater exposure conditions. The normal source of cement on Guam is the Kaiser-Permanente Corporation which operates a bulk cement handling facility on the island. Its cement, manufactured by the Ube Cement Company in Japan, conforms to ASTM C 150, Type I. Cement conforming to ASTM C 150, Type II, is available in bags by special order from Japan, the Phillippines, Hawaii and the U.S. mainland. Cement will be accepted on the basis of mill test reports and the manufacturer's certification of compliance with the specification. Provisions for check testing by the Government, if desired, will also be included in the contract documents.

26. Admixtures. All concrete shall be air-entrained. At the option of the contractor, a retarding admixture or a water reducing admixture may be used. All admixtures shall conform to ASTM C 494, and the contractor shall submit for approval certified copies of test reports of the products proposed for use. Provisions for check testing by the Government, if desired, will also be included in the contract documents.

27. Aggregates. Aggregates shall conform to ASTM C 33. Coarse aggregate shall be well graded from fine to coarse with a maximum nominal size of 1 inch. Coral limestone coarse aggregate meeting the requirements of ASTM C 33 is available on Guam at the Hawaiian Rock Products' quarry. The coarse aggregate is available in maximum nominal sizes of 1-1/2-inch, 1 inch, and 3/4 inch. The aggregate has a bulk specific gravity (SSD) of approximately 2.58, absorption of about 1.9%, LA abrasion resistance of about 34% and soundness loss (sodium sulfate) of about 7.6%.

28. In addition to operating a quarry, Hawaiian Rock Products produces concrete, asphaltic concrete, concrete block and concrete pipe. Approximate production rates for various products are 300 tons/day for riprap, 1,600 tons/day for crushed aggregate and 500 to 600 cubic yards per day for concrete.

29. Batch Plant Requirements. The batching plant may be located on-site, as approved, or off-site. The plant may be manual, semi-automatic, or better.

30. Truck mixers conforming to the requirements of ASTM C 94 will be allowed for complete mixing of central plant materials. Conveying concrete shall be accomplished by methods normally employed for civil works projects.

31. Contractor Quality Control. The contractor will be required to establish and maintain quality control for the concrete to assure compliance with the contract requirements.

APPENDIX E

SECTION IV. COST ESTIMATION SECTION

Table of Contents

IV. COST ESTIMATION SECTION

1. COST ESTIMATING ASSUMPTIONS

A. The following assumptions were utilized in estimating construction costs:

(1) Estimated quantities based on hydrographic survey map and typical plans and sections.

(2) Unit prices applied to neat line quantities (included overage of 14% to quantity).

(3) Guam based contractor to perform work

(4) Work based on 6-10 hour shifts per week.

(5) Disposal of dredged material within 2 miles of jobsite.

(6) All stone materials to come from existing "Hawaiian Rock Products" quarry at Fadian Point, Guam.

(7) April 1981 price level - 5.4% escalation factor applied to September 1980 price level (last available price level).

(8) A 20% contingency cost allowance.

(9) 18 month construction period.

2. COST ESTIMATES

a. Plan 1 (150 berths)

Project First Cost

Item	Unit	Quantity	$ Unit Cost	$ Total Cost
I. Construction Costs				
A. FEDERAL				
Mobilization and Demobilization	LS	1 Job	-	182,800
Dredging	CY	51,200	11.00	563,200
Main Breakwater				
Core	CY	1,013	56.10	56,800
Underlayer	CY	1,658	48.70	80,700
Armor	CY	6,114	62.20	380,300

Plan 1 (150 berths) (Cont)

Project First Cost (cont)

Item	Unit	Quantity	$ Unit Cost	$ Total Cost
Revetted Moles				
Fill	CY	9,790	1.50	14,700
Bedding	CY	4,092	56.10	229,600
Underlayer	CY	4,632	48.70	225,600
Armor	CY	7,902	62.20	491,500
Interior revetment	CY	738	58.50	43,200
Culverts		2ea	151,800	303,600
Detached Breakwater				
Armor	CY	3,246	62.20	201,900
Subtotal				$2,773,900
Contingency (20%)				554,800
TOTAL DIRECT FEDERAL CONSTR COST				$3,328,700
B. NON-FEDERAL				
Revetted Moles				
Fill	CY	19,964	1.50	29,900
Bedding	CY	3,525	56.10	197,800
Interior revetment	CY	2,165	58.50	126,700
Subtotal				354,400
Contingency (20%)				70,900
TOTAL DIRECT NON-FEDERAL CONSTR COST				$425,300

II. Engineering and Design	
A. FEDERAL	
Detailed Project Report (pre-authorized study costs)	258,500
Plans and Specifications	48,800
Engineering during construction	13,300
Subtotal	320,600
B. NON-FEDERAL	
Plans and Specifications	6,200
Engineering during construction	1,700
Subtotal	7,900
TOTAL ENGINEERING AND DESIGN COSTS	$328,500
III. Supervision and Administration (S & A)	
A. FEDERAL	294,600
B. NON-FEDERAL	29,600
TOTAL S&A COST	324,200
IV. U.S. Coast Guard Aids to Navigation	80,000
TOTAL PROJECT FIRST COST	$4,487,000

PLAN 2 (150 berths)

Project First Cost

Item	Unit	Quantity	\$ Unit Cost	\$ Total Cost
I. Construction Costs				
A. FEDERAL				
Mobilization and Demobilization	LS	1 Job	-	182,800
Dredging	CY	123,400	11.00	1,357,400
MAIN BREAKWATER				
Core	CY	1,653	56.10	92,700
Underlayer	CY	2,652	48.70	129,200
Armor	CY	9,691	62.20	602,800
MOLE				
Fill	CY	1,890	1.50	2,800
Bedding	CY	745	56.10	41,800
Underlayer	CY	1,821	48.70	88,700
Armor	CY	2,637	62.20	164,000
Stub Breakwaters				
Armor	CY	1,617	62.20	100,600
Subtotal				\$2,762,800
Contingency (20.0%)				552,600
TOTAL DIRECT FEDERAL CONSTR COST				\$3,315,400
B. NON-FEDERAL				
MOLE				
Fill	CY	27,244	1.50	40,900
Bedding	CY	2,082	56.10	116,800
Interior revetment	CY	1,279	58.50	74,800
Subtotal				\$232,500
Contingency (20.0%)				46,500
TOTAL DIRECT NON-FEDERAL CONSTR COST				\$279,000
II. Engineering and Design				
A. FEDERAL				
Detailed Project Report (pre-authorized study costs)				258,500
Plans and Specifications				50,700
Engineering during construction				13,800
Subtotal				323,000

PLAN 2 (150 berths) (Cont)

Project First Cost

Item	Unit	Quantity	$ Unit Cost	$ Total Cost
B. NON-FEDERAL				
Plans and Specifications				4,300
Engineering during construction				1,200
Subtotal				5,500
TOTAL ENGINEERING AND DESIGN COSTS				$328,500
III. Supervision and Administration (S & A)				
A. FEDERAL				294,300
B. NON-FEDERAL				19,500
TOTAL S&A COST				313,800
IV. U.S. Coast Guard Aids to Navigation				80,000
TOTAL PROJECT FIRST COST				$4,317,000

PLAN 3 (150 berths)

Project First Cost

Item	Unit	Quantity	$ Unit Cost	$ Total Cost
I. Construction Costs				
A. FEDERAL				
Mobilization and Demobilization	LS	1 Job	-	182,800
Dredging	CY	61,900	11.00	680,900
Breakwater				
Core	CY	955	56.10	53,600
Underlayer	CY	1,525	48.70	74,300
Armor	CY	5,560	62.20	345,800
Revetted Moles				
Fill	CY	9,712	1.50	14,600
Bedding	CY	3,984	56.10	223,500
Underlayer	CY	5,276	48.70	256,900
Armor	CY	9,045	62.20	562,600
Interior revetment	CY	361	58.50	21,100
Culvert		1 each	151,800	151,800
Subtotal				$2,567,900
Contingency (20.0%)				513,600
TOTAL DIRECT FEDERAL CONSTR COST				$3,081,500
B. NON-FEDERAL				
Revetted Moles				
Fill	CY	20,315	1.50	30,500
Bedding	CY	3,179	56.10	178,300
Interior rvetment	CY	1,951	58.50	114,100
Subtotal				$322,900
Contingency (20.0%)				64,600
TOTAL DIRECT NON-FED CONSTR COST				$387,500
II. Engineering and Design				
A. FEDERAL				
Detailed Project Report (pre-authorized study costs)				258,500
Plans and Specifications				48,800
Engineering during construction				13,300
Subtotal				$320,600

PLAN 3 (150 berths) (Cont)

Project First Cost

Item	Unit	Quantity	$ Unit Cost	$ Total Cost
B. NON-FEDERAL				
Plans and Specifications				6,200
Engineering during construction				1,700
Subtotal				7,900
TOTAL ENGINEERING AND DESIGN COSTS				$328,500
III. Supervision and Administration (S & A)				
A. FEDERAL				278,500
B. NON-FEDERAL				27,100
TOTAL S&A COST				$305,600
IV. U.S. Coast Guard Aids to Navigation				80,000
TOTAL PROJECT FIRST COST				$4,183,000

PLAN 4 (80 berths)

Project First Cost

Item	Unit	Quantity	$ Unit Cost	$ Total Cost
I. Construction Costs				
A. FEDERAL				
Mobilization and Demobilization	LS	1 Job	-	182,800
Dredging	CY	65,100	11.00	716,100
Breakwater				
Core	CY	2,080	56.10	116,700
Underlayer	CY	3,315	48.70	161,400
Armor	CY	12,075	62.20	751,100
Revetted Moles				
Fill	CY	5,635	1.50	8,500
Bedding	CY	2,245	56.10	125,900
Underlayer	CY	3,359	48.70	163,600
Armor	CY	5,539	62.20	344,500
Interior revetment	CY	558	58.50	32,600
Culverts		2 each	151,800	303,600
Subtotal				$2,906,800
Contingency (20.0%)				581,400
TOTAL DIRECT FED CONSTR COST				$3,488,200
B. NON-FEDERAL				
Revetted Moles				
Fill	CY	13,940	1.50	20,900
Bedding	CY	2,323	56.10	130,300
Interior revetment	CY	1,596	58.50	93,400
Subtotal				$244,600
Contingency (20%)				48,900
TOTAL DIRECT NON-FED CONSTR COST				$293,500
II. Engineering and Design				
A. FEDERAL				
Detailed Project Report (pre-authorized study costs)				258,500
Plans and Specifications				50,700
Engineering during construction				13,800
Subtotal				323,000

PLAN 4 (80 berths) (Cont)

Project First Cost

Item	Unit	Quantity	$ Unit Cost	$ Total Cost
B. NON-FEDERAL				
Plans and Specifications				4,300
Engineering during construction				1,200
Subtotal				5,500
TOTAL ENGINEERING AND DESIGN COSTS				328,500
III. Supervision and Administration (S & A)				
A. FEDERAL				305,500
B. NON-FEDERAL				20,400
TOTAL S&A COST				325,900
IV. U.S. Coast Guard Aids to Navigation				80,000
TOTAL PROJECT FIRST COST				$4,516,000

PLAN 5 (150 berths)

Project First Cost

Item	Unit	Quantity	$ Unit Cost	$ Total Cost
I. Construction Costs				
A. FEDERAL				
Mobilization and Demobilization	LS	1 Job	-	182,800
Dredging	CY	94,600	11.00	1,040,600
Main Breakwater				
Core	CY	1,870	56.10	104,900
Underlayer	CY	2,980	48.70	145,100
Armor	CY	10,870	62.10	675,000
Stub Breakwater				
Core	CY	130	56.10	7,300
Armor	CY	400	62.10	24,800
Revetted Moles				
Core and Bedding	CY	1,500	56.10	84,100
Underlayer	CY	1,250	48.70	60,900
Armor	CY	2,010	62.10	124,900
Subtotal				$2,450,400
Contingency (20.0%)				490,100
TOTAL DIRECT FED CONSTR COST				$2,940,500
B. NON-FEDERAL				
Interior Revetment				
Bedding	CY	2,090	56.10	117,300
Underlayer	CY	450	48.70	21,900
Armor	CY	1,660	62.10	103,100
Fill	CY	23,850	1.50	35,800
Subtotal				$278,100
Contingency (20%)				55,600
TOTAL DIRECT NON-FED CONSTR COST				$333,700
II. Engineering and Design				
A. FEDERAL				
Detailed Project Report (pre-authorized study costs)				258,500
Plans and Specifications				49,400
Engineering during construction				13,500
Subtotal				321,400

PLAN 5 (150 berths) (Cont)

Project First Cost

Item	Unit	Quantity	$ Unit Cost	$ Total Cost
B. NON-FEDERAL				
Plans and Specifications				5,600
Engineering during construction				1,500
Subtotal				7,100
TOTAL ENGINEERING AND DESIGN COSTS				$328,500
III. Supervision and Administration (S & A)				
A. FEDERAL				269,600
B. NON-FEDERAL				23,400
TOTAL S&A COST				293,000
IV. U.S. Coast Guard Aids to Navigation				80,000
TOTAL PROJECT FIRST COST				$3,976,000

Non-Federal Costs. Non-federal costs (non-liquidating) are those costs that the Government of Guam must provide in accordance with local cooperation agreements and assurances. Non-federal project first costs are anticipated for all alternative plans. Since the revetted moles in plans 1, 3, and 4 will provide offshore parking areas and an access roadway to the berthing areas, a portion of the construction cost for the mole structures will be a non-federal cost.

Other non-federal costs (self-liquidating) and local implementation responsibilities include dredging of the berthing areas, berthing and docking facilities, other onshore facilities needed to make the project complete. The dredging of the berthing area may be included into the overall federal construction contract using Government of Guam funds. Based upon dredging approximately 48,500, 52,600, 52,300, 26,700 and 52,100 cubic yards for plans 1, 2, 3, 4, and 5, respectively, local (non-federal) dredging costs is estimated to vary from a low of $294,000 for plan 4 to a high of $579,000 for plan 2. Plans 1, 3, and 5 will have estimated dredging costs of $534,000, $575,000, and $573,000, respectively.

3. ESTIMATED AVERAGE ANNUAL COST.

a. The average annual cost is the equivalent annual charges which includes interest, amortization of the initial investment, cost of maintenance and operation, and replacement costs during the project life.

b. Interest rate used follows the U.S. Water Resources Council's rate of 7-3/8 percent. The project economic life is 50 years.

c. Annual replacement, operation and maintenance costs can be broken down into the following categories:

(1) maintenance dredging due to shoaling
(2) periodic maintenance and repair for aids to navigation; and
(3) maintenance and repair costs for the breakwater structure.

Maintenance Dredging

Maintenance dredging to maintain the harbor and channel at the Nimitz Beach site is based on an estimated 5,300, 6,900, 4,800, 4,000 and 5,300 cubic yards for plans 1, 2, 3, 4, and 5, respectively every 10 years. The cost of maintaining the harbor and channel includes mobilization and demobilization of dredging equipment. Mobilization and demobilization cost is estimated at $53,000. Dredging cost is estimated at approximately $11.00 per cubic yard of material.

Aids to Navigation

Periodic maintenance and repair for unlighted aids to navigation is estimated at $500 per year.

Maintenance and Repair Costs for the Breakwater

Annual maintenance and repair costs of the breakwater for the economic life of the project is based on 1 (%) percent of the initial cost of the armor stone.

Summary of Average Annual Maintenance Costs

	Plans 1	2	3	4	5
Maintenance dredging	$7,900	$9,200	$7,500	$6,900	$7,900
Aids to Navigation	500	500	500	500	500
Protective Structures	10,200	8,200	8,600	10,400	8,200
Total average annual maintenance cost	$18,600	$17,900	$16,600	$17,800	$16,600

d. Summary of the average annual costs for determining the benefit to cost comparison is shown below:

	Plans 1	2	3	4	5
Total project first cost1/	$4,229,000	$4,059,000	$3,925,000	$4,258,000	$3,718,000
Average annual first cost	321,000	308,100	297,900	323,200	282,200
Average annual maintenance cost	18,600	17,900	16,600	17,800	16,600
Total average annual cost	$340,000	$326,000	$315,000	$341,000	$299,000

1/ Excludes preauthorized study costs for benefit cost analysis.

4. APPORTIONMENT OF COSTS.

In accordance with Section 107 of the River and Harbor Act of 1960, the apportionment of costs between federal and non-federal cost is specified below. The Federal share is a statutory limit of $2 million. All costs exceeding this amount must be borne by the Government of Guam. The non-federal share does not include costs of local self-liquidating facilities (dredging of berthing area, docks, etc.).

Summary of Apportionment of First Cost

	Plans 1	2	3	4	5
Federal Share1/					
Corps of Engineers	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000
U.S. Coast Guard	80,000	80,000	80,000	80,000	80,000
Non-federal share2/	2,407,000	2,237,000	2,103,000	2,436,000	1,896,000
Total project first cost	$4,487,000	$4,317,000	$4,183,000	$4,516,000	$3,976,000

1/ All future costs associated with future maintenance dredging, (excluding berthing area) repairs to the breakwater structure and maintenance for aids to navigation is Federal. These costs are not included in the project first costs but are considered in determining the average annual costs for developing the benefit to cost comparison.

2/ This share does not include the costs of local cooperation and assurances specified in the Main Report.

AGAT SMALL BOAT HARBOR
TERRITORY OF GUAM

ECONOMIC ANALYSIS

APPENDIX F

APPENDIX F

ECONOMIC ANALYSIS

Table of Contents

List of Tables

List of Figures

APPENDIX F

ECONOMIC ANALYSIS

GENERAL

The proposed Agat small boat harbor will provide a safe and efficient base of operations for a local "subsistence" fishing fleet and recreational boats, and afford an attractive stopping point or cruise destination for large craft from other areas in the Western Pacific. It would also serve as a harbor of refuge for both local and transient craft not normally based at the facility. The harbor will provide urgently needed navigation facilities for Guam and enhance the development of the sport fishing industry now on an upswing with growth of the tourist industry. Tangible benefits derived consist of shelter for the small craft and enhancement of general and recreational navigation activity.

Currently there are no boating facilities from Apra Harbor south to Merizo. Fishermen desiring to go fishing along the southern coast, where excellent fishing grounds are located, must use Apra or Agana Harbor. Agana is Guam's only publicly owned small boat harbor. Improvements at Agat would create safe boating opportunities desired by the local population.

Equivalent average annual benefits were computed using a 1985 base year, 7-3/8 percent interest rate, 50-year economic life, and April 1981 price level.

PROJECTED USE

Based on the existing and projected need for berthing facilities on Guam, as discussed in Section II of the main report, the harbor is expected to be filled immediately after completion of construction. Table F-1 shows the projected number of craft by type and use for an 80- and a 150-berth harbor. Subsistence fishing is estimated to be 60 percent of the outboard, inboard and trailer-mounted boats. Of the remainder, including auxiliary, charter, and transient boats, 25 percent are estimated to be engaged in commercial activities and the balance are recreational craft.

The Hawaii State Boat Launching Facilities Study completed in 1972 concluded from surveys that one trailer mounted boat used on an average of 40 times per year or 40 launchings per year, is considered equivalent to one permanently based boat. The same conclusion is assumed true for Guam. The reasonable number of launching lanes to accommodate trailer mounted boats at Agat harbor is two. Each lane is estimated to accommodate 4,000 launchings per year. With the assumption that one boat is launched 40 times in a year, the equivalent number of boats from each launching lane would be 100 or a total of 200 trailer mounted boats.

TABLE F-1. PROJECTED VESSEL TYPE AND USE

Harbor Size	Out-Board	In-Board	Auxiliary Sail	Transient	Total	Trailer Mounted	Total
SUBSISTENCE FISHING							
80 Berth	32	16	-	-	48	120	168
150 Berth	60	30	-	-	90	120	210
RECREATION							
80 Berth	15	3	5	1	24	80	104
150 Berth	28	5	11	1	45	80	125
CHARTER							
80 Berth	-	8	-	-	8	-	8
150 Berth	-	15	-	-	15	-	15
TOTAL							
80 Berth	47	27	5	1	80	200	280
150 Berth	88	50	11	1	150	200	350

SUBSISTENCE FISHING

Fishing provides a supplement to the diet for many families of Guam. It is not uncommon to find two or more families owning a boat used exclusively to catch fish for consumption by their families. Interviews made in 1973 indicated that approximately 60 percent of all boats, other than sail and charter boats, are used for "subsistence" fishing. Despite this large fishing fleet estimated at 106 boats in 1973, no suitable loading and storage facilities exist for efficient handling of the local fish catch. As a result, the efficiency of fishing operations is generally low. A new harbor providing adequate shelter, navigational aids, landing facilities, and temporary storage facilities would significantly improve the effectiveness of the local subsistence fishing fleet and may encourage the development of commercial fishing. An improved harbor would allow more time for fishing as a result of reduced time in loading supplies, fuel, equipment, unloading catch, and launching and recovering of boats.

Table F-2 shows subsistence fishing fleet with and without the plan of improvement. Since there are no navigation facilities at Agat the without condition is zero boats. The net benefit attributable to this fleet was computed applying an appropriate percentage return to the average depreciated value of each type of boat. The average depreciated value of boats and percentage return were obtained from interviews with marine interests. Fish are primarily caught as a supplementary food source, and the operating costs for subsistence fishing are estimated to exceed the value of their catch. Returns to the subsistence fishing fleet from improved harbor conditions are considered to at least equal the returns of recreational boats under existing and future boating conditions. The average annual benefits accruing to the proposed improvements for the subsistence fishing fleet are shown in Table F-2 for an 80 berth and 150 berth harbor.

TABLE F-2. EQUIVALENT AVERAGE ANNUAL BENEFITS TO SUBSISTENCE FISHING FLEET

	Outboards	Inboards	Trailer Mounted	Total
Number of Subsistence Boats				
With Improvements				
80 Berths	32	16	120	168
150 Berths	60	30	120	210
Without Improvements				
80 Berths	0	0	0	0
150 Berths	0	0	0	0
Returns per Boat				
Average Depreciated Value	$5,400	$18,100	$5,400	
Percent Annual Return with Improvement	15%	12%	15%	
Net Annual Return with Improvement	$810	$2,200	$810	
Percent Annual Return w/o Improvement	0	0	0	
Net Annual Return w/o Improvement	0	0	0	
Returns to Subsistence Fleet				
With Improvements				
80 Berths	$25,900	$35,200	$97,200	$158,000
150 Berths	$48,600	$66,000	$97,200	$212,000
Without Improvements				
80 Berths	0	0	0	0
150 Berths	0	0	0	0
Subsistence Fishing Fleet Benefits				
80 Berths	$25,900	$35,200	$97,200	$158,000
150 Berths	$48,600	$66,000	$97,200	$212,000

RECREATIONAL BOATING

Boating is one of the many recreational activities in Guam. Boat owners encounter restricted usage because of the lack of improved small boat facilities. Many of the present boat owners limit their activity to small outboards or do not own water-based boats because of these factors. Benefits to recreational boats are based on the net return received by owners of for-hire vessels, which range from 9 to 15 percent after all expenses have been paid. The number of recreational boats expected to use an 80 and 150 berth harbor and the equivalent average annual benefits are shown in Table F-3. Transient craft benefits were computed based on the assumption that 50 visits by transient craft with an average stay of one week is equivalent to one permanently based craft.

TABLE F-3. EQUIVALENT AVERAGE ANNUAL BENEFITS TO RECREATIONAL BOATS

Recreational Boats	Out-Board	In-Board	Auxiliary Sail	Transient	Trailer Mounted	Total
With Improvement						
80 Berths	15	3	5	1	80	104
150 Berths	28	5	11	1	80	125
Without Improvements						
80 Berths	0	0	0	0	0	0
150 Berths	0	0	0	0	0	0
Returns Per Boat						
Average Depreciated Average	$5,400	$18,100	$34,600	$19,500	$5,400	
Percent Annual Return With Improvements	15%	12%	9%	10%	15%	
Net Annual Return With Improvements	$810	$2,200	$3,100	$1,900	$810	
Percent Annual Return w/o Improvements	0	0	0	0	0	
Net Annual Return w/o Improvements	0	0	0	0	0	
Returns to Recreational Boats						
With Improvements						
80 Berths	$12,100	$6,600	$15,500	$1,900	$64,800	$101,000
150 Berths	$22,700	$11,000	$34,100	$1,900	$64,800	$134,000
Without Improvements						
80 Berths	0	0	0	0	0	0
150 Berths	0	0	0	0	0	0
Recreational Boating Benefits						
80 Berths	$12,100	$6,600	$15,500	$1,900	$64,800	$101,000
150 Berths	$22,700	$11,000	$34,100	$1,900	$64,800	$134,000

The Guam Department of Labor in their November 1981 survey of Guam households also asked (at the Corps' request) if the interviewee owned a boat. If they answered "yes" they were asked to indicate the main use of their boat. The choices were: food for family and friends; part-time commercial fishing; full-time commercial fishing; charter fishing; commercial cruise; recreation; other. If they answered "no" to the question of whether they owned a boat, they were asked to indicate why they did not want to own one. Their choices were: do not want a boat; would get boat if better harbor available; would get boat if better launching facilities available; other (See Figure F-1 for sample questionnaire). The Guam Department of Labor also was to transfer income and ethnicity information from their questionnaire to the Corps' question sheets. However, income data was not asked during this survey, so no information about boaters income groupings was available. Ethnicity data, however, was obtained for this survey. Table F-4 summarizes this data and reveals that subsistence fishing is definitely a culturally or ethnically biased activity. Table F-5 shows a complete tabulation of the responses. There were 942 questionnaire responses. The Guam Department of Labor maintains a complete inventory of Guam households which is the universe from which the sample is drawn. The sample excludes non-immigrant aliens and persons living on military posts. The survey results show that 71 percent of the boat owners among the Chamorro and Filipino ethnic groups are subsistence fishermen (i.e., fish for food for family and friends). Among the non-Chamorro and non-Filipino population the rate of subsistence fishing is only 34 percent of the boat owners. Some 52 percent of all the boat owners said they engaged in subsistence fishing.

Indepth interviews of a sampling of 27 subsistence fishermen on Guam indicated an ethnic composition of 19 Chamorros (70%), 6 Filipinos (22%), and 2 others (8%). A comparable breakout of the Guam Labor Department data is 48%, 20% and 32%, respectively. The indepth interviews are apparently biased with a disproportionate number of Chamorros in the sample.

All of the indepth interview subsistence fishermen respondents indicated they shared their catch with family and friends. Fifty-two percent say they sell no fish (58% of Chamorros, 50% of Filipinos, and 0% of others), see Table F-6. This same table indicates 80% of the Chamorro and Filipino groups sell 25 percent or less of their fish while none of the "Other" group falls in this category. (The sample size for the "Other" group is so small (2), that this may not be indicative of the "Other" group of subsistence fishermen.)

As a group the subsistence fishermen average 81 fishing trips a year and catch 78 pounds of fish a trip with boat and equipment valued at $9,300. Their expenses average $6,800 (only 10 respondents provided data on their expenses) including operator's time at 8 hours per trip at the average Guam private sector wage of $5.75 per hour in 1981 ($3,600 per year). Their fish catch (for the 10 reporting expenses) was valued at an average of $6,300 per craft. This is an economic loss of some $500 per year per craft. However, if their time is valued at no cost, their catch is worth some $2,700 per subsistence fisherman. For this Agat study we are claiming a benefit of approximately $900 per craft based on a return on the value of the craft.

FIGURE F-1. QUESTIONNAIRE ON BOAT OWNERSHIP

The purpose of these three questions about boating is to help the US Army Corps of Engineers in the Guam boating survey. The Bureau of Labor Statistics, Government of Guam, has agreed to assist the Corps by asking you these questions. You are not required to answer them, of course, but your cooperation will be greatly appreciated.

(Note to Interviewer: If the respondent does not want to answer the questions, please check here ____, and return the empty questionnaire).

1. Do you own a boat? Yes ___(go to #3) No____ (go to #2).

2. IF YOU DO NOT OWN A BOAT, which of the following apply to you (check one or more)?

   a. I do not want a boat ____
   b. I would have a boat if there were better harbor facilities ____
   c. I would have a boat if there were better launching facilities ____
   d. Other ____ (no explanation needed)

3. IF YOU DO OWN A BOAT, what is the main use of your boat?

(Note to Interviewer: Respondent may answer one or more, but leave it up to him/her. Please do not indicate one way or the other that we want either one only, or one or more).

   a. ____ Part-time fishing (food for family and friends)
   b. ____ Part-time commercial fishing
   c. ____ Full-time commercial fishing
   d. ____ Charter fishing
   e. ____ Commercial cruise
   f. ____ Recreation
   g. ____ Other (dealer, youth group, government, etc.)

Thank you for your help.

(Note to Interviewer: After the interview is complete, please enter the coded answers to BLS survey questions 20 (income) and H (ethnicity) below.)

Question 20 (columns 66-67) ______
Question H (columns 77-78) ______

Table F-4

GUAM HOUSEHOLD1/ SURVEY SUMMARY OF BOAT OWNERSHIP, FALL 1981: DISTRIBUTION OF INFORMATION BY ETHNIC CATEGORY (PERCENT OF BOAT OWNERS BY ETHNIC GROUP IN PARENTHESIS)

Category	Chamorro		Filipino		Filipino & Chamorro		Other		Total	
BOAT OWNERS										
		%		%		%		%		
Subsistence2/	12	(71)	5	(71)	17	(71)	8	(34)	25	(52)
Commercial	-		1	(14+)	1	(4)	3	(12)	4	(8)
Recreation	4	(24)	1	(14+)	5	(21)	13	(54)	18	(38)
Other (Not in Service)	1	(5)	-		1	(4)	-		1	(2)
TOTAL BOAT OWNERS	17	(100)	7	(100)	24	(100)	24	(100)	48	(100)
NON-BOAT OWNERS										
Don't Want a Boat	225		126		351		157		508	
Would Have if Better Facilities Available	50		22		72		34		106	
Other	137		49		186		94		280	
TOTAL NON-BOAT OWNERS	412		197		609		285		894	
TOTAL RESPONSES	429		204		633		309		942	

1/ Performed by Guam Dept of Labor for Corps of Engineers; 942 responses, 101 refusals & blank forms, 76 vacant & demolished & other for a total of 1119 survey units. Survey excludes non-immigrant aliens, plus military personnel and their dependents living on base [estimated to be (4000) and (11000), respectively by POD.] Total 1980 population 105,816 Census of Guam, preliminary.

2/ Includes 3a, plus 3a combined with 3b and 3f:
- Part-time fishing (food for family and friends) (14)
- Part-time fishing (food), plus part-time commercial (2)
- Part-time fishing (food), plus recreation (9)

TABLE F-5. GUAM HOUSEHOLD SURVEY OF BOAT OWNERSHIP BY ETHNIC CATEGORY

		Chamorros Guamanian	Filipinos	Caucasians	Micronesians	Japanese	Chinese	Korean	Other Pure	Other Mixed	Not Specified	Total
2a	Don't want to own boat	225	126	58	4	11	5	1	5	14	59	508
2b	Would if better harbor	27	9	4	1	-	3	1	-	4	8	57
2c	Would if better launch ramp	7	5	1	-	1	-	-	-	-	-	14
2b/c	Would if better hbr or launch ramp	16	8	4	-	-	-	-	-	2	5	35
2d	'Other' don't have	137	49	25	5	5	4	2	7	8	38	280
		412	197	92	10	17	12	4	12	28	110	894
3a	Pt Time Food & Family	5	4	2	-	-	-	-	-	1	2	14
3a/b	Food/pt time com	-	1	-	-	-	-	-	-	-	-	1
3a/b/f	Food/pt time com/rec	-		-	-	-	-	-	-	-	1	1
3a/f	Food/rec	7	-	2	-	-	-	-	-	-	-	9
3b/e	Pt time com/cruise	-	-	-	-	-	-	-	1	-	-	1
3b/f	Pt time com/rec	-	-	1	-	-	-	-	-	-	-	1
3d	Charter	-	-	1	-	-	-	-	-	-	-	1
3e	Cruise	-	1	-	-	-	-	-	-	-	-	1
3f	Recreation	4	1	8	1	-	-	-	-	-	4	18
3-	Not in service	1	-	-	-	-	-	-	-	-	-	1
		17	7	14	1	-	-	-	1	1	7	48
	TOTAL	429	204	106	11	17	12	4	13	29	117	942

Table F-6

INDICATION OF SALE OF FISH CATCH FROM INDEPTH INTERVIEW OF 27 GUAM SUBSISTENCE FISHERMEN BY ETHNICITY

	Total	None Sold	Up to 25% Sold	25 to 50% Sold	50 to 75% Sold	Over 75% Sold
Number						
Chamorro	19	11	4	4	-	-
Filipino	6	3	2	-	1	-
Other	2	-	-	1	-	1
TOTAL	27	14	6	5	1	1
Percent						
Chamorro	100%	58%	21%	21%	-	-
Filipino	100%	50%	33%	-	17%	-
Other	100%	-	-	50%	-	50%
TOTAL	100%	52%	22%	19%	4%	4%

CHARTER BOATS

The local interests have stated that charter fishing, diving and sight-seeing boats will operate out of the proposed harbor. The projected number of commercial charter vessels is shown in the Table F-1, and Table F-7 shows the estimated average annual benefits accruing to charter boats.

TABLE F-7. ESTIMATED AVERAGE ANNUAL BENEFITS TO CHARTER BOATS

	Number of Boats		Returns		Average
	With Improvements	Without Improvements	With Improvements	Without Improvements	Annual Benefits
80 Berths	8	0	$17,600	0	$18,000
150 Berths	15	0	$33,000	0	$33,000

Note: Returns are based on average depreciated value per boat of $18,100, and percent annual return under ideal condition of 12 percent.

BENEFIT SUMMARY

The average annual benefits which would accrue to the proposed project are summarized in Table F-8.

TABLE F-8. BENEFIT SUMMARY

	Average Annual Benefits	
Benefit Category	80 Berths	150 Berths
Subsistence Fishing	$158,000	$212,000
Recreational Boating	101,000	134,000
Charter Boats	18,000	33,000
TOTAL AVERAGE ANNUAL BENEFIT	$227,000	$379,000

ALLOCATION OF AVERAGE ANNUAL BENEFITS

The allocation of average annual benefits between general and local interests is presented in Table F-9.

TABLE F-9. ALLOCATION OF AVERAGE ANNUAL BENEFITS

	80 Berths			150 Berths		
Benefit Category	Total	General	Local	Total	General	Local
Subsistence Fishing	$158,000	$158,000	0	$212,000	$212,000	0
Recreational Boating	101,000	50,500	$50,500	134,000	67,000	$67,000
Charter Boats	18,000	9,000	9,000	33,000	16,500	16,500
TOTAL (DOLLARS)	$277,000	$217,500	$59,500	$379,000	$295,500	$83,500
TOTAL (PERCENT)	100%	78.5%	21.5%	100%	78.0%	22.0%

AVERAGE ANNUAL BENEFITS ASSOCIATED WITH ALTERNATIVE PLANS

The estimated average annual benefits associated with the alternative plans based on navigation improvements for subsistence fishermen, recreation boaters, and commercial charter boat operators are presented in Table F-10.

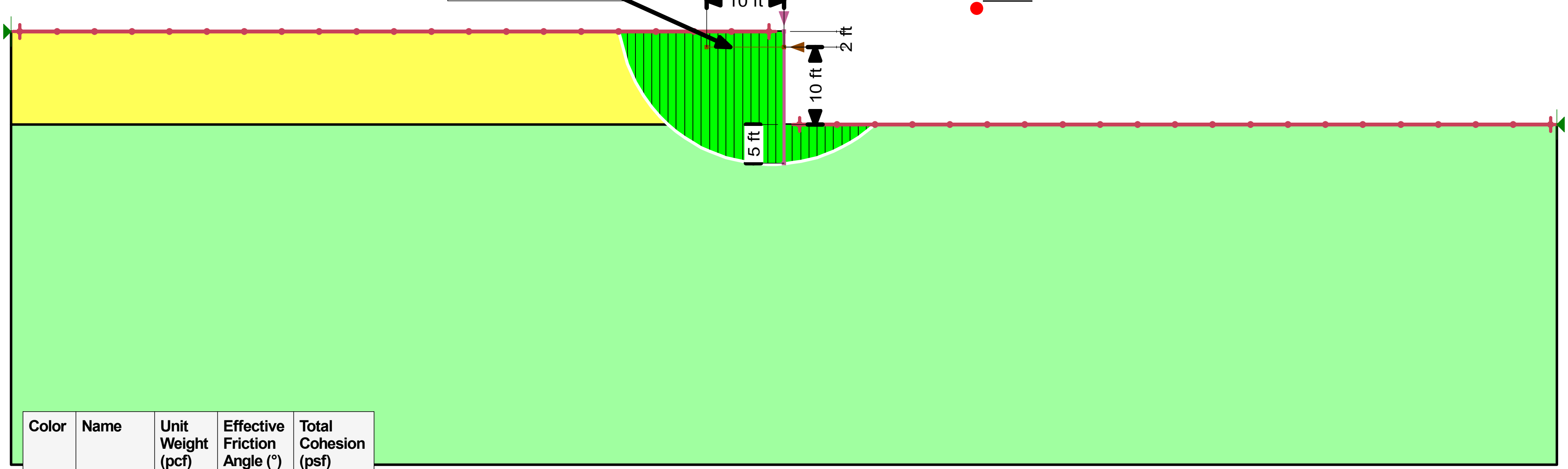
TABLE F-10. SUMMARY OF BENEFITS FOR ALTERNATIVE PLANS

Benefit Category	Plan 1	Plan 2	Plan 3	Plan 4	Plan 5
Subsistence Fishing	$212,000	$212,000	$212,000	$158,000	$212,000
Recreational Boating	134,000	134,000	134,000	101,000	134,000
Charter Boats	33,000	33,000	33,000	18,000	33,000
TOTAL AVERAGE ANNUAL BENEFIT	$379,000	$379,000	$379,000	$277,000	$379,000

ATTACHMENT D

SLOPE STABILITY RESULTS

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Total Cohesion (psf)
	Limestone Shelf	Undrained (Phi=0)	140			5,000
	Sand	Mohr-Coulomb	115	0	32	



Color	Name	Unit Weight (pcf)	Effective Friction Angle (°)	Total Cohesion (psf)
	Limestone Shelf	140		5,000
	Sand	115	32	

US Army Corps of Engineers
Alaska District

Slope Stability			
Project:	Agat Mayor's Complex Shoreline Protection	Date:	06/28/2024 10:58:08 AM
Location:	Agat, Guam	Factor of Safety:	14.377
Engineer:	Twain M. Cacek, EIT, GIT	Scale:	1:246

AGAT EMERGENCY SHORELINE PROTECTION
CONTINUING AUTHORITIES PROGRAM - SECTION 14
AGAT, GUAM

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

Agat CAP Section 14 Emergency Shoreline Protection Project

Draft Integrated Feasibility Report and Environmental Assessment

September 2024

1. Project Description

The study purpose is to identify a plan that will provide emergency shoreline protection from coastal erosion to the Mayor's Compound community building of the village of Agat. Section 14 of the Flood Control Act of 1946, as amended. This is a Continuing Authorities Program (CAP) project. The authority allows for planning and constructing emergency stream bank and shoreline protection for public facilities in imminent danger of failing. Each project has a Federal expenditure limit of $10,000,000.

1.1 Alternatives:

Three major Alternatives were considered for this study (not including NO ACTION). Alternatives were priced to a Class 4 estimate level for comparative purposes. Estimates for this phase may be developed by applying parametric processes of various cost sources, using quotes, calculations, unit prices, cost books, or historical data as backup. Use of MCACES software was utilized and the costs of the Planning, Engineering, and Design feature (30 account) and the Construction Management feature (31 account) are included as a percentage of the construction costs. The costs for the Lands and Damages were obtained through the PDT from the real estate office. Alternatives are developed to the same constant dollar basis for fair comparison. Project specific risk-based contingencies are identified for each alternative under comparison.

1.1.1 Alternative 1: No-Action

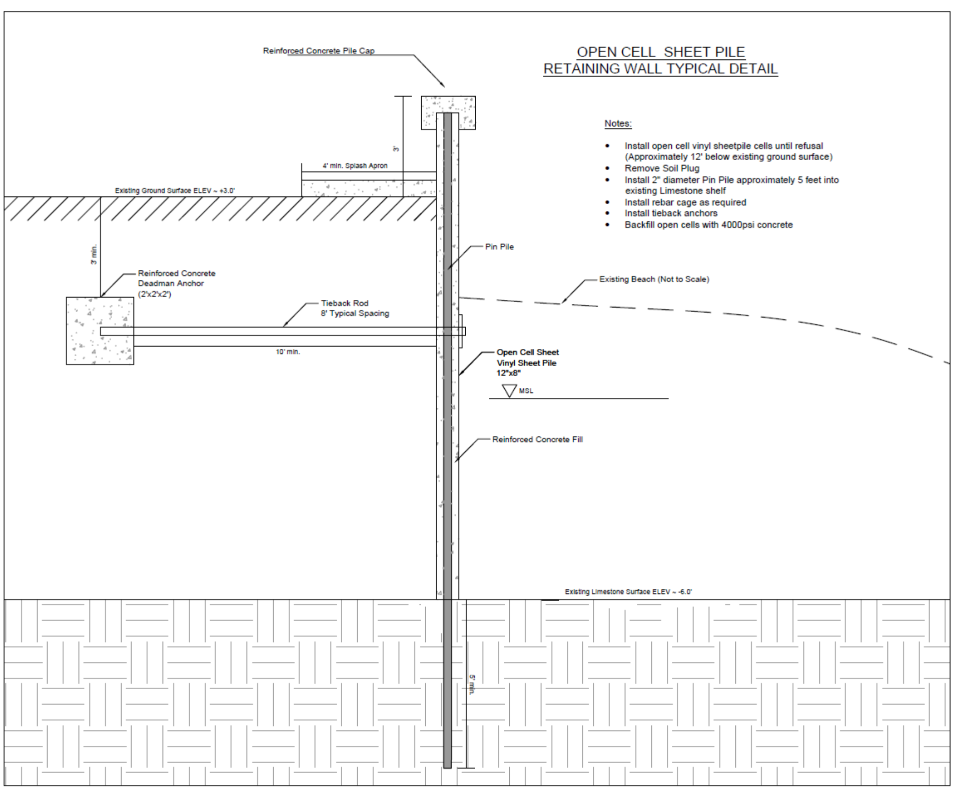
1.1.2 Alternative 2: Concrete Armor Unit Revetment

1.1.3 Alternative 3: Open Cell Piling Seawall

1.1.4 Alternative 4: Secant Pile Seawall

1.2 Tentatively Selected Plan

Alternative 3: Open Cell Piling Seawall



Components:

- Vinyl sheetpile cells with reinforced concrete
- Anchor pin
- Reinforced Pile Cap
- Tieback Anchors

2. Cost Summary

The following table includes cost summary of the various alternatives. The TSP alternative is shown in YELLOW below as alternative 3: Open Cell Piling Seawall.

			Agat Alternative Estimates				**9/26/2024**
			Includes 30 and 31 Account for PED and S&A.				
Alt.		**Measure**	**Quantity**	**U/M**	**Total Direct Cost**	**Contingency**	**Total Project Cost**
Alt. 1	**No Action**				**N/A**	**N/A**	**N/A**
						70%	
Alt. 2	**Concrete Armor Unit (1 TN Tribar)**				**$ 4,471,848**	**$ 3,097,267**	**$ 7,569,115**
	01	Lands and Damages	1	LS	**61,467**	**10,000**	**$ 71,467**
	06	Environmental Mitigation	0.15	AC	**350,000**	**245,000**	**$ 595,000**
	18	Cultural Mitigation	1	LS	**200,000**	**140,000**	**$ 340,000**
		Construction					
		Existing Wall Demo	142	CY	169,014	118,309	$ 287,323
		Backfill Wall	47	CY	1,768	1,237	$ 3,005
		Geotextile	889	SY	7,738	5,417	$ 13,155
		Revetment (1 TN Tribar)	320	LF	1,953,984	1,367,789	$ 3,321,772
		Associated Cost	1	EA	63,155	44,209	$ 107,364
		Tree Removal and Replacement	20	EA	254,122	177,885	$ 432,007
		Reseeding	5280	SY	136,895	95,827	$ 232,722
		Backfill behind Revetment	36	CY	1,334	934	$ 2,268
		Concrete Stairs	1	EA	44,980	31,486	$ 76,467
		Cultural Resource Monitor	450	HRS	124,426	**87,098**	$ 211,524
	16	**Construction Subtotal**			**2,757,415**	**1,930,191**	**4,687,606**
	30	**Engineering and Design (25%)**			**689,354**	**482,548**	**1,171,901**
	31	**Supervision and Admin (15%)**			**413,612**	**289,529**	**703,141**
						50%	
Alt. 3	**Open Cell Piling Seawall**				**$ 4,480,569**	**$ 2,226,427**	**$ 6,706,996**
	01	Lands and Damages	1	LS	**47,715**	**10,000**	**$ 57,715**
	06	Environmental Mitigation	0.15	AC	**350,000**	**175,000**	**$ 525,000**
	18	Cultural Mitigation	1	LS	**200,000**	**100,000**	**$ 300,000**
		Construction					
		Existing Wall Demo	142	CY	169,014	84,507	$ 253,520
		Construct Vinyl Cell Wall	320	LF	1,713,245	856,622	$ 2,569,867
		Associated Cost	1	EA	67,556	33,778	$ 101,334
		Tree Removal and Replacement	20	EA	254,122	177,885	$ 432,007
		Reseeding	5,280	SY	136,895	68,448	$ 205,343
		Concrete Stairs	1	EA	44,980	31,486	$ 76,467
		Cultural Resource Monitor	1,402	HRS	387,656	193,828	$ 581,484
	16	**Construction Subtotal**			**2,773,467**	**1,386,734**	**4,160,201**
	30	**Engineering and Design (25%)**			**693,367**	**346,683**	**1,040,050**
	31	**Supervision and Admin (15%)**			**416,020**	**208,010**	**624,030**
						57%	
Alt. 4	**Secant Pile Seawall**				**$ 5,392,609**	**$ 3,056,590**	**$ 8,449,199**
	01	Lands and Damages	1	LS	**47,715**	**10,000**	**$ 57,715**
	06	Environmental Mitigation	0.15	AC	**350,000**	**199,500**	**$ 549,500**
	18	Cultural Mitigation	1	LS	**200,000**	**114,000**	**$ 314,000**
		Construction					
		Existing Wall Demo	142	CY	169,014	96,338	$ 265,351
		Construct Secant Pile Wall	320	LF	2,441,293	1,391,537	$ 3,832,829
		Associated Cost	1	EA	67,556	38,507	$ 106,063
		Tree Removal and Replacement	20	EA	254,122	177,885	$ 432,007
		Reseeding	5,280	SY	136,895	78,030	$ 214,925
		Concrete Stairs	1	EA	44,980	31,486	$ 76,467
		Cultural Resource Monitor	1,125	HRS	311,065	177,307	$ 488,372
	16	**Construction Subtotal**			**3,424,924**	**1,952,207**	**5,377,131**
	30	**Engineering and Design (25%)**			**856,231**	**488,052**	**1,344,283**
	31	**Supervision and Admin (15%)**			**513,739**	**292,831**	**806,570**

3. Basis of Estimate

3.1 Basis of Design

The design details are described in the Agat CAP Section 14 Emergency Shoreline Protection Project. 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.

Alternative 1: 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 2: Concrete Armor Unit Revetment
Alternative 2 involves the removal of the existing seawall and the construction of a new concrete armor unit revetment. The 320'-long revetment will have a 30'-wide footprint, a 6'-wide crest, and a 1V:1.5H side slope. The revetment will be constructed with a 2.7'-thick layer of 1-ton armor rock atop a 2.2'-thick underlayer stone layer of 100 to 300-pound rock. The base of the revetment will be keyed in 2' deep into the hard substrate (the limestone bedrock). Finished crest elevation will be 6' above mean sea level (MSL) and will extend down to -6' MSL.

Alternative 3: Open Cell Piling Seawall
Alternative 3 is the tentatively selected plan (TSP) and involves the removal of the existing seawall and the construction of an open cell piling seawall. The 320'-long open cell piling seawall will have 1' wide vinyl cells filled with reinforced concrete installed to the consolidated limestone shelf. The seawall will have a 2'-wide pile cap and a 4'-wide splash apron. The seawall will be constructed by driving vinyl open cell sheet piling using a vibratory mandrel hammer to the limestone shelf. Following the driving of the vinyl piles, the soils in the annulus will be removed by a water jet method. A 2" diameter pin pile will be installed a minimum of 1' deep into the limestone bedrock, with an expected embedment depth of 5'. The annulus will be backfilled with reinforced concrete. The minimum depth of embedment for the pin piles is 1'. The seawall will be attached to reinforced concrete deadman anchors using 10' long tieback rods at a minimum of 3' deep in the backfill. The 2' x 2' x 2' deadman anchors will be placed every 8' for the length of the seawall. The finished seawall will have a top elevation of 6' MSL and will extend down to -6' MSL (Plus an additional 5' for the Pin Pile). The top of the seawall will be approximately 3' above the existing grade of the mayor's complex.

Alternative 4: Secant Pile Seawall
Alternative 4 involves the removal of the existing seawall and the construction of a secant pile seawall. The 320'-long secant pile seawall will have a 2'-wide footprint and will be vertical. The secant piles will be anchored 5' into the bedrock and will be 2' in diameter with a reinforced concrete pile cap at the top of the wall. The finished seawall will have a top elevation of 6' MSL and will extend down to -6' MSL (plus 5' drilled into the existing limestone).

3.2 Basis of Quantities

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

3.3 TSP 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 Guam regional area and estimated at 10% of the direct construction costs.

3.3.2 Existing Wall Demolition

The existing wall is made up of block, concrete and rock rubble and will be demolished and backfilled prior to construction. The demolition will be hauled offsite and disposed at a local waste facility.

3.3.3 Pile Driving

A temporary work platform will be constructed in order to allow for vertical alignment and driving of the vinyl piles. The vinyl piles will be driven through 10 to 12’ of unconsolidated marine sediments until reaching the underlying limestone bedrock. Piling can be drive with a hydraulic hammer on a small excavator or backhoe.


3.3.4 Water Jet Interior

Removing the material from the interior of the vinyl piling will be accomplished by pumping a jet of water into the annular space in the piling and clearing the sand.

3.3.5 Pin Anchors

Friction fit pin piles will be drilled through the existing limestone rock to a depth of 5’. This is assumed to be accomplished with a small drill rig similar to what would drill water wells.

3.3.6 Reinforced Concrete Fill

Rebar is inserted into the annular space and 4,000 psi concrete is pumped into the interior of the vinyl piling.


Reinforced Pile Cap

The estimate assumes 20 trees will need to be removed for the existing wall demolition or revetment installation.

3.3.7 Deadman Anchors

Deadman anchors (2' x 2' x 2') will be installed 5' below grade and 10' on the landside of the wall. Anchors are assumed to be set on an aggregate pad and have a 10' tie back rod connecting them to the vinyl pile wall at 8' on center spacing.

3.3.8 Cultural Resource Monitor

The estimate assumes a cultural resource monitor is onsite during active excavation for the vinyl wall.

3.3.9 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
Mobilization [Running %]	10.00%	10.00%
JOOH [Running %]	25.00%	25.00%
HOOH [Running %]	15.00%	15.00%
Profit [Running %]	10.00%	10.00%
Bond [Running %]	1.00%	1.00%

Subcontractor

Markup	Own Work	Sub Work
Mobilization [Running %]	10.00%	10.00%
JOOH [Running %]	10.00%	10.00%
HOOH [Running %]	15.00%	15.00%
Profit [Running %]	10.00%	10.00%

3.3.10 Miscellaneous Markups, Assumptions, & General Notes

- Escalation (~9%) was taken into account for the alternative analysis.
- 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.
- There are no work windows or restriction. 10% overtime rate was applied in MII and assumes a single shift working a typical 50 hour work.
- MII Equipment rates per EP 1110-1-8, Volume 12, 2022.

- 2024 Davis Bacon Wage Rates for Guam were assumed in the estimate. Labor shortages have been reported in Guam and an additional $10/hr was added to the Davis Bacon Wage rates.

4. Construction Schedule

The anticipated base year for construction is 2027. The current estimated duration for the project is 6 months of construction with a single construction contract.

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 3 is approximately 50%. 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

Estimated by
Designed by
Prepared by Phillip Ohnstad CPC, CCC
Preparation Date 9/26/2024
Effective Date of Pricing 9/26/2024
Estimated Construction Time Days

Designed by

Estimated by

Prepared by
Phillip Ohnstad CPC, CCC

Design Document	
Document Date	9/26/2024
District	Walla Walla District
Contact	Phillip Ohnstad 509.527.7587
Budget Year	2024
UOM System	Original

Direct Costs
LaborCost
EQCost
MatlCost
SubBidCost
HistoricalCost
Quote
Allowance
Design Fee

Timeline/Currency

Preparation Date	9/26/2024
Escalation Date	9/26/2024
Eff. Pricing Date	9/26/2024
Estimated Duration	0 Day(s)
Currency	US dollars
Exchange Rate	1.000000

Costbook CB22EN: 2022 MII English Cost Book

Labor NLS2021: Davis Bacon Wage Rates Guam 2024

Labor Rates
LaborCost1
LaborCost2
LaborCost3
LaborCost4

Equipment EP22R12: MII Equipment 2022 Region 12

Region 12 - KWAJALEIN, (2022)

Sales Tax	4.25
Working Hours per Year	1,370
Labor Adjustment Factor	0.94
Cost of Money	4.88
Cost of Money Discount	25.00
Tire Recap Cost Factor	1.50
Tire Recap Wear Factor	1.80
Tire Repair Factor	0.15
Equipment Cost Factor	1.00
Standby Depreciation Factor	0.50

Fuel

Electricity	0.378
Gas	5.150
Diesel Off-Road	5.030
Diesel On-Road	5.530

Shipping Rates

Over 0 CWT	291.30
Over 240 CWT	137.99
Over 300 CWT	116.41
Over 400 CWT	120.89
Over 500 CWT	32.37
Over 700 CWT	27.74
Over 800 CWT	9.51

Currency in US dollars

Description	Quantity	UOM	ContractCost	ProjectCost
Project Cost Summary Report			**8,216,336**	**8,955,807**
1 Concrete Armor Unit (1 TN Tribar)	**320.00**	**LF**	**2,529,739**	**2,757,415**
2 Open Cell Piling Seawall	**320.00**	**LF**	**2,544,465**	**2,773,467**
3 Secant Pile Seawall	**320.00**	**LF**	**3,142,132**	**3,424,924**

Currency in US dollars

Abbreviated Risk Analysis

Project (less than $40M): **Agat Shore Protection** — **Alternative:** **Alt 2,3,4**

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

Risk Category: **Moderate Risk: Typical Project Construction Type** — **Meeting Date:** **12/12/2023**

Total Estimated Construction Contract Cost = $ -

	CWWBS	Feature of Work	Estimated Cost		% Contingency	$ Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	$ -		0%	$ -	$ -
2	10 BREAKWATERS AND SEAWALLS	Tribar Revetment	$ 2,760,000		70%	$ 1,933,828	$ 4,693,828
3	10 BREAKWATERS AND SEAWALLS	Vinyl Open Cell Piling	$ 2,773,500		50%	$ 1,398,512	$ 4,172,012
4	10 BREAKWATERS AND SEAWALLS	Secant Pile	$ 3,425,000		57%	$ 1,950,136	$ 5,375,136
5			$ -		0%	$ -	$ -
6			$ -		0%	$ -	$ -
7			$ -		0%	$ -	$ -
8			$ -		0%	$ -	$ -
9			$ -		0%	$ -	$ -
10			$ -		0%	$ -	$ -
11			$ -		0%	$ -	$ -
12			$ -		0%	$ -	$ -
13	All Other	**Remaining Construction Items**	$ -	*0.0%*	0%	$ -	$ -
14	30 PLANNING, ENGINEERING, AND DESIGN	**Planning, Engineering, & Design**	$ -		0%	$ -	$ -
15	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.)	

Agat Shore Protection Alt 2,3,4

Alternative Formulation

Abbreviated Risk Analysis

Meeting Date: 12-Dec-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	Tribar Revetment	• Potential for scope growth, added features? • Project accomplishes intent? • Funding Difficulties?	Additional protection measures or modification to proposed measures may need to be modified due to wave climate but should be reflected in current assumptions. Quantity risk is considered low and is more likely to have greater impact. Tree scope of work is assumed and likely to change based on final wall layout.	Marginal	Possible	1
PS-2	Vinyl Open Cell Piling	• Potential for scope growth, added features? • Project accomplishes intent? • Funding Difficulties?	Additional protection measures or modification to proposed measures may need to be modified due to wave climate but should be reflected in current assumptions. Quantity risk is considered low and is more likely to have greater impact. Tree scope of work is assumed and likely to change based on final wall layout. Vinyl base could break down and could add plastic to a marine environment. Risk of additional maintenance or mitigation costs. Resource agencies may say impacts are now greater because the impacts associated with construction would be in vain if the benefits are shorter due to shorter shelf life	Moderate	Possible	2
PS-3	Secant Pile	• Potential for scope growth, added features? • Project accomplishes intent? • Funding Difficulties?	Additional protection measures or modification to proposed measures may need to be modified due to wave climate but should be reflected in current assumptions. Quantity risk is considered low and is more likely to have greater impact. Tree scope of work is assumed and likely to change based on final wall layout.	Marginal	Possible	1
Acquisition Strategy				**Maximum Project Growth**		**30%**

AS-1	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. Tribar new construction type that has not been utilized on Guam and may limit competition.	Moderate	Possible	2
AS-2	Vinyl Open Cell Piling	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. Viny Cell new construction type that has not been utilized on Guam and may limit competition.	Moderate	Possible	2
AS-3	Secant Pile	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. Specialty contractor needed for installing the secant piles.	Significant	Possible	3
Construction Elements					**Maximum Project Growth**	**25%**
CE-1	Tribar Revetment	• High risk or complex construction elements, site access, in-water? • Special mobilization of plants • Potential for construction modification and claims?	Revetment installation is pretty straight forward and cost growth is possible. Limited concrete supply has occurred leading to increased costs.	Marginal	Possible	1
CE-2	Vinyl Open Cell Piling	• High risk or complex construction elements, site access, in-water? • Special mobilization of plants • Potential for construction modification and claims?	Vinyl wall has not been completed by the USACE and contractor could experience difficulties driving vinyl pile. Limited concrete supply has occurred leading to increased costs.	Marginal	Possible	1
CE-3	Secant Pile	• High risk or complex construction elements, site access, in-water? • Special mobilization of plants • Potential for construction modification and claims?	Large pile drilling equipment may not be available on Guam and may need to be imported leading to increased costs. Limited concrete supply has occurred leading to increased costs.	Moderate	Possible	2
Specialty Construction or Fabrication					**Maximum Project Growth**	**65%**

SC-1	Tribar Revetment	Numerous assumptions are made w/ a conceptual design, but no special equipment or fabrications are anticipated.	Tribar Concrete Armor Units have not been utilzied on Guam. Esablishing local fabrication site and QC issues could lead to additional costs.	Significant	Likely	4
SC-2	Vinyl Open Cell Piling	Numerous assumptions are made w/ a conceptual design, but no special equipment or fabrications are anticipated.	Major construction is vinyl pile with minimal equipment requirements. Additional cost impacts are possible but the impact is marginal.	Marginal	Likely	2
SC-3	Secant Pile	Numerous assumptions are made w/ a conceptual design. Large drilling equipmetn is required for a secant pile wall and may not be available on Guam.	Major construction is secan pile with large drilling equipjment required. Additional cost impacts are possible but the impact is moderate.	Moderate	Likely	3
Technical Design & Quantities				**Maximum Project Growth**		**30%**
T-1	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.	Moderate	Possible	2
T-2	Vinyl Open Cell Piling	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.	Moderate	Possible	2
T-3	Secant Pile	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.	Moderate	Possible	2
Cost Estimate Assumptions				**Maximum Project Growth**		**35%**
EST-1	Tribar Revetment	Most cost changes will be based on design scope and quantity changes, which are addressed elsewhere.	Design may change from current assumptions but its not expected to have any significant impact on cost. Design and tribar revetment has not been constructed in Guam so costs changes are likely. Labor shortages have been reported and may cost more than estimated.	Significant	Possible	3
EST-2	Vinyl Open Cell Piling	Most cost changes will be based on design scope and quantity changes, which are addressed elsewhere.	Design may change from current assumptions but its not expected to have any significant impact on cost. Design and tribar revetment has not been constructed in Guam so costs changes are likely. There is no historical production data so much of the production for the vinyl wall are based on the estimators judement. Labor shortages have been reported and may cost more than estimated.	Moderate	Likely	3
EST-3	Secant Pile	Most cost changes will be based on design scope and quantity changes, which are addressed elsewhere.	Design may change from current assumptions but its not expected to have any significant impact on cost. Design and tribar revetment has not been constructed in Guam so costs changes are likely. There is no historical production data so much of the production for the vinyl wall are based on the estimators judement. Labor shortages have been reported and may cost more than estimated.	Moderate	Possible	2
External Project Risks				**Maximum Project Growth**		**40%**

EX-1	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. Recent history indicates an annual national construction escalation rate of 3.5%. The support for the project is high sovinyl seawall delay risks are unlikely. Human Remains are possible in the shallow water and could lead to delays and additional project costs. Material shortages are possible. Cement shortages have been reported and could lead to additional costs. Need easement/agreement from Gov-Guam for land required for the project.	Moderate	Possible	**2**
EX-2	Vinyl Open Cell Piling	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. Recent history indicates an annual national construction escalation rate of 3.5%. The support for the project is high sovinyl seawall delay risks are unlikely. Human Remains are possible in the shallow water and could lead to delays and additional project costs. Material shortages are possible. Cement shortages have been reported and could lead to additional costs. Need easement/agreement from Gov-Guam for land required for the project.	Moderate	Possible	**2**
EX-3	Secant Pile	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. Recent history indicates an annual national construction escalation rate of 3.5%. The support for the project is high sovinyl seawall delay risks are unlikely. Human Remain are possible in the shallow water and could lead to delays and additional project costs. Material shortages are possible. Cement shortages have been reported and could lead to additional costs. No offsite materials required and lowers risk compared to the tribar and vinyl options. Need easement/agreement from Gov-Guam for land required for the project.	Moderate	Unlikely	**1**

Agat Shore Protection Alt 2,3,4
Alternative Formulation
Abbreviated Risk Analysis

Risk Evaluation

WBS	Potential Risk Areas	Project Management & Scope Growth	Acquisition Strategy	Construction Elements	Specialty Construction or Fabrication	Technical Design & Quantities	Cost Estimate Assumptions	External Project Risks	Cost in Thousands
10 BREAKWATERS AND SEAWALLS	**Tribar Revetment**	1	2	1	4	2	3	2	$2,760
10 BREAKWATERS AND SEAWALLS	Vinyl Open Cell Piling	2	2	1	2	2	3	2	$2,774
10 BREAKWATERS AND SEAWALLS	Secant Pile	1	3	2	3	2	2	1	$3,425

AGAT EMERGENCY SHORELINE PROTECTION
CONTINUING AUTHORITIES PROGRAM - SECTION 14
AGAT, GUAM

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

Agat, Guam

CAP Section 14 Emergency Shoreline Protection

Draft Integrated Feasibility Report and Environmental Assessment

September 2024

Appendix A-3

TABLE OF CONTENTS

***to be inserted when received*

1 INTRODUCTION

This Appendix to the Integrated Feasibility Report and Environmental Assessment (IFR/EA) provides a more detailed administrative record of coordination on environmental compliance conducted to date as part of the Agat Mayor’s Complex - Continuing Authorities Program (CAP), Section 14 Emergency Shoreline Protection (Project). It further discusses compliance specific to the Territory of Guam (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)
- Guam Environmental Protection Agency (GEPA)
- Guam Division of Aquatic and Wildlife Resources (DAWR)
- Guam State Historic Preservation Office (GSHPO)
- Guam Preservation Trust (GPT)
- Guam Department of Chamorro Affairs (GDCA)

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 IFR/EA and FONSI have 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 IFR/EA. Coordination on public outreach and information sharing continues with the non-federal sponsor, the Government of Guam. Compliance with this Act will be complete at the time of the FONSI signing. The FONSI is located in Attachment 10.

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

Agat is not designated as a nonattainment or maintenance area for any criteria pollutant; therefore, U.S. Environmental Protection Agency's (USEPA) General Conformity Rule to implement Section 176(c) of the CAA [42 U.S.C. §7506(c)] does not apply. No air quality permits, nor a conformity determination are required for this project. The project will comply with the Act.

3.3 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 does 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. The Preferred Alternative 3: Open Cell Pile Seawall disturbs 0.72 acres, less than 1 acre and therefore doe not require an NPDES construction permit.

- 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) and 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 4.

- Sections 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. All “existing and readily available” state or territorial surface water quality data must be reviewed and compared to 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.

3.3.1 Specific Territorial Regulations for CWA

CWA Section 401: In accordance with CWA Section 401, the Guam Environmental Protection (GEPA) 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.

CWA Section 402: In accordance with CWA Section 402, the U.S. Environmental Protection Act (USEPA) administers the Territory's 402 Water Quality Certification and NPDES Program. The USEPA has not authorized the Territory of Guam to issue its own NPDES permits; therefore, USEPA Region 9 is the permit-issuing agency for Guam. 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.

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

CWA Section 305(b) and Section 303(d): The Territory's water quality standards designate the waters of Agat Bay as M2, whole body contact recreation, aquatic life, and consumption primary designated uses. Agat Bay water quality in the vicinity of the Mayor's Complex is reported as good for 2020 (USEPA 2023). TMDLs have not yet been developed for any of these impaired waters.

3.3.2 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 GEPA were informed about the preferred plan during a Resource Agency Workshop on 17 May 2023 (HST). Section 401 Water Quality Certification will be requested from the GEPA prior to construction of the project.

With respect to the Section 401 permit, USACE would be responsible for compliance during construction while the Guam Department of Public Works (GDPW) would need to comply separately with Section 401 for O&M.

Coordination with the USEPA and GEPA will continue during the draft IFR/NEPTA 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 GEPA prior to construction of the project.

CWA 404

A Draft 404(b)(1) evaluation is included as Attachment 4 of this Appendix. The 404(b)(1) analysis demonstrates that both construction and O&M will comply with Section 404. So long as the non-federal sponsor (Guam Department of Public Works) 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.

3.4 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 public notice and other evaluations normally conducted for activities related to the Act. The proposed work will not obstruct navigable waters of the U.S. The project will comply with the Act.

3.5 Marine Protection, Research, and Sanctuaries Act (33 U.S.C. §1401 ET SEQ.).

Ocean disposal is not a component of this project; therefore, this Act is not applicable.

3.6 Migratory Bird Treaty Act (MBTA; 16 U.S.C. §§703-712) and Migratory Bird Conservation Act (16 U.S.C. §§715-715D, 715E, 715F-715R)

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 means of intentional or unintentional human assistance.

Currently, none of the migratory bird species found on Guam nest in the project area; therefore, vegetation clearing during nesting season does not need to be avoided. If that should change, USACE will include standard migratory bird protection measures as described in Attachment 7: Migratory Bird Consultation in the project plans and specifications and will require the Contractor to abide by those requirements. The USACE coordinated with the USFWS, and the project will comply with these Acts.

3.7 Marine Mammal Protection Act (MMPA)

All marine mammals are protected under MMPA (*16 USC § 1361 et seq*.), which prohibits take 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 Threatened and Endangered marine mammals, any activities that could affect ESA-listed species must be consistent with the ESA as well.

3.7.1 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 project area 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.

3.8 Anadromous Fish Conservation Act (16 U.S.C. §§757A-757G)

This project will have no effect on anadromous fish species. The Act does not apply.

3.9 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.

3.9.1 FWCA Coordination for the Proposed Project

Pursuant to the Fish and Wildlife Coordination Act (FWCA) of 1934, as amended (16 U.S.C. §§ 661–667e), USACE consulted USFWS and NMFS on the effect of the recommended alternative (Alternative 3) on fish and wildlife resources as documented in Appendix 3, Attachment 1. A final FWCA Report was received on April 29, 2024, and incorporated into this report. DAWR received a copy of this report and concurred with the findings. The project complies with the Act.

3.10 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.

3.10.1 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 Guam. 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 (MOU) outlines the specific roles of each agency.

DAWR is the territorial agency responsible for managing and preserving the marine and wildlife resources in Guam. DAWR also distributes hunting regulations that control the taking of various wildlife species, including fruit bats and native birds.

3.10.2 ESA Coordination for the Proposed Project

USFWS and NMFS participated in the July 17, 2023, Resource Agency Workshop. USACE requested technical assistance from NMFS and USFWS on December 22, 2023, and received a list of species listed or proposed for listing under NMFS jurisdiction on 27 December 27, 2023 and USFWS jurisdiction on 28 February 2024 that may be present on or in the vicinity of the proposed project location, 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 2).

Pursuant to Section 7 of the Endangered Species Act, USACE evaluated the potential effects to Threatened and Endangered species that may be affected by implementation of the

Recommended Plan. USACE determined the federal action may affect but is not likely to adversely affect corals, turtles, the Mariana fruit bat, and tree snails. Detailed discussion on the USACE determination is included in the Biological Assessment in Appendix 3 Attachment 2f.

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

3.11 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 U.S. Pacific Islands and creates and amends management plans for fisheries seaward of state/territorial waters in the U.S. Pacific Islands. Both the Guam Bottomfish 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.

3.11.1 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 Guam to 200 nautical miles from the baseline from which the breadth of the territorial sea is measured. 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).

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 Guam were designated as EFH. As such, all surrounding waters and submerged lands around Guam are designated as EFH and support various life stages for the management unit species (MUS) identified under the Western Pacific Fishery Management Council's Guam Bottomfish and Pacific Pelagic Fishery Ecosystem Plans. The management unit species and life stages found in these waters include eggs, larvae, juveniles, and adults of Bottomfish 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. See Section 2.9 of Appendix A-3.

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 Guam were designated as EFH. As such, all surrounding waters and submerged lands around the island of Guam are designated as EFH and support various life stages for the MUS identified under the WPRFMC's Pelagic and Mariana Archipelago Fishery Ecosystem Plans. The MUS and life stages found in these waters include eggs, larvae, juveniles, and adults of Bottomfish 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. See Section 3.3 of Appendix A-3.

3.11.2 MSA Coordination for the Proposed Project

USACE initiated consultation with NMFS during the July 17, 2023, Resource Agency Workshop. Consultation is ongoing; EFH consultation including the EFH assessment can be found in Attachment 3 of this Appendix. The project will comply with the Act.

3.12 Coastal Zone Management Act (CZMA) of 1972

Congress enacted the Coastal Zone Management Act (*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.

3.12.1 Specific Territorial Regulations for CZMA

In Guam, federal consistency determinations under the CZMA are administered by the Guam Bureau of Statistics and Plans (GBSP) through the Guam Coastal Management Program (GCMP).

The GCMP was approved in 1979 and is the federally approved coastal management program for the Territory of Guam. The GCMP 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.

3.12.2 CZMA Coordination for the Proposed Project

A Federal Consistency Determination (FCD) evaluation is included as Attachment 5 in this Appendix. Pursuant to the CZMA, an FCD was drafted and will be submitted to Guam BSP for review and concurrence. USACE determined that the Recommended Plan is consistent with the territory’s Coastal Zone Management Program and anticipates receiving concurrence. The project will comply with this Act.

3.13 Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 U.S.C. §4601 ET SEQ.).

The purpose of Public Law 91-646 is to ensure that owners of real property to be acquired for Federal and federally assisted projects are treated fairly and consistently and that persons displaced as a direct result of such acquisition will not suffer disproportionate injuries because of projects designed for the benefit of the public as a whole. This project does not involve real property acquisition and/or displacement of property owners or tenants. Therefore, this Act is not applicable.

3.14 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.

3.15 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 of Historic Places. In carrying out their responsibilities under Section 106, the NHPA requires that federal agencies consult with federally recognized tribes and native peoples 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 the potential of a proposed federal undertaking to cause an effect; 2) identify historic properties with the federal undertaking’s Area of Potential Effect; 3) assess whether the undertaking will have an adverse effect on historic properties that are within the Area of Potential Effect, and 4) if avoidance or minimization of an adverse effect is not possible, work with consulting parties to identify mitigation that will resolve the adverse effect.

3.15.1 NHPA Coordination for the Proposed Project

Pursuant to Section 106 of the National Historic Preservation Act of 1966 (54 U.S.C. § 306108), as amended, USACE notified the Guam State Historic Preservation Officer (SHPO), the Guam Preservation Trust, and the Guam Department of Chamorro Affairs of this undertaking on 29

August 2023. In consultation with these parties, USACE has determined the proposed undertaking's Area of Potential Effect (APE), reviewed existing information on cultural resources and historic properties within and in the general vicinity of the APE, and applied the criteria of adverse effect. On 20 March 2024, in accordance with 36 CFR § 800.5(b), USACE found that the recommended plan (Alternative 3) will not have an adverse effect on historic properties. The SHPO concurred with this determination on 29 March 2024. The project will comply with this Act.

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

The principles of the Federal Water Project Recreation Act (16 U.S.C. §460l-12 et. seq.) require USACE to give full consideration to any opportunity for the project to add or improve outdoor recreation and/or fish and wildlife enhancement. The recommended alternative does not have any anticipated long-term impacts to recreation. The project will comply with this Act.

3.17 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 Guam (National Wild and Scenic Rivers System 2015). This Act is not applicable.

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

No designated Estuary of National Significance exists within American Samoa, CNMI, Guam, or Hawaii. This Act is not applicable.

3.19 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.

3.20 Executive Order (EO) 14008 Tackling the Climate Crisis at Home and Abroad

EO 14008 (Tackling the Climate Crisis at Home and Abroad; Section 2223) established the Justice40 Initiative requiring that 40% of the overall benefits of certain federal investments be directed to disadvantaged communities. The 15 March 2022 Memorandum for Commanding General, U.S. Army Corps of Engineers, Implementation of Environmental Justice and the Justice40 Initiative defined the process for USACE to address Justice40. While CEQ's CEJST does not designate the census tracts immediately adjacent to the study area as disadvantaged, Guam is designated as an economically disadvantaged community in accordance with Section 160 of the Water Resources Development Act of 2022 and USACE (2023a). Protecting the Agat shoreline furthers Objective 6: Increase the proportion of project benefits to economically disadvantaged and historically underserved communities of Honolulu District's Environmental Justice Strategic Plan (USACE 2023b). The project will comply with this Order.

3.21 EO 13690 Floodplain 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 and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. Additionally, the agency must minimize potential harm to or in the floodplain and explain why the action is proposed. Additional floodplain management guidelines for EO 11988 were provided in 1978 by the Water Resources Council, and these have recently been revised as part of EO 13690, signed on 30 January 2015, which amends EO 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 they 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.

An eight-step process is used to ensure compliance with EO 13690; 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 IFR/EA, as listed below.

Step 1: Determine whether the proposed action is in the base floodplain. T*he proposed project is located on the shoreline in Agat, Guam.*

Step 2: Provide early public review of any plans or proposals for action in the base floodplain. *A 30-day review period of the draft IFR/EA documents will be provided to the public and consulting agencies.*

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 IFR/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 study completion if approved to move forward and all pre-construction permits are obtained.*

To comply with EO 13690, the policy of USACE is to formulate projects that, to the extent possible, avoid or minimize adverse effects associated with the use of the floodplain and avoid inducing development in the floodplain unless there is no practicable alternative. Based on the analysis in the IFR/EA, USACE concludes that the recommended alternative will not result in harm to people, property, and floodplain values, in fact would protect the floodplain, will not induce development in the floodplain, and the project is in the public interest. The project will comply with the Order.

3.22 EO 13186 Responsibilities of Federal Agencies to Protect Migratory Birds

This EO requires a MOU between the USACE and USFWS concerning migratory birds. Neither the Department of Defense MOU nor the USACE Draft MOU clearly address migratory birds on lands not owned or controlled by USACE. For many USACE civil works projects, the real estate interests are provided by the non-federal sponsor. Control and ownership of the project lands remain with a non-federal interest. Measures to avoid disturbing migratory birds are described in Attachment 7 of this Appendix and are incorporated by reference. The USACE will include standard migratory bird protection requirements in the project plans and specifications and will require the Contractor to abide by those requirements. The project will comply with the Order.

3.23 EO 13571 Invasive Species

The project's plans and specifications will include conditions to avoid the introduction and/or promotion of non-native species to the region. The USACE will require the Contractor to abide by those requirements. The project will comply with the Order.

3.24 EO 13089 Coral Reef Protection

Coral reef is in the project's proposed action area, approximately 160 ft away from the construction footprint. This distance reduces possible minimal impacts to the reef from the federal action. Impacts would be further minimized through adherence to identified conservation recommendations (CRs) and best management practices (BMPs). The project will comply with the Order.

3.25 EO 13045 Protection of Children from Environmental Health Risks and Safety Risks

On 21 April 1997, the President of the U.S. issued EO 13045, Protection of Children from Environmental Health Risks and Safety Risks. The EO mandates that each federal agency prioritizes identifying and assessing environmental health risks and safety risks that may disproportionately affect children and ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks. The proposed action does not affect children disproportionately from other members of the population and would not increase any environmental health or safety risks to children. The project will comply with the Order.

3.26 EO 12898 Environmental Justice

On 11 February 1994, the President of the U.S. issued EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. This EO mandates that each federal agency makes environmental justice (EJ) part of the agency mission and to address, as appropriate, disproportionately high and adverse human health or environmental effects of the programs and policies on minority and low-income populations. Significance thresholds that may be used to evaluate the effects of a proposed action related to EJ are not specifically outlined. However, CEQ guidance requires an evaluation of a proposed action's effect on the human environment, and USACE must comply with EO 12898. The USACE has determined that a proposed action or its alternatives would result in significant effects related to EJ if the proposed action or an alternative would disproportionately adversely affect an EJ community through its effects on:

- Environmental conditions such as quality of air, water, and other environmental media; degradation of aesthetics, loss of open space, and nuisance concerns such as odor, noise, and dust;
- Human health such as exposure of EJ populations to pathogens;
- Public welfare in terms of social conditions such as reduced access to certain amenities like hospitals, safe drinking water, public transportation, etc.; and
- Public welfare in terms of economic conditions such as changes in employment, income, and the cost of housing, etc.

The USACE conducted an evaluation of EJ impacts using a two-step process: as a first step, the study area was evaluated to determine whether it contains a concentration of minority and/or low-income populations. Following that evaluation, in the second step, USACE determined whether the proposed action would result in the types of effects listed above in a disproportionately, high adverse manner on these populations. As defined in EO 12898 and the CEQ guidance, a minority population occurs where one or both of the following conditions are met within a given geographic area:

- The American Indian, Alaska Native, Asian, Pacific Islander, Black, or Hispanic population of the affected area exceeds 50 %; or
- The minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

An affected geographic area is considered to consist of a low-income population (i.e. below the poverty level for purposes of this analysis) where the percentage of low-income persons:

- is at least 50 % of the total population; or
- is meaningfully greater than the low-income population percentage in the general population or other appropriate unit of geographic analysis.

The definition of Economically Disadvantaged Community in this document applies to all provisions in WRDA 2020 including any amendments, and future WRDA provisions for which no specific definition appears in the law. An economically disadvantaged community is defined as meeting one or more of the following:

a. Low per capita income - The area has a per capita income of 80 percent or less of the national average;
b. Unemployment rate above national average - The area has an unemployment rate that is, for the most recent 24-month period for which data are available, at least 1 percent greater than the national average unemployment rate;
c. Indian country as defined in 18 U.S.C. 1151 or in the proximity of an Alaska Native Village;
d. U.S. Territories; or
e. Communities identified as disadvantaged by the Council on Environmental Quality's Climate and Economic Justice Screening Tool (https://screeningtool.geoplatform.gov).

The Territory of Guam is now included in the CEQ's CEJST. While the entirety of Guam is considered a disadvantaged community, the purpose of this project is the protection of the community and as such would not have an adverse effect on the community. No disproportionate and adverse effects to minority and/or low-income populations are expected to result from the implementation of the recommended alternative. The project will comply with the Order.

3.27 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. There are no wetlands within the proposed project area, and no wetlands would be affected by any project activities. This EO is not applicable.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaiʻi 96850

18 December 2023

Marian Dean
Environmental Planner
Civil & Public Works Branch
US Army Corps of Engineers
Honolulu District
Fort Shafter, Hawaii 96858-5440

Re: Fish and Wildlife Coordination Act (FWCA): Agat Mayor's Complex Emergency Shoreline Protection – Agat, Guam

Dear Marian Dean:

The U.S. Fish and Wildlife Service (Service) has received a request for assistance in assessing aquatic habitat and biological resources, and potential impacts to those resources, at work sites of the proposed Agat Mayor's Complex Emergency Shoreline Protection project in Agat, Guam. The Service is requested to deliver a Fish and Wildlife Coordination Act (FWCA) Planning Aid Report to assist the U.S. Army Corps of Engineers (USACE) in assessing potential environmental impacts of the project and make recommendations for conservation of fish and wildlife resources. The areas to be assessed include 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 semi-quantitative marine resource information as well as habitat delineation maps. The semi-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 include adverse and unpredictable wind and sea conditions in the project area, travel complications, etc.

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.

Sincerely,

Dan Polhemus
Acting PIFWO Deputy Field Supervisor

Enclosures:
Enclosure 1
Enclosure 2
Enclosure 3

ENCLOSURE 1

SCOPE OF WORK
FISH AND WILDLIFE COORDINATION ACT REPORT
AGAT MAYOR'S COMPLEX EMERGENCY SHORELINE PROTECTION, AGAT, GUAM

18 December 2023

1. Project Name: Agat Mayor's Complex Emergency Shoreline Protection

2. Location: Agat, Guam

3. Proposed Project Schedule:

   Fieldwork and Reporting:

SOW Draft	18 December 2023
MIPR signed	22 December 2023
Funds Transferred	End of December 2023 (estimated)
Fieldwork	Within 30 days of receipt of funding (estimated last two weeks of January 2024)
Preliminary Findings	10 days after completion of fieldwork (estimated first week of February 2024)
Draft FWCA Report	40 days after completion of fieldwork (estimated March 2024)
USACE comments	30 days after receipt of draft (estimated April 2024)
Final FWCA Report	30 days after receipt of USACE comments on Draft (estimated May 2024)

4. Funding: **$ 43,031** (Budget Attached)

5. Study Authority and Appropriations:

   This study is authorized under Section 14 of the 1946 Flood Control Act (P.L. 79-525), as amended. This authority allows for the planning and construction of emergency stream bank and shoreline protection projects for public facilities in imminent danger of failing.

   The Fish and Wildlife Coordination Act (FWCA) of 1958, as amended (87 Stat. 401, as amended; 16 U.S.C. 661 et seq.), is intended to ensure that fish and wildlife conservation is an integral part of the development of our Nation's water resources. It is recommended that the U.S. Army Corps of Engineers (USACE) consult with the U.S. Fish and Wildlife Service (Service) to ensure that equal consideration is provided for fish and wildlife resources during the planning of the proposed project.

The Service enters into this agreement pursuant to:

a. The Economy Act of 1932 as amended (31 U.S.C. 1535) and the Fish and Wildlife Coordination Act (16 U.S.C. sec 661).
b. Section 2(e) of the Fish and Wildlife Coordination Act (16 U.S.C. 662(e)).
c. Memorandum of Agreement between the U.S. Fish and Wildlife Service and the U.S. Army Corps of Engineers for funding FWCA activities, January 22, 2003.

6. Project Background and Description:

USACE is completing a feasibility study to identify coastal erosion hazards and develop potential project alternatives for implementing emergency shoreline protection measures in Agat, Guam.

The municipal government headquarters of Agat (Mayor's Complex) is located at Agat Bay on the central west coast of the U.S. Territory of Guam (Figure 1 and 2). The Mayor's Complex acts as a key local government administrative center and a public gathering place for recreation and emergency operations. Beach erosion along approximately 450 feet of shoreline at the west-facing extent of the Mayor's Complex threatens the value and function of the property (Figure 3).

Without this project, impacts to the reliability and accessibility of this multi-use community space are imminent. A low-profile concrete rock masonry (CRM) seawall is present at the western border of the property where the lawn meets the beach (Figure 4). This structure is outdated and at risk of failure and overtopping by waves during rough sea conditions. The furthest oceanward building of the complex is just a few feet from the seawall and the eroding shoreline, and property at risk of inundation and erosion includes the mayor's office, Agat Sagan Bisita, and other adjacent structures (Figure 5).

The following alternative plans are under consideration 1) no action, 2) tribar revetment, 3) vinyl open cell sheetpile with reinforced concrete seawall, 4) secant pile seawall, and 5) relocation of the Mayor's Complex.

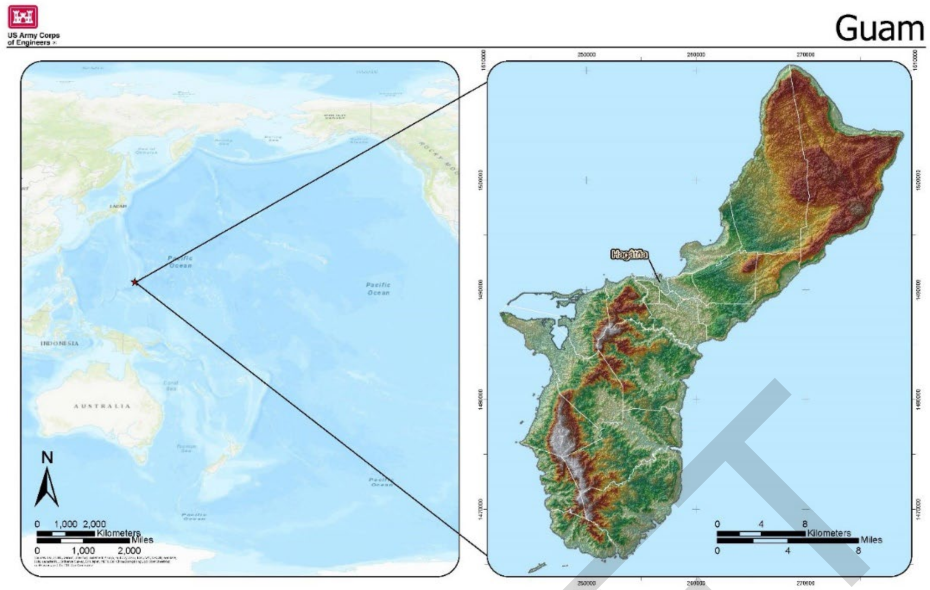


Figure 1. Location of Territory of Guam (Image provided by USACE).

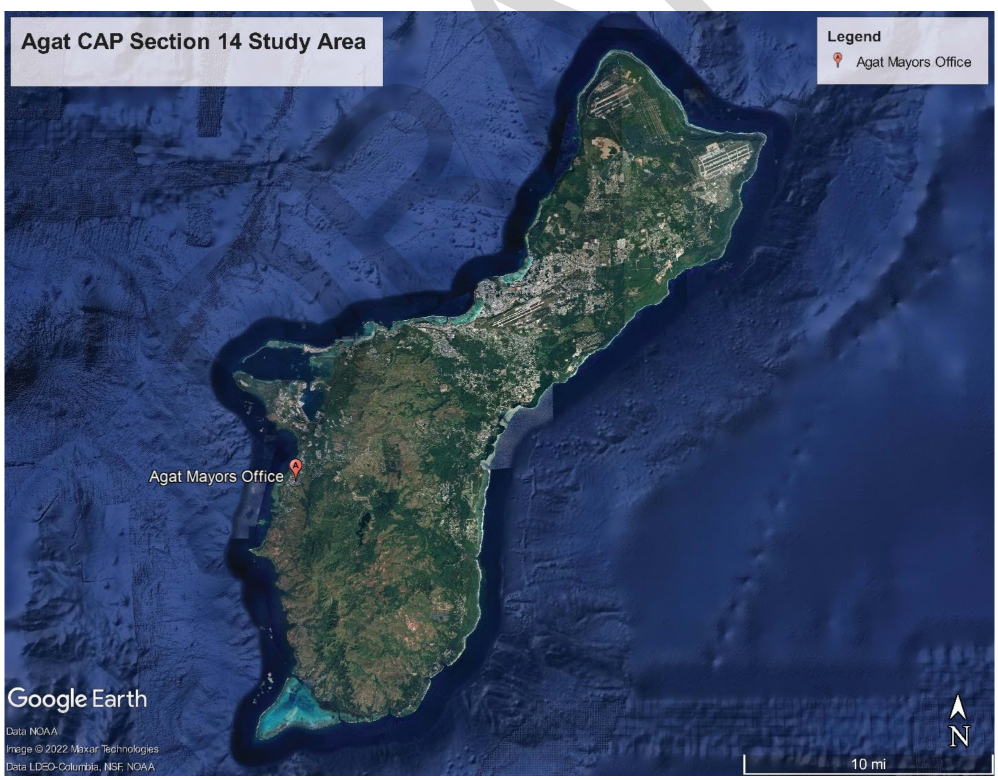


Figure 2. Location of proposed project site on the central west coast of Guam (Image provided by USACE).

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Figure 3. The proposed project site (Image provided by USACE).

Figure 4. Rock masonry wall, infrastructure, and shoreline threatened by erosion (Image provided by USACE).

Image 5. Existing seawall, infrastructure, and shoreline threatened by beach erosion (Image provided by USACE).

7. Proposed work to be completed:

The USACE aims to evaluate proposed Project Alternatives for engineering adequacy, economic viability, environmental acceptability, and project non-federal sponsor support.

In accordance with the provisions of Section 2(b) of the Fish and Wildlife Coordination Act (48 stat. 401, as amended; 16 U.S.C. 661 et seq.), the USFWS Pacific Islands Fish and Wildlife Office is requested to identify fish and wildlife concerns, identify available information and data, provide USFWS positions on the significance of fish and wildlife resources and anticipated impacts, recommend resources that should be evaluated in the study, and participate in the identification and evaluation of the effects that the Study alternatives may have on wildlife and aquatic resources. The USFWS will coordinate with the National Marine Fisheries Service (NMFS) and the Guam Division of Aquatic and Wildlife Resources (DAWR) during this project and for reporting. Comments and concerns from NMFS and DAWR will be incorporated into the FWCAR.

1a. USFWS Scope of Work

General tasks to be completed by the USFWS as part of this scope include: 1) attend and participate in study team meetings and participate in general coordination with USACE environmental personnel; 2) coordinate with other resource agencies; 3) provide the perspective of the USFWS on the final array of alternatives with recommendations on protecting and conserving fish and wildlife resources; 4) conduct field surveys and produce a field survey report or memo that summarizes findings; and 5) develop a draft and final Fish and Wildlife Coordination Act (FWCA) Report (FWCAR); sometimes this is referred to as a FWCA Section 2(b) Report.

The service will provide a FWCA Report intended to assist USACE in their equal consideration of fish and wildlife resources as part of the project feasibility study. FWCA findings can help to inform decisions on whether to move forward with the proposed project and what Project Alternatives are favorable based on potential impacts to aquatic natural resources.

The FWCA investigation aims to assess potential threats to aquatic resources and recommend avoidance measures associated with the proposed project. The Service and/or partner agency biologists will collect the ecological data needed to inform USACE on potential impacts of the proposed project on valuable and protected aquatic habitats and species. Reporting will include review of relevant literature and previous studies, available remote sensing data, and field data collected at the specific proposed project site. The Service will produce habitat maps, including the most likely areas of impacts to aquatic resources based on detailed field observations, provide descriptions of environmental concerns associated with the proposed project, and will recommend approaches to achieve project goals while minimizing impacts to natural resources of concern. Recommendations may also include mitigation options to offset any unavoidable negative impacts to aquatic natural resources. The Service will solicit input from relevant local and federal agencies to contribute to development and execution of the FWCA investigation and report.

The Service will provide the following specific work:

A. Basic marine surveys with habitat delineation of the project area, along the existing Mayor's Complex seawall (See Enclosure 2; Budget)
    i. The Service will lead a team of two (2) biologists to conduct habitat mapping and qualitative surveys at the project area to provide a basic characterization of the resources.
    ii. Habitat maps will be generated by the Service to provide a general overview and delineation of habitats within the project area.

iii. Semi-quantitative surveys by the Service will include the following: surveys of corals and the geomorphological structure including identification of any observed ESA listed corals.

iv. Preliminary findings including general qualitative observation and draft maps will be provided as soon as possible after fieldwork completion. This may include meetings to show photos and maps of the area and discuss details of the surveys.

v. A Draft Survey Report is expected to be provided within 120 days following the receipt of the MIPR and 30 days after analysis of preliminary findings.

vi. The Final Survey Report will be provided within 30 days after formal comments are received from USACE; otherwise, the draft report will serve as the final report.

8. Key Contact Persons:

U.S. Fish and Wildlife Service (USFWS)
Pacific Islands Fish and Wildlife Office (PIFWO)
300 Ala Moana Blvd Rm 3-122
Honolulu, HI 96850
Tel. (808) 792-9400

USFWS Technical POC:		
Jeremy Raynal	jeremy_raynal@fws.gov	(808)210-6298
USFWS Financial POC:		
Laurie Thiery	laurie_thiery@fws.gov	(808)792-9405

U.S. Army Corps of Engineers (USACE)
Honolulu District
Fort Shafter, HI 968580-5440

USACE Project POC:		
Marian Dean	marian.dean@usace.army.mil	(808)379-8223
USACE Financial POC:		
Kathleen De Guzman	kathleen.m.deguzman@usace.army.mil	(808)835-4043

ENCLOSURE 2

PROPOSED BUDGET
FISH AND WILDLIFE COORDINATION ACT REPORT
AGAT MAYOR'S COMPLEX EMERGENCY SHORELINE PROTECTION, AGAT, GUAM

18 December 2023

SERVICE – Agat Mayor's Complex Fieldwork and Reporting

Staff:	
Coordination meetings: Bioday Rate $1,085 x 2 bios x 2 days:	$ 4,340
Analysis and Writing: Bioday Rate $1,085 x 1 bios x 10 days:	$ 10,850
Subtotal	**$ 15,190**
Supplies:	
Survey Supplies:	$ 500
Subtotal	**$ 500**
Field Work:	
Field Work: Bioday Rate $1085 x 2 bios x 3 days:	$ 6,510
Airline travel: 2 passengers (HNL-GUM-HNL):	$ 6,350
Airline baggage fees ($450):	$ 000*
*Travel costs split with pending Merizo Flood Risk Management Project	
On-island transportation (taxi/rental car):	$ 370
Hotel: $159/person/day (2 person x 4 nights):	$ 1,272
Per diem: $99/person/day (2 people x 5 days):	$ 990
Subtotal	**$ 15,492**
SUBTOTAL	**$ 31,182**
Overhead (38%)	**$ 11,849**
TOTAL	**$ 43,031**

Budget Justification

Bioday Rate:
The Service has determined the bioday rate for FY23 is $1,085 based on a cost calculation worksheet complete by the Service administrative office. The number of biodays is based on a reasonable effort spread over the proposed project area and is detailed in the individual task sections. A bioday rate is required to be used based on the 2003 MOU between the USACE and USFWS. For days with diving involved, hazard pay of 25% the bioday rate is included.

Supplies:
Supply costs cover consumable and replacement equipment needed for field work.

Overhead:
The Service uses a 38% overhead rate based on the 2003 MOU between the USACE and USFWS. The overhead rate is periodically reviewed and published at: https://www.fws.gov/policy/264fw1.html

Period of Performance

December 30, 2023 – September 30, 2024.

Funding Status

The Service will limit expenditures to the funds provided. If circumstances arise where additional funds are needed complete this scope, the Service will request additional funds no less than one week prior to exhaustion of initial funding. If tasks are completed before expenditure of all funds, USACE can elect to modify this scope or accept return of left over funds.

If USACE cancels the agreement, USFWS may collect costs incurred prior to the cancellation of the agreement plus any termination costs. Either party may propose modifications to this agreement. This agreement is binding when USFWS signs it. You must send requests to extend the period of performance to the USACE Technical and Financial POCs 60 days before the last day of the period of performance. After the agreement expires, the Financial POC will not grant requests for extension. You must send other modification requests to the Technical and Financial POCs no less than 30 days before required execution.

ENCLOSURE 3

U.S. FISH AND WILDLIFE SERVICE REQUIRED CLAUSES

A. Method for Settlement of Disputes.

(1) We intend for nothing in this document to conflict with current Service or "other agency" directives. If the terms of this agreement are inconsistent with existing directives of either of the agencies entering into the agreement, then those portions of the agreement that are inconsistent must be renegotiated. We will complete a modification to the agreement to provide those corrections and directive compliance. All other terms and conditions not affected by the inconsistency must remain in full force and effect.

(2) Should disagreement arise on the interpretation of the provisions of this agreement, or modifications or revisions to it, that cannot be resolved at the operating level, each party must state the area(s) of disagreement in writing and present the matter to the other party for consideration. If agreement on interpretation is not reached within 30 days, the agencies must send a written presentation describing the disagreement to respective higher officials for resolution.

(3) The agencies under this agreement are also responsible for resolving any billing/payment disputes that may arise within 120 business days of the billing date. If the agencies cannot resolve the dispute within this period, the matter will be referred to the Department of the Interior's Office of Financial Management the following business day.

B. Effective Date, Review, Modification, and Termination/Cancellation Clause.

(1) This agreement is effective on the date of the final signature, and it will remain in effect through 9/30/2026. Both agencies must review the agreement to determine its suitability for modification to provide for revision, renewal, extension, or termination. Any modifications must be in writing. Both agencies must approve and sign them.

(2) Either agency may terminate this instrument in whole or in part, in writing, at any time before the date of expiration upon 30 days written notice of such termination. Neither party may incur any new obligations for the terminated portion of the Inter/Intra-Agency Agreement (IAA) after the effective date and must cancel as many obligations as possible. Full credit must be allowable for each party's expense and all obligations that cannot be cancelled, but were properly incurred, up to the effective date of termination.

C. Liability Issues. N/A

D. Indirect Cost Recovery Rates. We review our indirect cost recovery rates every 2 years (see 264 FW 1).

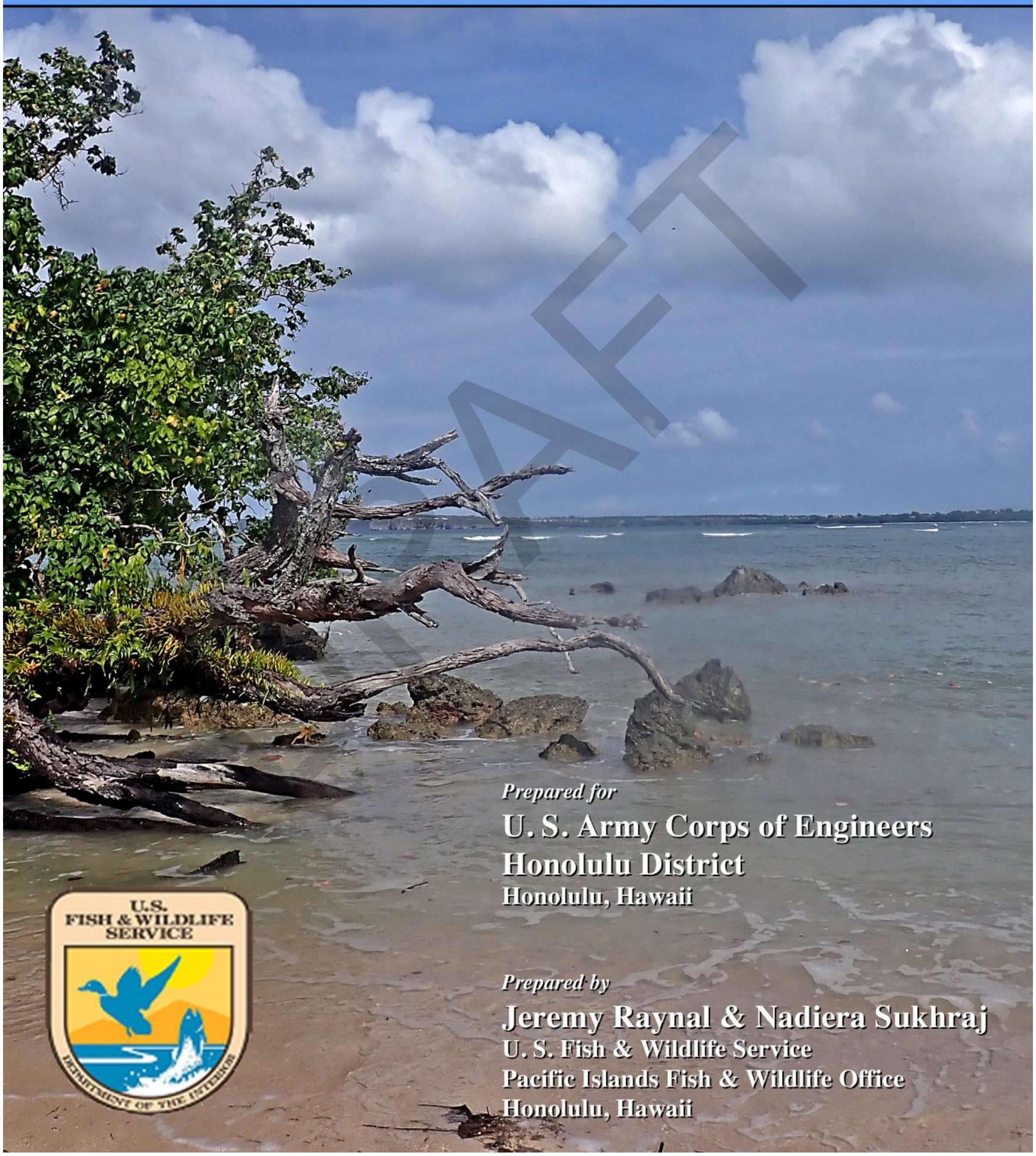
Phase 1 Marine Habitat Characterization

Emergency Shoreline Protection

Agat Mayor's Complex, Agat, Guam, USA

Fish & Wildlife Coordination Act Report

FINAL REPORT **April 2024**



Prepared for

U. S. Army Corps of Engineers
Honolulu District
Honolulu, Hawaii

Prepared by

Jeremy Raynal & Nadiera Sukhraj
U. S. Fish & Wildlife Service
Pacific Islands Fish & Wildlife Office
Honolulu, Hawaii

FINAL REPORT
FISH AND WILDLIFE COORDINATION ACT REPORT

PHASE 1 MARINE HABITAT CHARACTERIZATION
EMERGENCY SHORELINE PROTECTION
AGAT MAYOR'S COMPLEX

AGAT, GUAM, USA

Prepared by:

Jeremy Raynal, USFWS
Nadiera Sukhraj, USFWS

U.S. Fish and Wildlife Service
Honolulu, HI

Prepared for

U.S. Army USACE of Engineers
Honolulu District

April 2024

REF: 2024-0029693

TABLE OF CONTENTS

INTRODUCTION

Authority, Purpose, and Scope

The Proposed Emergency Shoreline Protection project at the Agat[1] Mayors Office Complex in Agat, Guam is being developed as a cooperative effort between the United States Army Corps of Engineers (USACE) and the Government of Guam, Department of Public Works (DPW). This Emergency Shoreline Protection project is authorized by Section 14 of the 1946 Flood Control Act (P.L. 79-525), as amended (33 U.S.C. 701r). The project will utilize federal funding and is subject to Section 404 of the Clean Water Act, and therefore requires 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 or Territory fish and game agency to cooperate with Federal, State, Territory, and public or private organizations in the conservation and rehabilitation of aquatic wildlife. This authority is provided to the Secretary of the Interior and delegated to the U.S. Fish and Wildlife Service (Service), and subsequently to the Ecological Services Program. The authority provided to the Secretary of Commerce is delegated to the National Oceanic and Atmospheric Administration's 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. Department of Agriculture, Division of Aquatic and Wildlife Resources [DAWR] in Guam). 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 impacts that the proposed project could have on those resources.

The following report is prepared in response to the USACE request that the Service, Pacific Islands Fish and Wildlife Office (PIFWO) develop a FWCA report to advise USACE on FWCA compliance on the proposed Emergency Shoreline Protection Project at the Agat Mayor's Complex. An informal request for initial coordination was received by the Service via email correspondence from USACE Project Lead, Marian Dean, dated 6 October 2023. This email referenced a 17 July 2023 charette in which the project was first introduced to resource agencies, and initiated development of a Scope of Work and budget that was later approved by the USACE and the Service. PIFWO 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 USACE, the DAWR, and the NMFS; and 5) drafted the FWCA report to document and present 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 are consistent with the National Environmental Policy Act of 1969 [42 U.S.C. 4321 et seq.; 83 Stat. 852], as amended (NEPA), and other legislation that authorizes the Service to provide technical assistance to conserve trust resources.

[1] In August 2021, Governor Lou Leon Guerrero signed a bill officially changing the name of the village from Agat to Hågat. The Service conforms to the Corps' use of the village name "Agat" here for consistency across project documents.

The proposed Agat Mayor's Complex Emergency Shoreline Protection project aims to protect investment, infrastructure, and community services provided by site facilities by hardening the shoreline at the seaward extent of the Mayor's Complex property. The USACE has prepared a Draft Integrated Feasibility Report and Environmental Assessment for the Agat Mayor's Complex Emergency Shoreline Protection Feasibility Study and is drafting a Description of Proposed Action and Alternatives for the project.

The overall scope of the current FWCA investigation was to document the existing fish and wildlife resources within the proposed project site and to ensure that fish and wildlife conservation receives equal consideration with other proposed project objectives. The report includes a qualitative and semiquantitative assessment of fish and wildlife resources at the proposed project site (e.g. coral abundance and size class distribution, cover of macroalgae, the abundance of non-coral macroinvertebrates, and a characterization of the geomorphological structure), 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

Guam is a Micronesian island in the North Pacific Ocean. The island is located at approximately 13.5 degrees north latitude and 144.8 degrees east longitude, south of the Commonwealth of the Northern Mariana Islands and north of the Federated States of Micronesia (Figure 1). Guam is a U.S. territory located approximately 6,000 kilometers (km) west of Hawaii, representing the westernmost U.S. land holding, and is culturally and economically important, and strategic to U.S. defense.

Guam is approximately 540 square km in area with population of about 170,000. The island is geologically comprised of volcanic rock and coralline limestone. It is primarily surrounded by fringing coral reefs, shallow limestone tidal flats, and embayments including narrow calcium carbonate sand beaches separated by rocky headlands. Generally easterly trade winds prevail throughout most of the year but tend to be weaker from July to December, a season characterized by increased rain and periodic tropical cyclones.

Agat Municipality is in Agat Bay on the western facing coast of the southern half of Guam (Figure 2). Though Agat is on the leeward side of the island and experiences less wave action from trade winds and Pacific Ocean swells and storms, sediment transport in the area is influenced by a range of natural and human-influenced factors that shape the coast. These influences include currents associated with complex bathymetry and coastal morphology, and widespread shoreline manipulation throughout the area. Periodic typhoons can also temporarily change local conditions in extreme ways, leading to coastal inundation and erosion in some cases, potentially increasingly so due to climate change and sea level rise. Conditions at the proposed project site include offshore sediment transport during typical and extreme sea conditions (USACE 2020).

The Agat Mayor's Complex includes the municipal headquarters, education facilities, and important multipurpose community gathering space (Figure 3). The Mayor's Complex also includes a post office, market venue, and provides emergency response services for the community. The Mayor's Complex property and facilities are located directly adjacent to the coastline and are currently threatened by inundation and coastal erosion. The seaward most buildings at the site are within a few feet of mean high high water (MHHW) line. Approximately 10 to 15 feet of beach have eroded there since the early 1990s (USACE 2020). The property is currently protected by a small concrete masonry seawall and piled utility poles and rocks, but those structures are currently at risk of undermining due to continued beach erosion (Figures 4–6). The proposed project aims to enhance protection of the Mayor's Complex facilities from coastal erosion and flooding.

The proposed project footprint extends approximately 320 feet (ft) or 98 meters (m) along the seaward edge at the northwestern extent of the Agat Mayor's Complex property. Continuing seaward from the property, the intertidal zone transitions from beach to limestone tidal flat and habitat transitions from sand to mixed unconsolidated sediment, rock, and pavement, and then to coral reef. The reef crest is about 300 m offshore where the fore reef begins to slope off to deep water. The offshore waters include productive economically and culturally important pelagic fisheries.

Project Alternatives Under Consideration

Five project Alternatives are proposed for new construction: 1) no action, 2) concrete armor unit revetment, 3) open cell piling seawall, 4) secant pile seawall, and 5) relocation of the Mayor's Complex. No federal actions would take place under Alternative 1. This would leave the Agat Mayor's Complex vulnerable to damage and the Government of Guam would likely need to put shoreline protection measures in place to prevent inundation and erosion impacts to Agat municipal facilities.

Under Alternative 2, a concrete armor unit revetment would be constructed parallel to the shoreline where the current seawall is. Revetments generally reduce erosion by dissipating wave energy across and through the rigid structure. Construction would include tribar units placed in a single layer and cement and geotextile bags would be used to seal the toe and crest of the structure (Figure 7). A trench would be dug into the underlying limestone to attach the toe of the structure. Local real estate requirements along with available space at the project site would likely restrict the size of the proposed revetment in ways that could make this alternative impractical.

Alternative 3 would include construction of a concrete seawall encased in a polyvinyl chloride (PVC) to provide additional durability. This alternative has the advantage of a relatively small seaward footprint but would require panels be driven into the ground with a vibratory hammer. The crest of the wall is designed to be 2 feet wide and to include an additional 2-foot splash apron to total 4 feet wide. The wall would be supported with landward-extending buried anchors connected with 10-ft tie backs spaced every 8 feet along the length of the wall (Figure 8). Anchors would be 2 ft by 2 ft concrete blocks. Their installation would require digging and refilling 6 inch wide and 2 feet deep trenches to burry anchors and tie backs. An estimated total number of 40 anchors would lead to 40 total yards of excavation. The wall would stand approximately 3 feet in height and would extend to approximately 17 feet underground.

Alternative 4 includes drilling overlapping concrete columns to form a barrier along the coast (Figure 9). This wall would have approximately the same footprint as Alternative 3 once completed but construction would potentially require less excavation on the landward wide of the site because tie backs would not be used.

Alternative 5 would require demolition of the current Mayor's Complex facilities and reconstruction of similar facilities elsewhere. Real estate and construction costs would be high and erosion would continue to occur at the proposed project site.

Prior Fish and Wildlife Service Studies and Reports

The Service has not previously completed studies or reports on marine resources in Agat Municipality. The following selected references are reports on similar environments in western Guam.

USFWS. 2007. Fish and Wildlife Coordination Act Report: Apra Commercial Warf Expansion and Land Reclamation Project, Island of Guam. 2007

USFWS. 2007. Kilo Warf Extension Project Marine Assessment and Impact Analysis, Apra Harbor, Guam, February 2007.

Prior Studies and Reports by Other Agencies

USACE. 1980. Guam Comprehensive Study, U.S. Army Corps of Engineers, Pacific Ocean Division, 1980.

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USACE. 2020. Agat (Hågat) Bay Regional Shoreline Assessment, July 2020.

USACE. 2022. Guam Watershed Plan, July 2022.

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Coordination with Federal and State Resource Agencies

17 July 2023 – USACE led charette to introduce project to resource agencies.

6 October 2023 – USACE requested development of SOW and Budget for FWCA Consultation.

26 October 2023 – Service and NPS discussed availability of data appropriate for FWCA assessment and Service determined sufficient data were not available from NPS.

23 January 2024 – USACE provided the Service with general project descriptions.

1-7 February 2024 – Service biologists traveled to Guam and completed field surveys.

8 February 2024 – Service provided a verbal report on general field observations at the project site.

13 February 2024 – USACE provided Service with tentative shape files of Project Alternative footprints.

14 February 2024 – USACE provided Service with Draft Alternatives and Project Description (DOPAA).

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 1.

***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 potentially have secondary impacts on beach habitat that is proposed Critical Habitat for sea turtle nesting, and on coral reefs. These habitats fall under Categories 1 and 2 and call for planning to avoid loss of existing habitat and in-kind habitat respectively. In the case of this project, direct impacts to high value resources are unlikely.

Scientific understanding of green sea turtle (*Chelonia mydas*) populations changed from a single world-wide population to 11 Distinct Population Segments (DPS) in 2016. This placed green sea turtles in Guam into the endangered Central West Pacific DPS (81 FR 20057, April 6, 2016), further increasing the importance of nesting and foraging habitats there. Although geographically widespread in the Pacific, nesting in Central West Pacific DPS occurs at low levels with only approximately 22 nesting green turtles in Guam (Seminoff et al., 2015). Endangered hawksbill sea turtles (*Eretmochelys imbricata*) also nest in Guam, but very limited data on their nesting locations and abundance is available. Green sea turtles and hawksbill sea turtles (hereafter referred to as turtles) are often restricted to nesting on undisturbed beaches and only in areas where sandy beaches extend above the mean high tide line because eggs are vulnerable to mortality from inundation and flooding. Turtles nest throughout the year in Guam but nesting typically peaks from April through July.

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 Categories 1 and 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 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.

Turtles are the evaluation species typically used for sandy coastal ecosystems. 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 sandy beaches.

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 secondary impacts to sea turtle nesting habitat and coral reef ecosystems. Proposed critical green sea turtle nesting habitat is located approximately 500 m southeast of the Project Area but is additionally separated from the proposed activities by natural and manmade barriers including Ga’an Poing, a small islet, sand shoals, and a jetty. Direct impacts to proposed critical green sea turtle nesting habitat are unlikely, but the proposed work could lead to secondary impacts on adjacent turtle nesting habitat and coral reefs 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 potential impacts to ESA listed species or their habitat.

The Service's specific planning objective is to collect and provide the USACE 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 provides interpretation of those data and provides minimization, avoidance, and mitigation comments, and recommendations to consider during additional project planning and ongoing coordination among the USACE and resource agencies.

EVALUATION METHODOLOGY

Field Data Collection Protocol

Geomorphological structure, benthic habitat characteristics, and potential sea turtle nesting areas were surveyed at the proposed project site. Surveys included the intertidal zone, the reef flat, and out to the surf zone or to approximately 200 m from shore. Surveys were limited to the intertidal zone and reef flat because surf conditions limited safe access to the reef crest and forereef, and the distance across the reef flat was greater than the likely reach of project impacts, considering the nature of the proposed work and the natural resource assemblages observed in the project area. Data was collected to map and assess potential impacts to benthic resources by the Agat Mayor's Complex 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 and semiquantitative 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 relevant 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 at a relevant frequency 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 or absent), and then logged as disease, pale bleached, partial bleached, or complete bleached.

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.).

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).

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 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 as the area including the Target Area and all areas extending to 5 m beyond the most distant survey dive track points, plus the area visually observed during the survey if greater than the 5 m survey dive track buffer, minus areas labeled as Land. The Target area is intended to represent the most likely area to be directly impacted. The Project Area is intended to represent the area most likely to experience secondary impacts in addition to any direct 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 traversed 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 Target Area (project footprint) was located directly along the seaward-facing (northwest) extremity of the Agat Mayor's Complex property, running parallel to the natural shoreline. The Target Area was intended to represent only the primary project impact area and not the total potential 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 18 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 Target Area was 366 m^2. The geomorphological habitat and major structures were made up almost entirely of area classified as Land (> 99 percent). Unconsolidated Sediment made up less than one percent of the Target Area. The habitat zones included Land (> 99 percent) and Shoreline Intertidal (< 1 percent). The sediment present in the intertidal zone was generally Sand and Rubble. Terrestrial soils were not classified.

Intertidal Habitat

Habitat Characteristics

The Target Area was located completely above the low water mark. It generally included the landward edge of the transition from the beach to the Mayor's Complex property (land) including the existing shoreline stabilization structure that, in some cases, defined the line between the intertidal zone and land (Figures 4-6 and A1). A stream mouth separated the southwestern extent of the municipal property from Ga'an Point, a park managed by the U.S. National Park Service (NPS) (Figures 6 and 10-12).

Biological Resources

The intertidal habitat located within the Target Area is likely periodically saturated by high tides, especially during high surf or extreme weather events. However, the biological community observed in the Target Area was largely terrestrial and not captured by our data. The Project Area, Target Area, and boundaries of areas where significant marine biota were and were not observed can be seen in Figure A2. The tracks surveyed by biologists can be seen in Figure A3.

The Shoreline Intertidal habitat within the Target Area did not appear to be suitable for turtle nesting but could still be traversed by turtles seeking nesting opportunities or by hatchlings. Some areas directly northeast of the Target Area, including beach habitat within the Project Area (starting at the northeastern edge of the Target Area and extending beyond the Project Area, approximately 500 m northeast along the beach), could potentially be suitable for turtle nesting. Additionally, Proposed Critical Habitat for turtle nesting is located less than 400 m to the southwest of the Target Area (Figure 12). Egg-laying adult turtles could traverse the beach adjacent to the Target Area when searching for nesting sites. Hatchling turtles could cross the beach at the Target Area, especially if confused by lights that can distract them from a direct path to the ocean. No turtles or turtle nests were observed in Project Area locations designated as Shoreline Intertidal or Land during this study.

Reef Flat Habitat

Habitat Characteristics

The reef flat was located directly seaward of the Target Area and the intertidal zone. The reef flat was characterized by water depth of approximately 0.1–1.5 m over primarily Hard Bottom Pavement with smaller areas of Unconsolidated Sediment (Mud, Sand, and Rubble) and Mixed Habitat Structure consisting of Scattered Coral Rock in Unconsolidated Sediment (Figures A4 to A6). Moderately high turbidity was observed (Figure 13). Habitat complexity at the reef flat was low (Figure A7) with relief less than 1 m throughout. At the time of the surveys, the surf zone consisted of moderate to small swells breaking across a broad, shallow, gently sloping area, approximately 200 to 300 m offshore. The physical environment on the reef flat included enough wave energy to suspend fine sediments and create a turbid environment from the beach out to approximately 100 m from shore. Beyond this distance, currents and waves aided in mixing clear oceanic water, decreasing turbidity gradually from there out to the reef crest.

Biological Resources

Surveyed areas of the reef flat appeared to indicate a relatively low-productivity coral reef habitat overall within the Project Area. Corals were absent to rare within approximately 50 m of the Target Area. Coral cover, diversity, and colony size increased slightly beyond 50 m from shore. Coral cover was low to moderate, up to a maximum of 10 percent, only beyond approximately 140 m from the Target Area, where species diversity and colony size also increased slightly (Figure A8). Coral species in the genera *Porites* and *Pocillopora* were most common (Figure 13). No ESA-listed coral species were observed.

Seagrass was common but not dominant in the Project area (Figure 14). Three species were observed: *Enhalus acoroides*, *Halodule uninervis*, and *Halophila minor*. The nearest recorded seagrass was approximately 35 m from the Target Area and the most abundant seagrass was more than 100 m from the Target Area (Figure A9). Crustose coralline algae, frondose algae, and turf algae were common but not dominant throughout the reef flat (Figures A10–A12). Frondose algae included species from the genera *Caulerpa*, *Neomeris*, *Halimeda*, *Jania*, *Padina*, *Asparagopsis*, *Galaxaura*, *Sargassum*, *Laurencia*, *Dictyota*, and *Acanthophora*. Filamentous algae and cyanobacteria were uncommon (Figure A13). Sea cucumbers and sea stars were observed (Figures A14 and A15). One giant clam (*Tridacna maxima*) was observed in the Project Area, approximately 140 m from the Target Area (Figures 15 and A16). Visibility in the water column was limited due to turbid conditions, so there may have been others present. Additional invertebrates, such as crabs and nudibranchs, were not observed in populations considered significant to define the overall ecosystem characteristics. There were no sponges observed within the Project Area.

Two adult green turtles (Figure A17) and two large stingrays were observed swimming within the Project Area during surveys. Two additional adult green turtles were seen from the beach before and after in-water surveys were conducted and were not recorded (total of 4 green turtles observed within the Project Area). An abandoned gill net was also observed (Figures 16 and A18) and was entangled among coral colonies in some places.

PROJECT IMPACTS

The proposed project footprint consists of inland habitat at the seaward edge of the Agat Mayor's Complex property, including lawn and erosion prevention structures, and a small amount of intertidal sandy beach that borders the property. The proposed project footprint does not extend seaward to the low water line and does not include reef flat or other marine habitats seaward of the beach.

This project could yield loss of intertidal sandy beach habitat. Generally, construction on or in the vicinity of beaches can result in sand and sediment compaction, sea turtle nest destruction, beach erosion, contaminant and nutrient runoff, and an increase in direct and ambient light pollution which may disorient hatchling turtles or deter nesting females. Projects that alter the natural beach profile, such as nourishment and hardening, the latter including the placement of seawalls, jetties, sandbags, and other structures, are known to reduce the suitability of onshore habitat for sea turtles.

The proposed project is unlikely to directly remove active turtle nesting habitat because the beach along the proposed footprint is periodically saturated up to the seawall (inland habitat) at high tides. However, the beach directly northeast of the Target Area (starting from the northeast edge of the Target Area and extending approximately 500 m up the beach to the northeast) could be suitable for turtle nesting and may experience primary (e.g. light pollution during construction) and secondary (e.g. sediment compaction and erosion) impacts from the project.

The hardening of a shoreline increases the potential for erosion in adjacent areas, often resulting in additional habitat loss and subsequent requests to install stabilization structures or conduct beach renourishment. These types of projects often result in sand compaction, erosion, and additional sedimentation in nearshore habitats, resulting in adverse effects to the ecological community. Given projected sea level rise, the likelihood of increased storm surge intensity, and other factors associated with climate change, we anticipate that beach erosion will continue and likely increase. Where possible, projects should consider alternatives that avoid the modification or hardening of coastlines. Beach nourishment or beach hardening projects should evaluate the long-term effect to sea turtle nesting habitat and nearshore marine habitats and consider the cumulative effects.

The Service has proposed to designate terrestrial Critical Habitat for sea turtle nesting in Guam. The designation describes shoreline areas that are more frequently used by endangered turtles. While this designation is not yet official at the time of writing, it could be by the time project construction begins. One area of proposed Critical Habitat is located along the shore 400 m southwest of the proposed project site. The described area of Critical Habitat is unlikely to experience direct impacts from the project and is partially protected from indirect impacts of the proposed activities by natural and artificial structures including Ga'an Point, a small islet, sand shoals, and a low-profile jetty built perpendicular to the shoreline. However, increased sedimentation and turbidity caused by the project could impact the proposed Critical Habitat. Additionally, turtles that nest or hatch at the proposed Critical Habitat site may also be more likely to enter the Project Area and experience elevated vulnerability to project activities.

Specific impacts of each Project Alternative are currently difficult to quantify with the available information. Proposed seawall alternatives would minimize the project footprint initially but could require relatively frequent maintenance and lead to more erosion of beach sediments over time, especially at adjacent beach sites. The proposed revetment alternative would require a greater initial loss of intertidal habitat, would potentially use more intrusive construction methods, and would likely have more direct and indirect impacts on the reef flat, both from the construction activities and from erosion over time. While the revetment alternative (Alternative 2) would likely last longer and require less maintenance over time, the local and territorial governments have pointed out that this type of structure may pose challenges due to their real estate laws and is, therefore, initially not preferred by the Territory.

Alternative 3, the open cell piling seawall, tentatively appears to be the preferred alternative by the Territory of Guam and the USACE. This alternative, along with Alternative 4, secant pile seawall, may be more environmentally sound than a tribar revetment, largely due to their minimization of footprint and loss of intertidal habitat. However, PVC sheathing associated with Alternative 3 is a potential environmental concern. While PVC sheathing could potentially help to increase the stability and longevity of the proposed seawall, it would inevitably eventually degrade and could then disperse fragments and microplastics into the environment.

The PVC material proposed for use in this project is quite robust and resistant to the elements but could occur at an accelerated rate when exposed to ultraviolet radiation, abrasion by sand, and impact by stones and other debris tumbled by the surf. Extremely high exposure to these elements is expected for the proposed structure. It is unclear how long the material will last when used as a seawall, and how it's properties will change over time. As the material becomes increasingly brittle over time, for example, it could quickly break apart in the inevitable event of extreme weather or large swells, and release fragments into the environment.

Dispersal of microplastics could eventually result as the material inevitably begins to break down over time. Microplastics are an increasing global concern and have a range of negative impacts on marine ecosystems and humans alike. Microplastics are increasingly found in wildlife and human tissues. Plastics, whether micro or macro, commonly both accumulate and/or leach contaminants that can be hazardous to wildlife and humans. Plastic fragments in coastal ecosystems are known to negatively impact ESA listed species including birds, turtles, and corals.

Seaward of the proposed project footprint, the habitat gradually transitions from sand to pavement and, further offshore, to coral reef. Initial marine surveys did not indicate that coral reef habitats are likely to be directly impacted by the proposed project. Coral colonies are generally rare within 50 m of the project footprint and uncommon within 140 m. 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.

Changes in sedimentation and turbidity during the construction phase are possible. Given that the waters at the beach are commonly relatively turbid and resources of concern are uncommon within 50 m or more of the proposed construction site, losses due to sedimentation caused by construction appear to be relatively unlikely as long as sediment associated with trenching, driving structures into the earth, and washing structures and equipment are trapped and dewatered appropriately.

Long term changes in sedimentation associated with altered currents and erosion patterns around the proposed structure could occur. It is difficult to predict impacts of a new seawall or revetment on erosion and sediment transport in the dynamic coastal environment. The most sensitive marine habitat features, such as living coral colonies and seagrasses, appear to be partially protected from expected impacts by a buffer of distance. While significant direct or indirect impacts of the proposed structure on sensitive habitats remains possible, it currently appears unlikely that turbidity, erosion, or sedimentation will deteriorate protected marine habitats. Primary environmental concerns with this project include the proposed use of plastics as construction materials, which include a wide range of potential impacts over a potentially large dispersal area, and potential interactions with turtles.

RECOMMENDATIONS

1) *The Service recommends going forward with a design that will minimize the project footprint, potential erosion, and plastic pollution:*

The proposed seawall alternatives can minimize take of the narrow beach habitat at the project site and avoid direct impacts to the reef flat if constructed according to recommended practices.

The Service has some concerns use of PVC materials proposed in Alternative 3, though this material does appear to be appropriate for the proposed application as long as it is maintained properly. If PVC is to be used, a maintenance plan should be developed to ensure regular inspections of materials and replacement prior to breakdown of PVC components to avoid dispersal of fragments and microplastics. Presence of any cracking, abrasion, or other degradation (e.g. from exposure to UV, sand, etc.) should be assumed to indicate that the material is beyond a safe utilization period and should be immediately removed and disposed of properly.

Alternative 4 may be similarly effective to Alternative 3 in terms of preventing erosion, and potentially more appropriate when considering possible release of microplastics (though likely years down the line) associated with materials proposed in construction of Alternative 3. Alternatives that do not require plastics are preferred by the Service and should not be prematurely ruled out.

The chosen alternative should be constructed as far inland as possible to minimize loss of intertidal beach habitat.

2) *The Service recommends all work be completed in a manner to minimize chances of 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 Guam, turtle nesting season is year-round but typically peaks from April to July. The service recommends planning work outside of these months, 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 nests. Surveys should be conducted daily for two weeks prior to construction and 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.

3) *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.

4) *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.*

5) *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 freshwater streams, the beach, or marine ecosystems.*

6) *The Service recommends that any project-related debris, trash, or equipment be removed from the beach or dune if not actively being used.*

7) *The Service recommends project-related materials not be stockpiled in the intertidal zone, reef flats, sandy beach, and adjacent vegetated areas.*

8) *The Service recommends that sediment production associated with trenching, filling, driving seawall panels (including cleaning, jetting, and removing and disposing of soil plugs, etc.) or any other part of the project be done in a manner that ensures sediment is trapped, dewatered, and disposed of appropriately to avoid releasing sediments to the beach, stream, reef flat, or sea.*

9) *The Service recommends the best management practices provided as Appendix B.*

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FIGURES

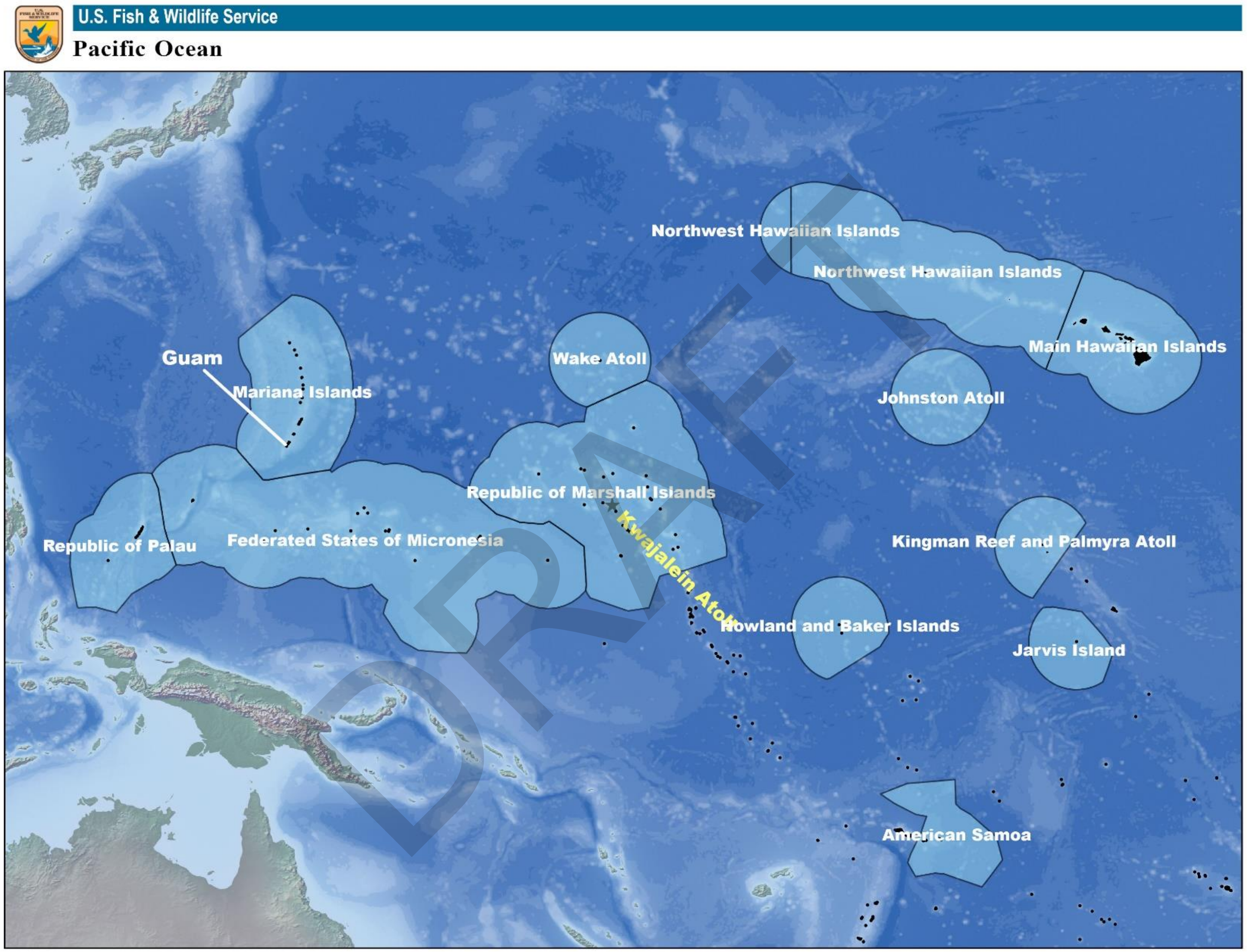

Figure 1: Pacific Ocean. Map of the Pacific Ocean showing the location of Guam, south of the Commonwealth of the Northern Mariana Islands and north of the Federated States of Micronesia.

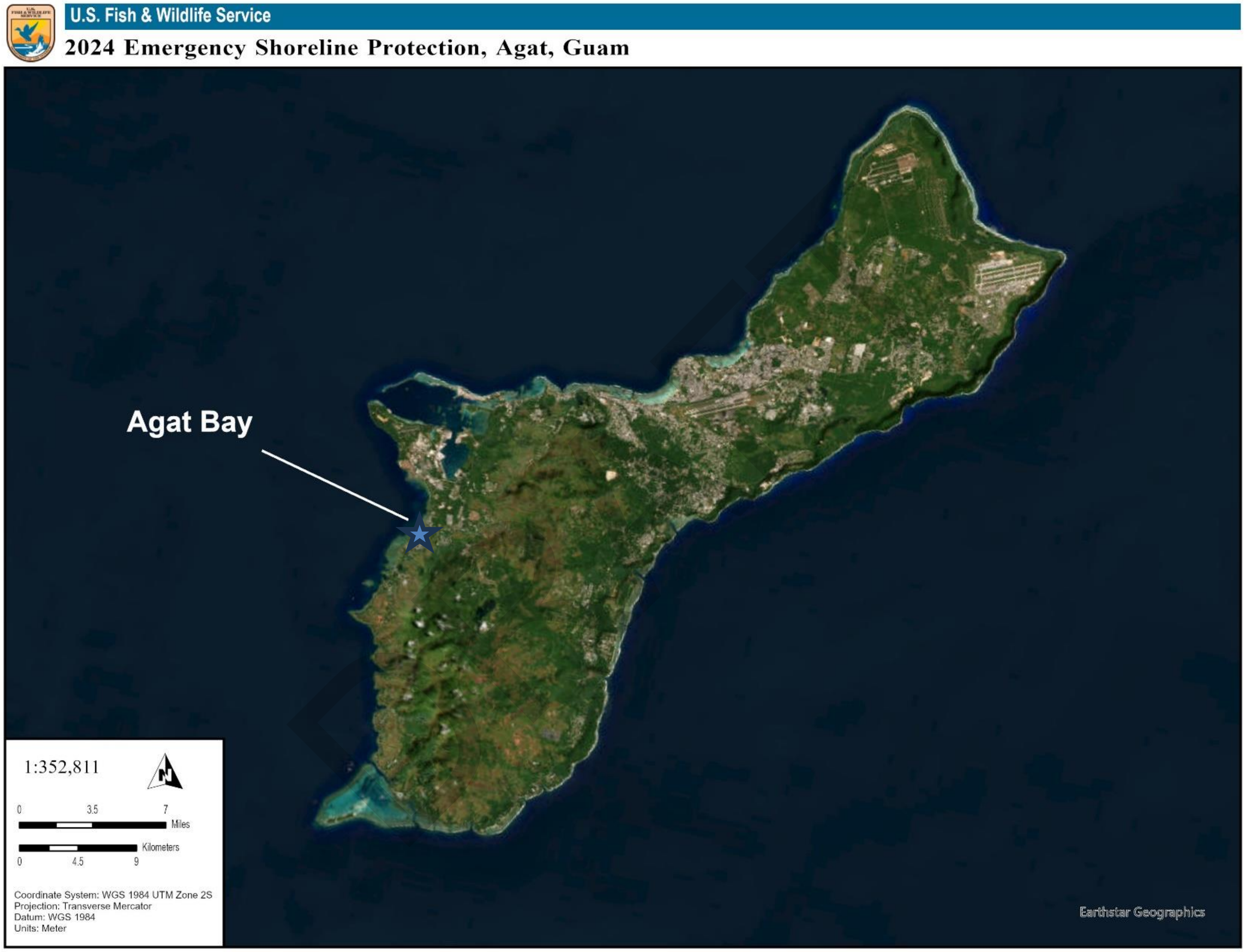

Figure 2: Island of Guam. Map of Guam showing the location of Agat Municipality, indicated by a blue star, within Agat Bay.

Figure 3: Mayor's Office Complex. Map of the Agat Mayor's Office Complex including the municipal headquarters and education facilities (approximately bordered in yellow), the multipurpose public gathering space (approximately bordered in red), and the Target Area for the proposed project (striped orange).

Figure 4: Current Seawall. Image of the current seawall and the community meeting space at the Mayor's Office Complex viewed facing inland from the shoreline. Photo by Jeremy Raynal.

Figure 5: Seawall & Stones. Image of seawaters encroaching on educations facilities at the Mayor's Office Complex during calm high tide conditions, taken along the shoreline facing northeast. A low seawall and debris used as shoreline stabilization can be seen.

Figure 6: Shoreline Facing Southwest. Image of the Project Area shoreline facing southwest toward Ga'an Point. The current seawall that protects the community meeting space can be seen on the left and Ga'an Point Park is in the background on the opposite side of a stream mouth. Photo by Jeremy Raynal.

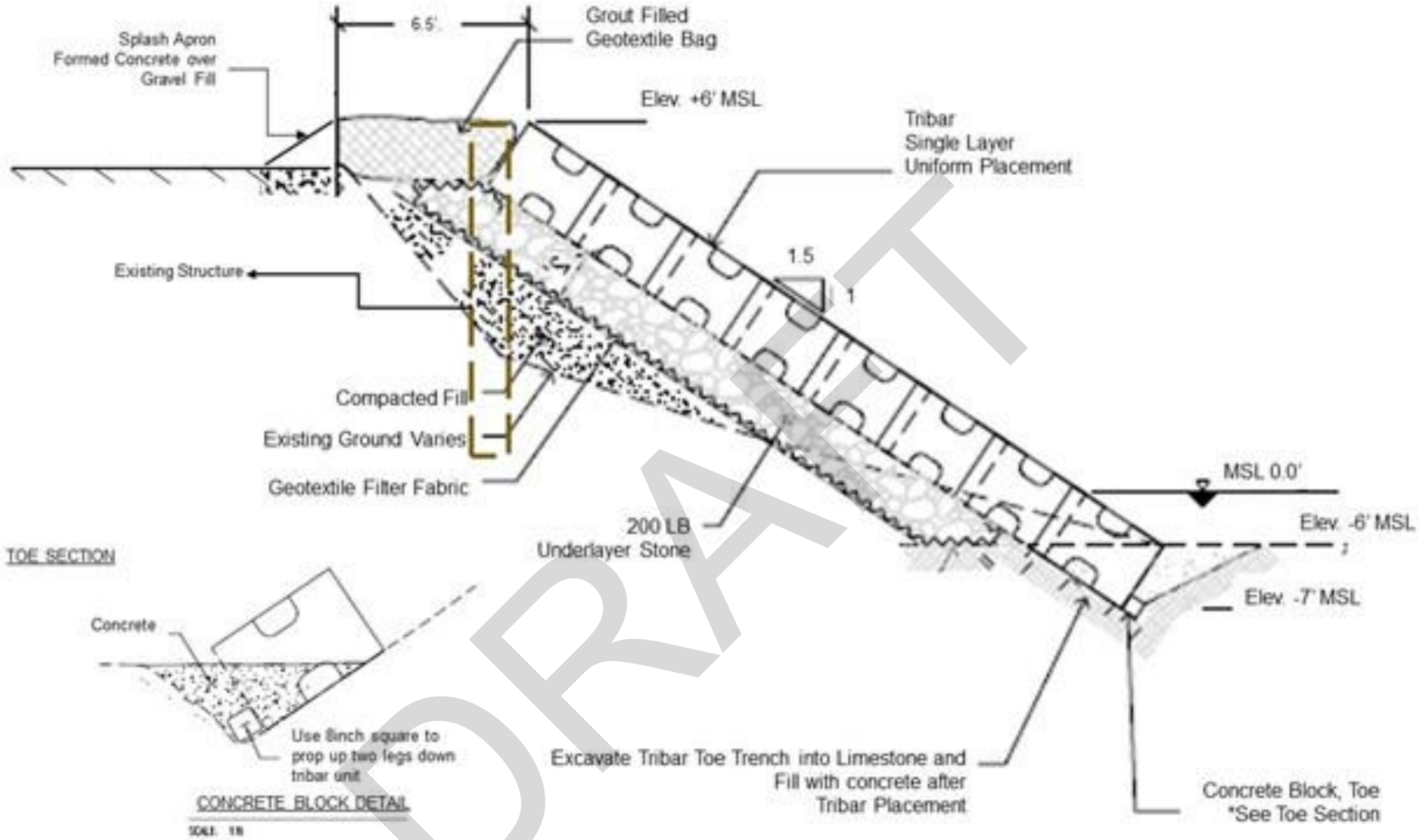

Figure 7: Concrete Armor Unit Revetment. Schematic of the proposed concrete armor unit revetment design (Alternative 2). Schematic provided by USACE.

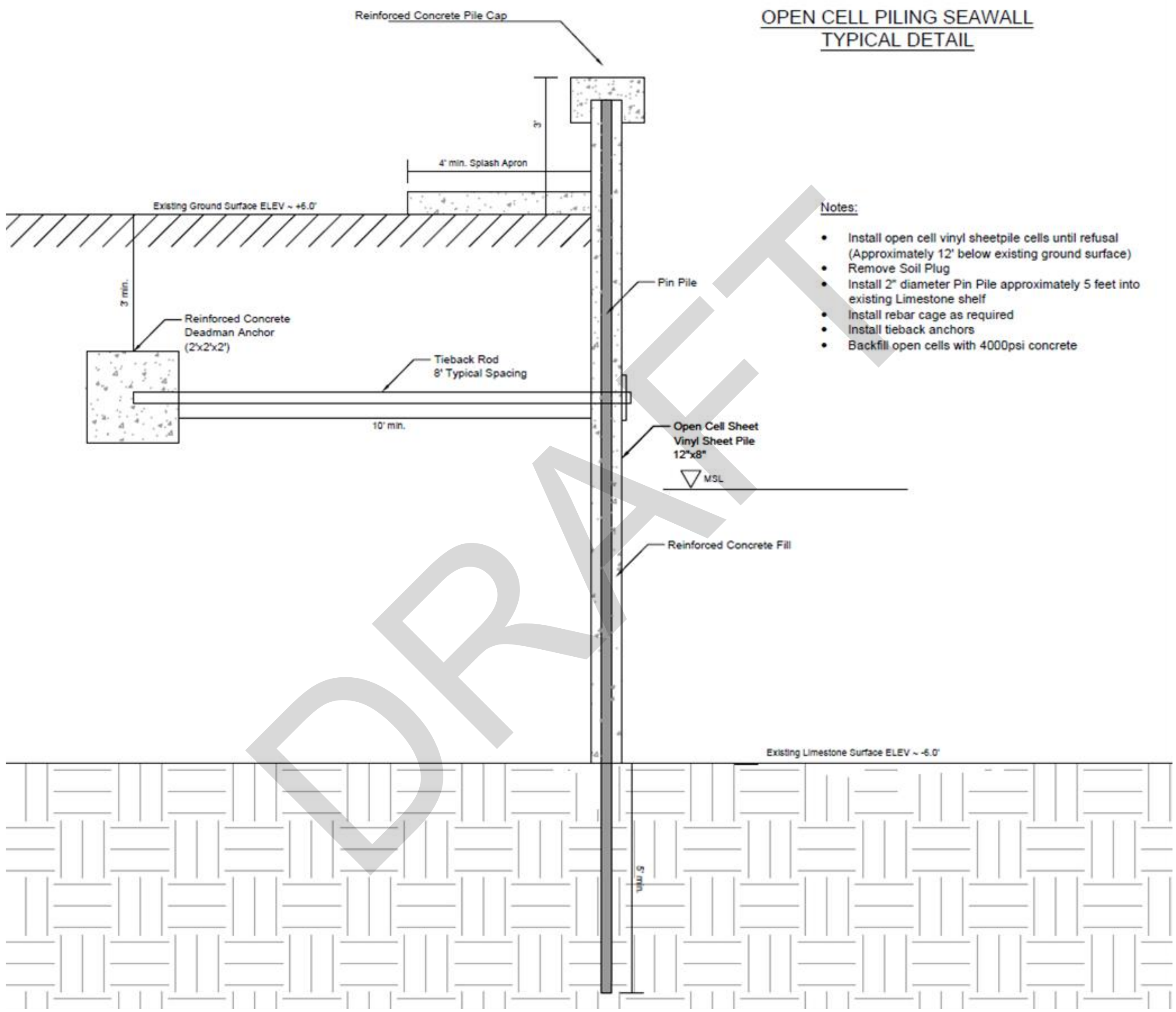

Figure 8: Open Cell Piling Seawall. Schematic of the proposed open cell sheet pile alternative (Alternative 3). Schematic provided by USACE.

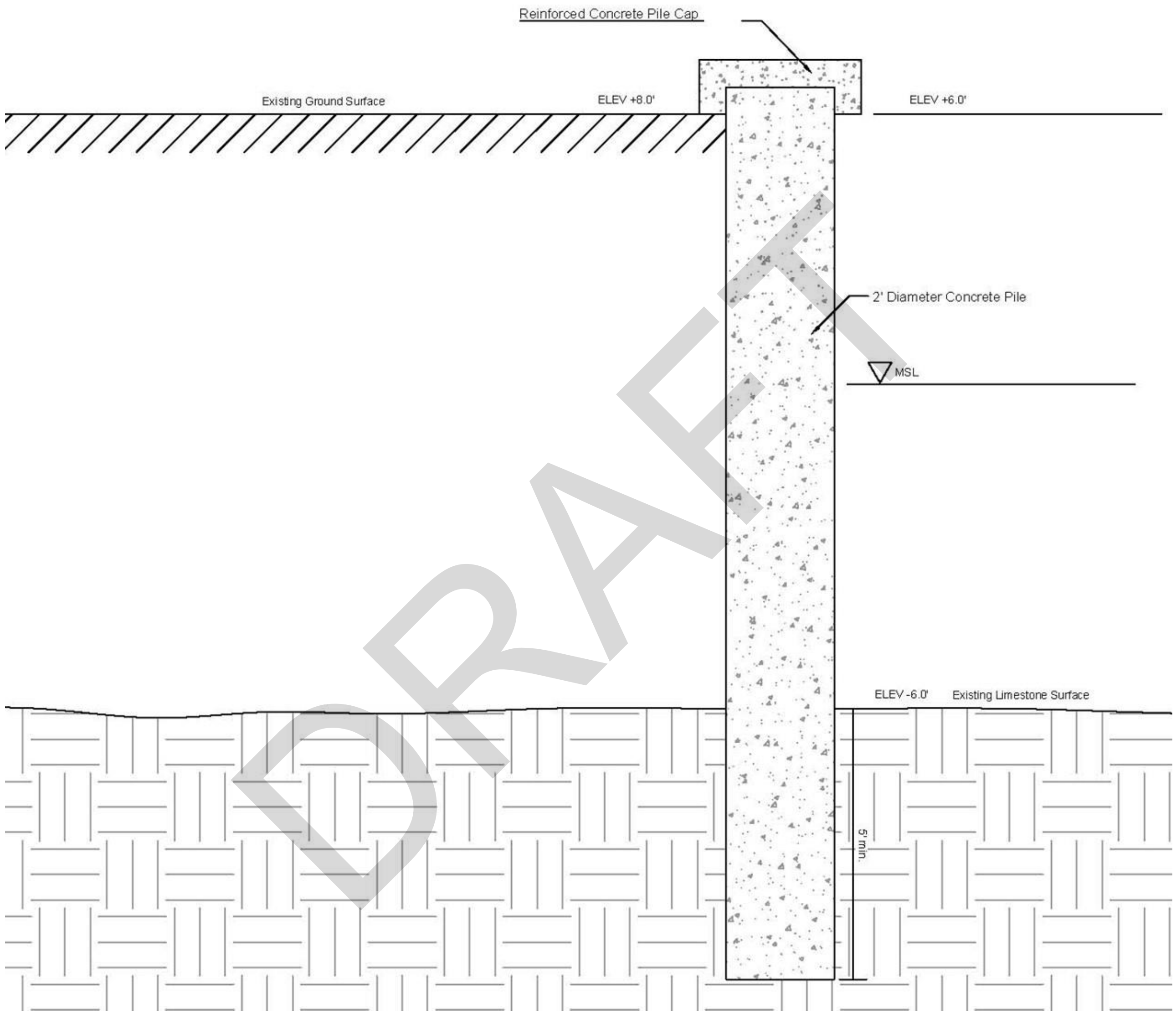

Figure 9: Secant Pile Seawall. Schematic of the proposed secant pile seawall design (Alternative 4). Schematic provided by USACE.

Figure 10: Ga'an Point Stream Mouth. Image of Ga'an Point viewed across the stream mouth from the beach in front of the Mayor's Office Complex. Photo by Jeremy Raynal.

Figure 11: Ga'an Point. Image of Ga'an Point viewed seaward from the stream mouth. Photograph by Jeremy Raynal.

Figure 12: Ga'an Park, Project Location, and Proposed Critical Habitat. Map showing Ga'an Park with the Target Area to the northeast, the proposed Critical Habitat for nesting turtles to the southwest, and the low-profile jetty and shoal and islet features in between.

Figure 13: Common Corals. Images of the most commonly observed coral species in the Project Area including examples of microatoll (top left) and lobate (top right) growth forms from the genus *Porites*, and two examples of *Pocillopora damicornis* (below). Images display moderately high turbidity. Photographs by J. Raynal.

Figure 14: Seagrasses. Image of two species of seagrasses observed in the Project Area. Photograph by Nadiera Sukhraj.

Figure 15: Tridacna maxima. Image showing the one giant clam (*Tridacna maxima*) observed in the Project Area. Photograph by Jeremy Raynal.

Figure 16: Abandoned Gill Net. Image showing the abandoned gill net observed in the Project Area. Photograph by Nadiera Sukhraj.

TABLES

Table 2: Area Calculations for Target Area.

Area Type	Classification	Area (m^2)	Percent of Target Area
Structure/Major Structure	Land Unconsolidated Sediment	366 <1	>99 <1
	Total	366	100
Zone	Land Shoreline Intertidal	366 <1	>99 <1
	Total	366	100
Sediment	Sand/Rubble Unclassified/Terrestrial	<1 366	<1 >99
	Total	366	100

APPENDICES

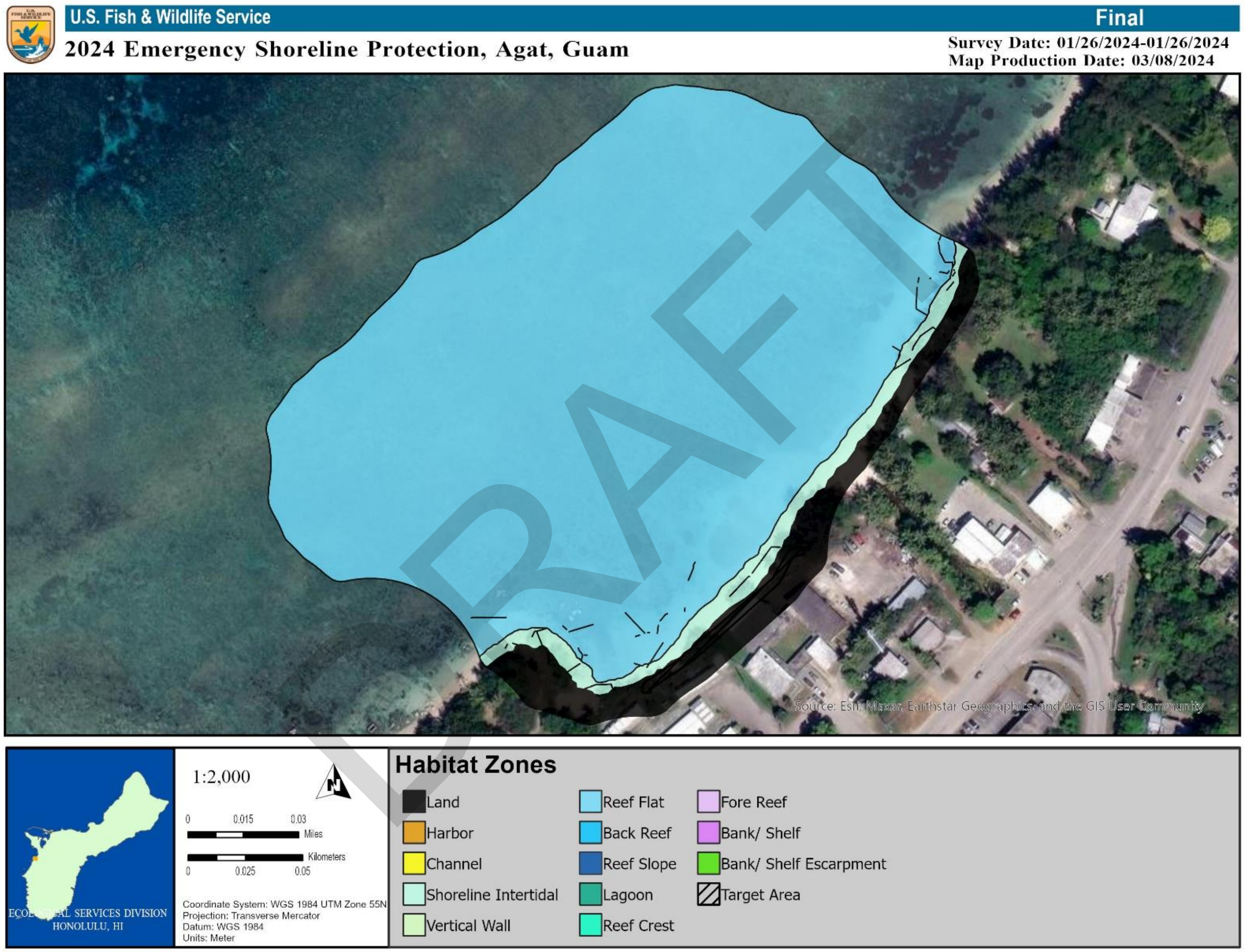

Figure A1. Habitat Zones. Map of the Agat Mayor’s Complex Project Area, including the Target Area and Habitat Zones.

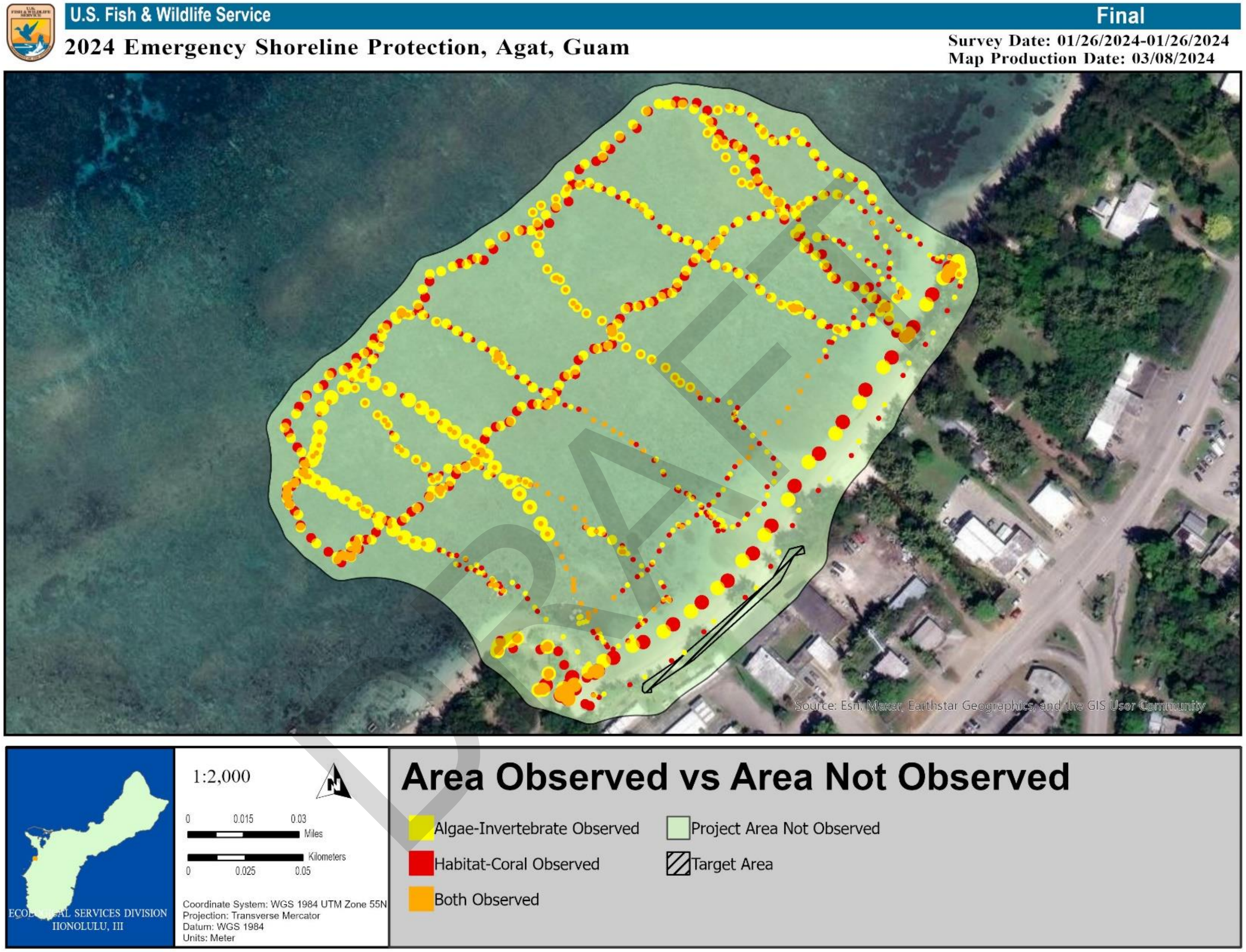

Figure A2. Area Observed vs Area Not Observed. Map of the Agat Mayor's Complex Project Area, including the Target Area and Area Observed vs Area Not Observed.

Figure A3. Dive Tracks. Map of the Project Area and survey tracks completed by biologists.

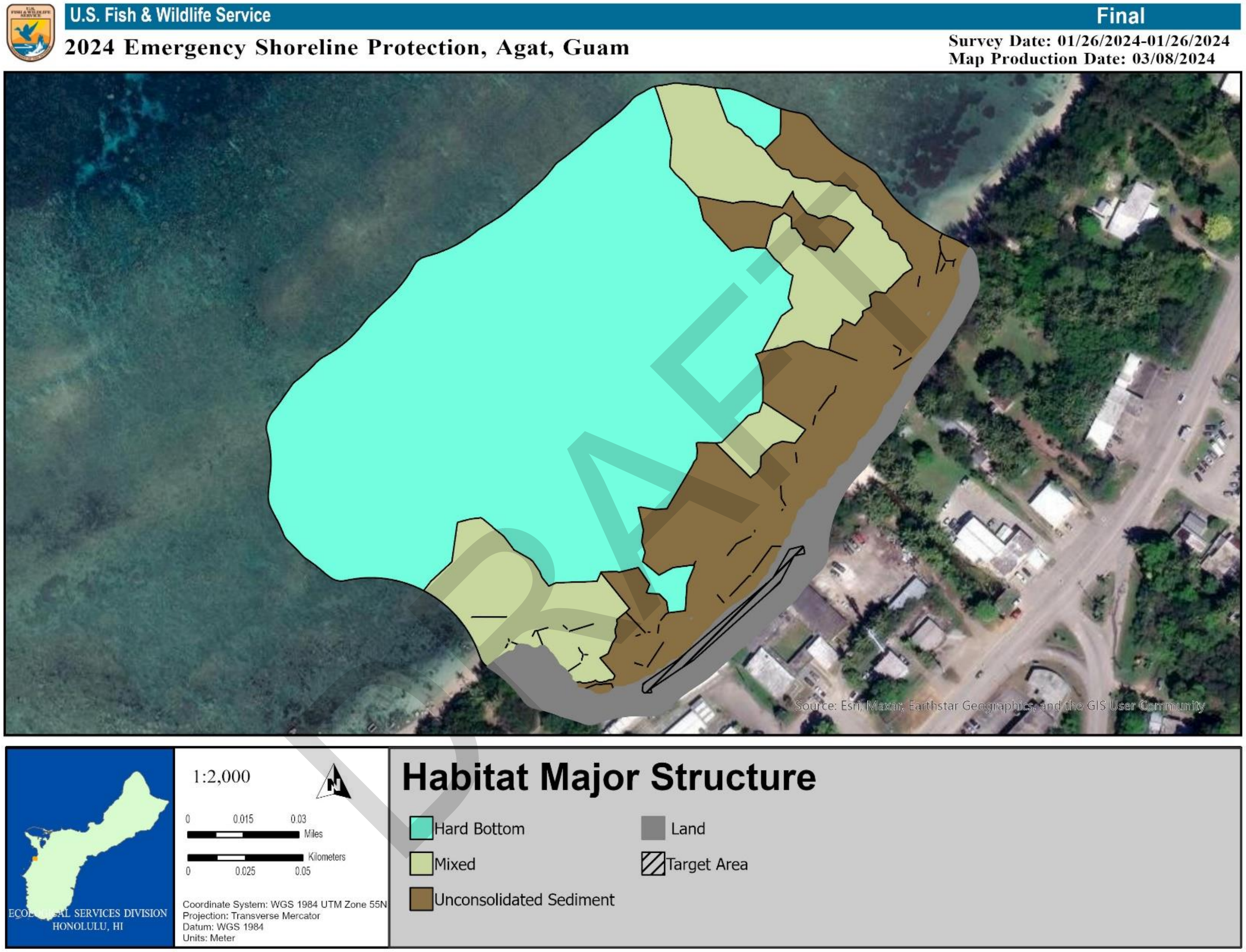

Figure A4. Habitat Major Structure. Map of habitat structure types observed in the Project Area.

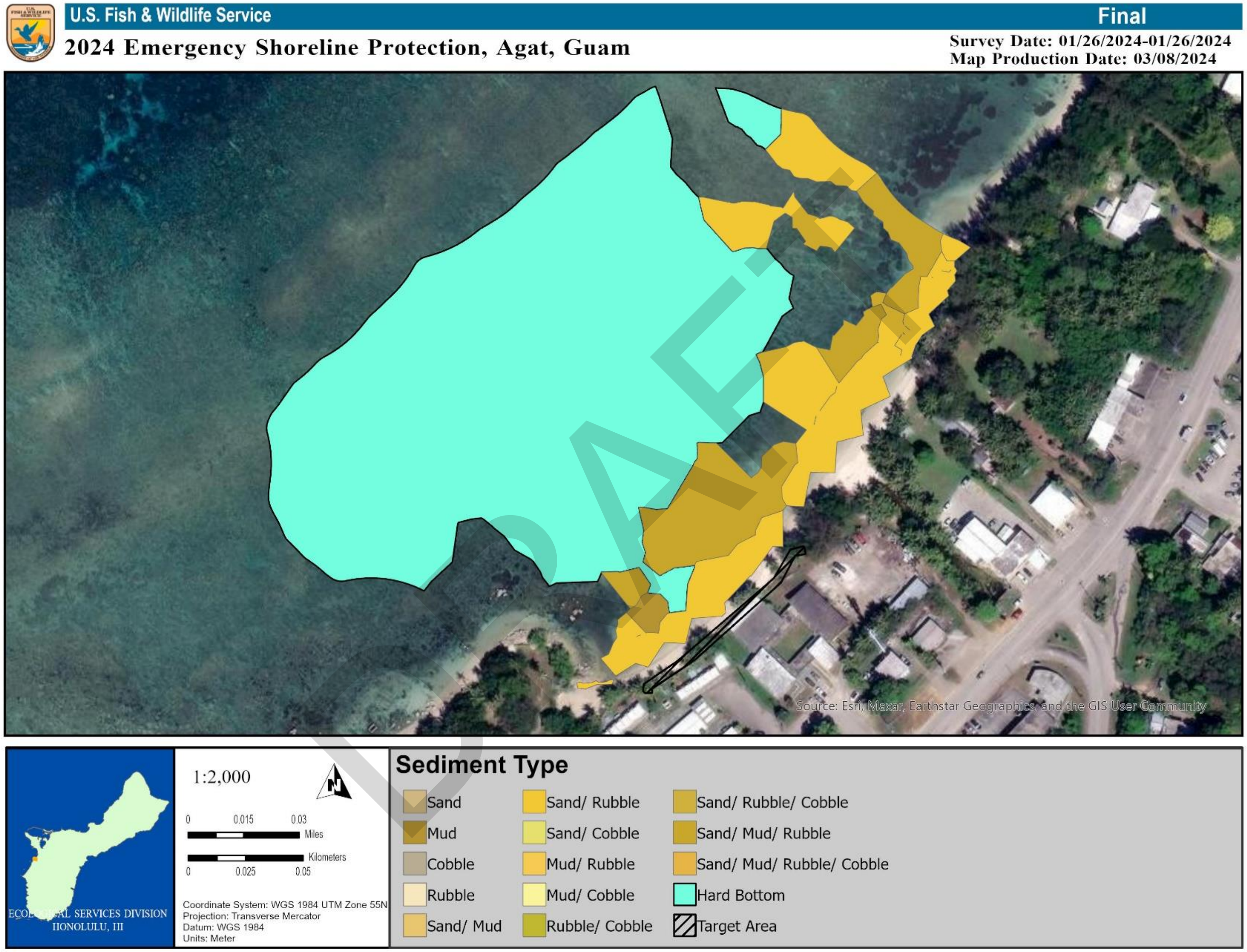

Figure A5. Sediment Type. Map of the sediment types that the Project Area contains.

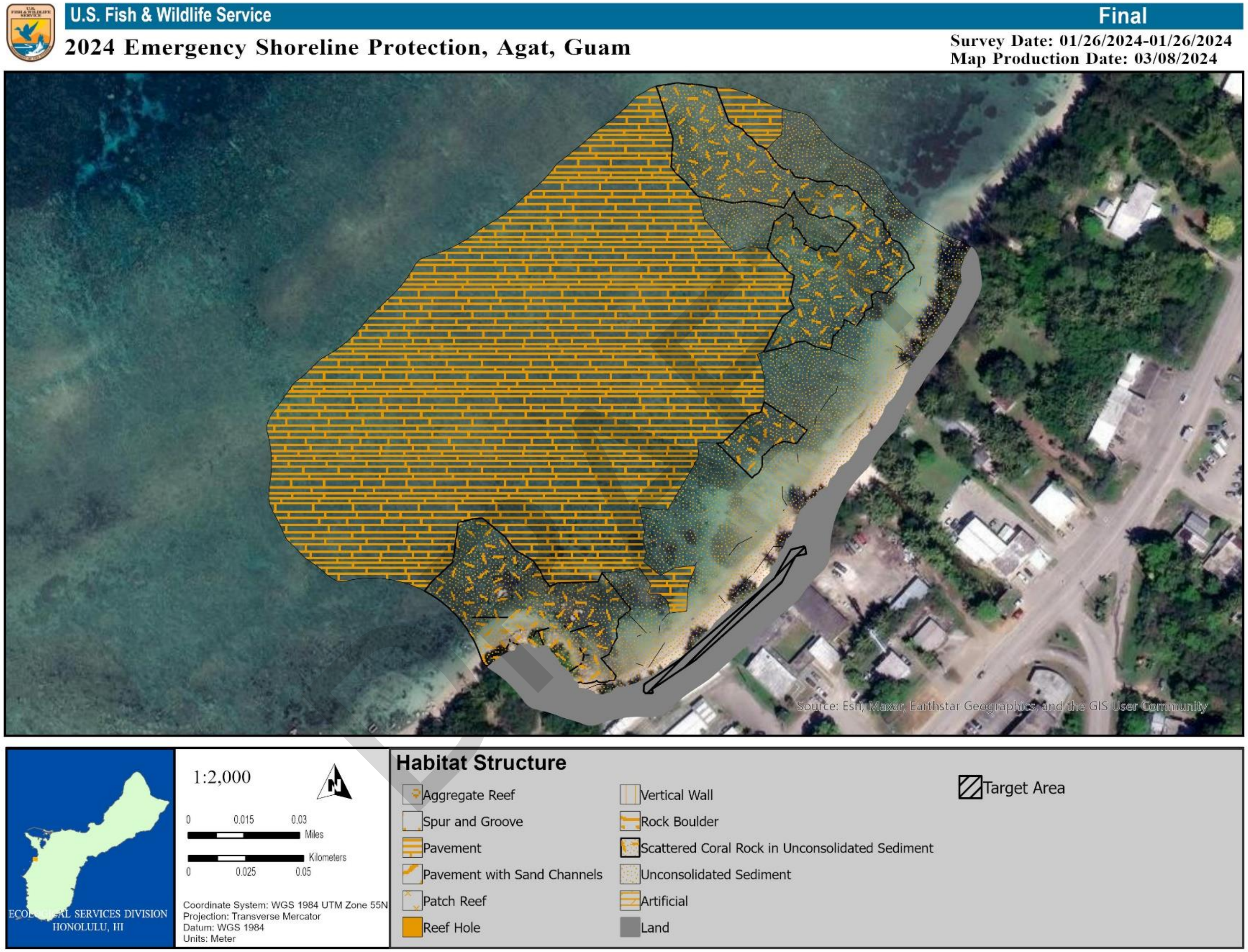

Figure A6. Habitat Structure. Map of the habitat structure within the Project Area.

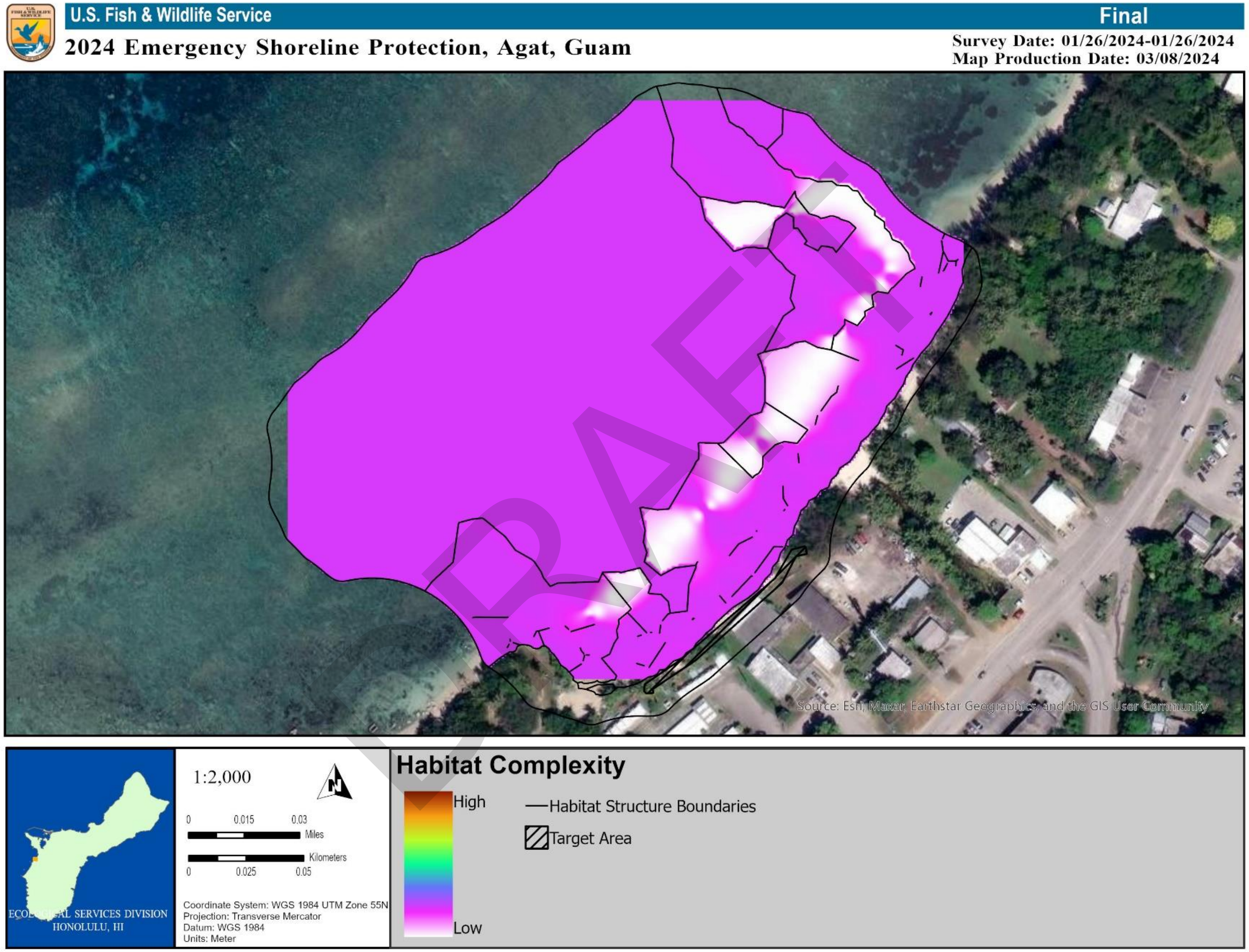

Figure A7. Habitat Complexity. Map of the habitat complexity within the Project Area.

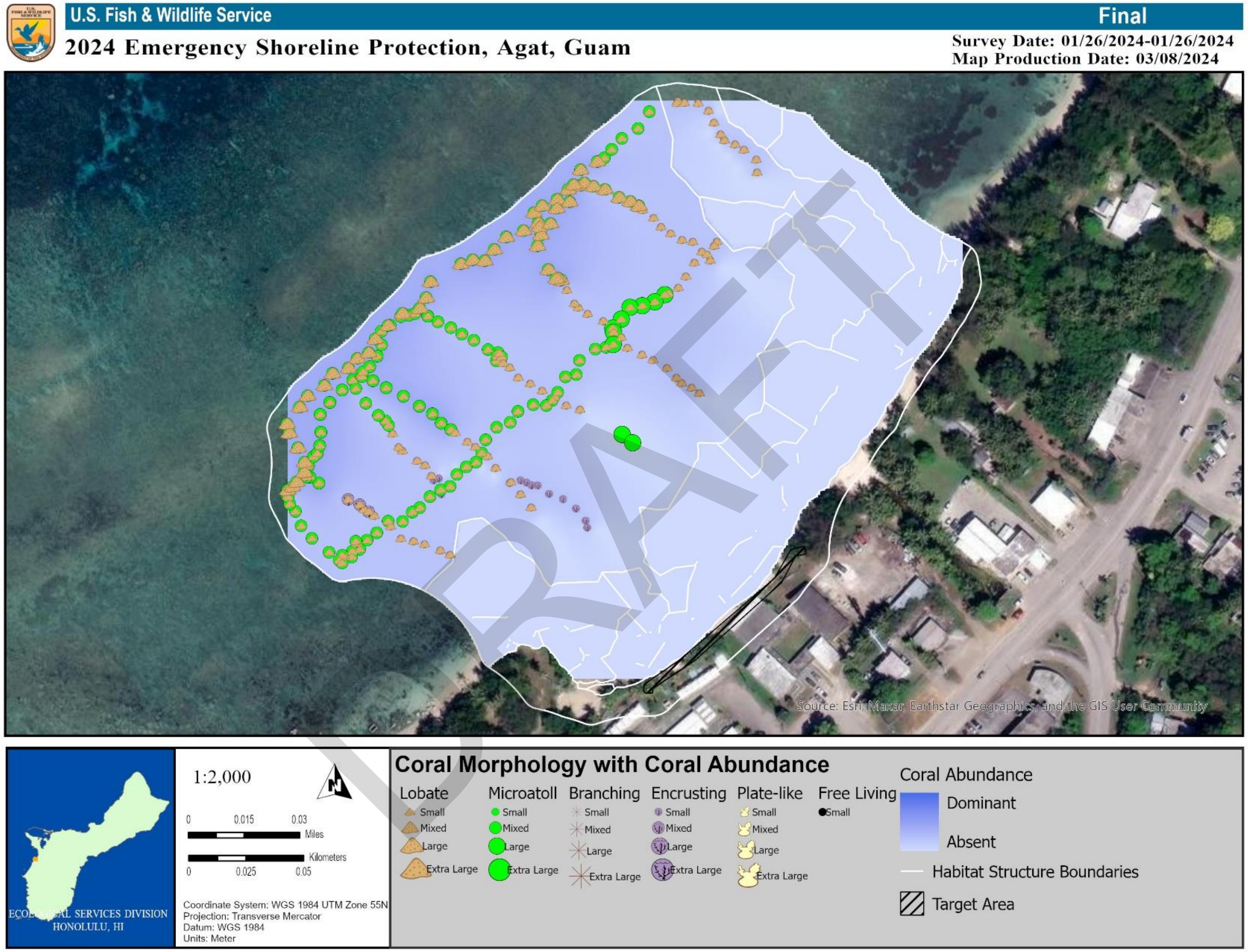

Figure A8. Coral Morphology with Coral Abundance. Map of coral morphology and coral abundance observed in the Project Area.

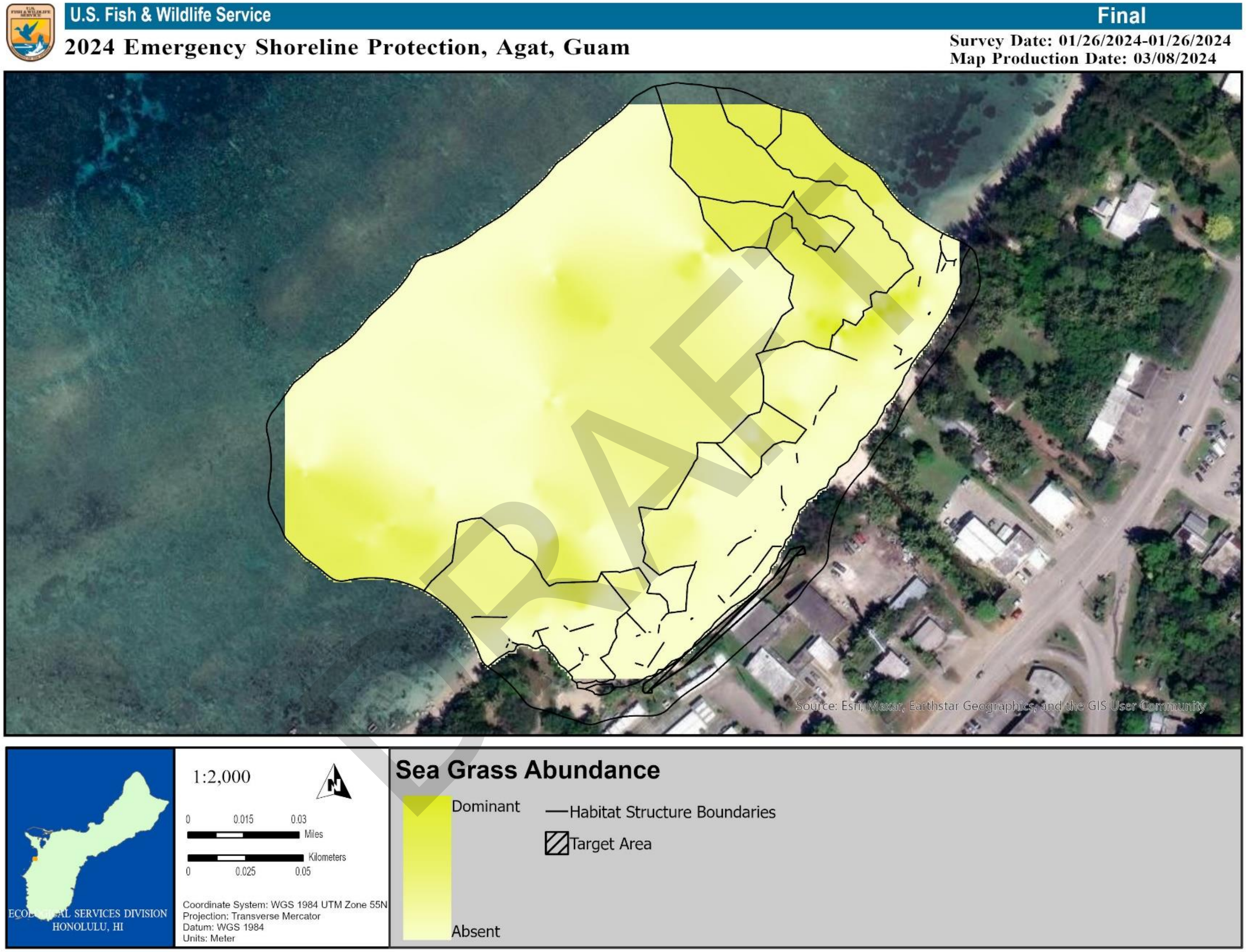

Figure A9. Seagrass Abundance. Map of seagrass abundance observed in the Project Area.

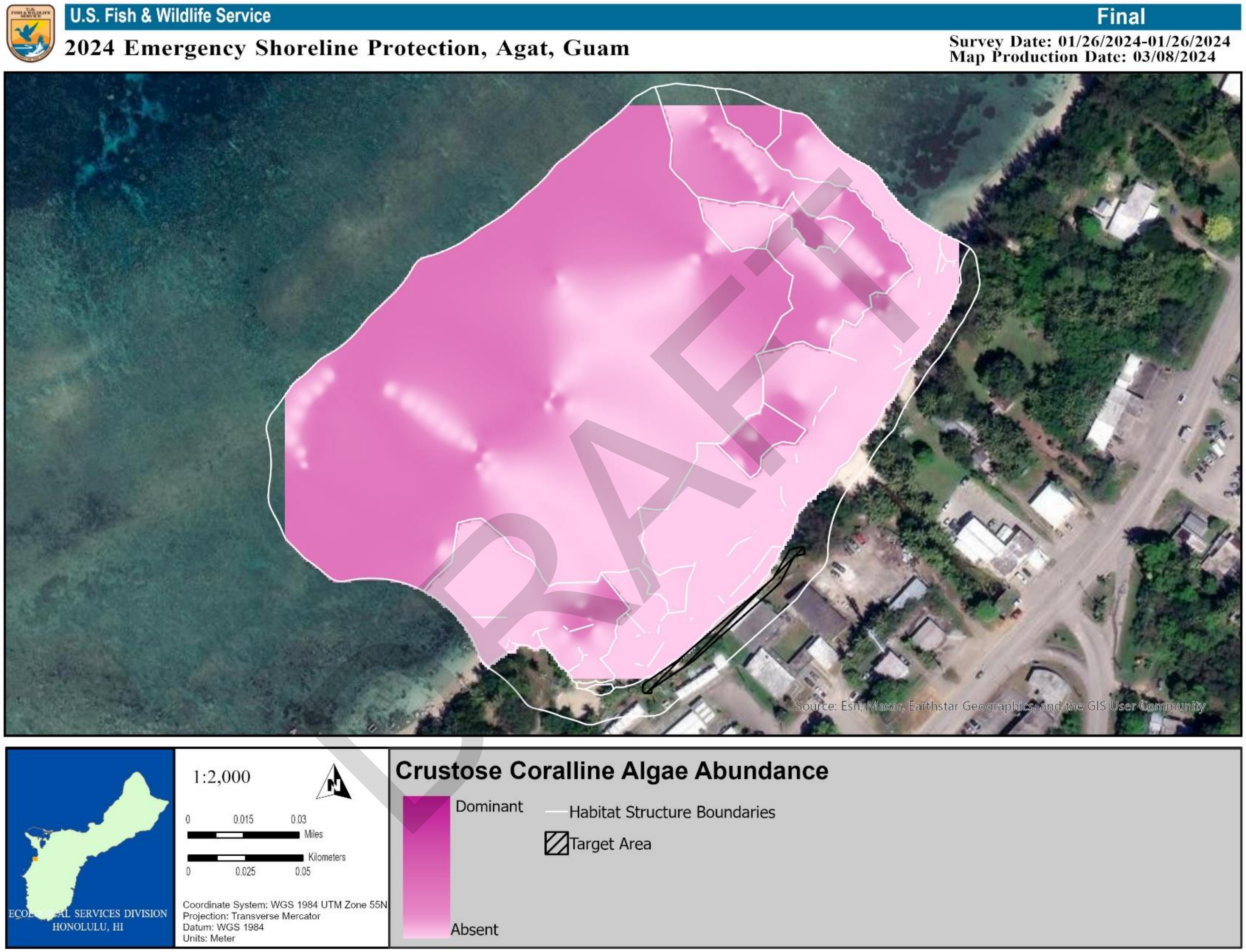

Figure A10. Crustose Coralline Algae Abundance. Map of the CCA abundance observed in the Project Area.

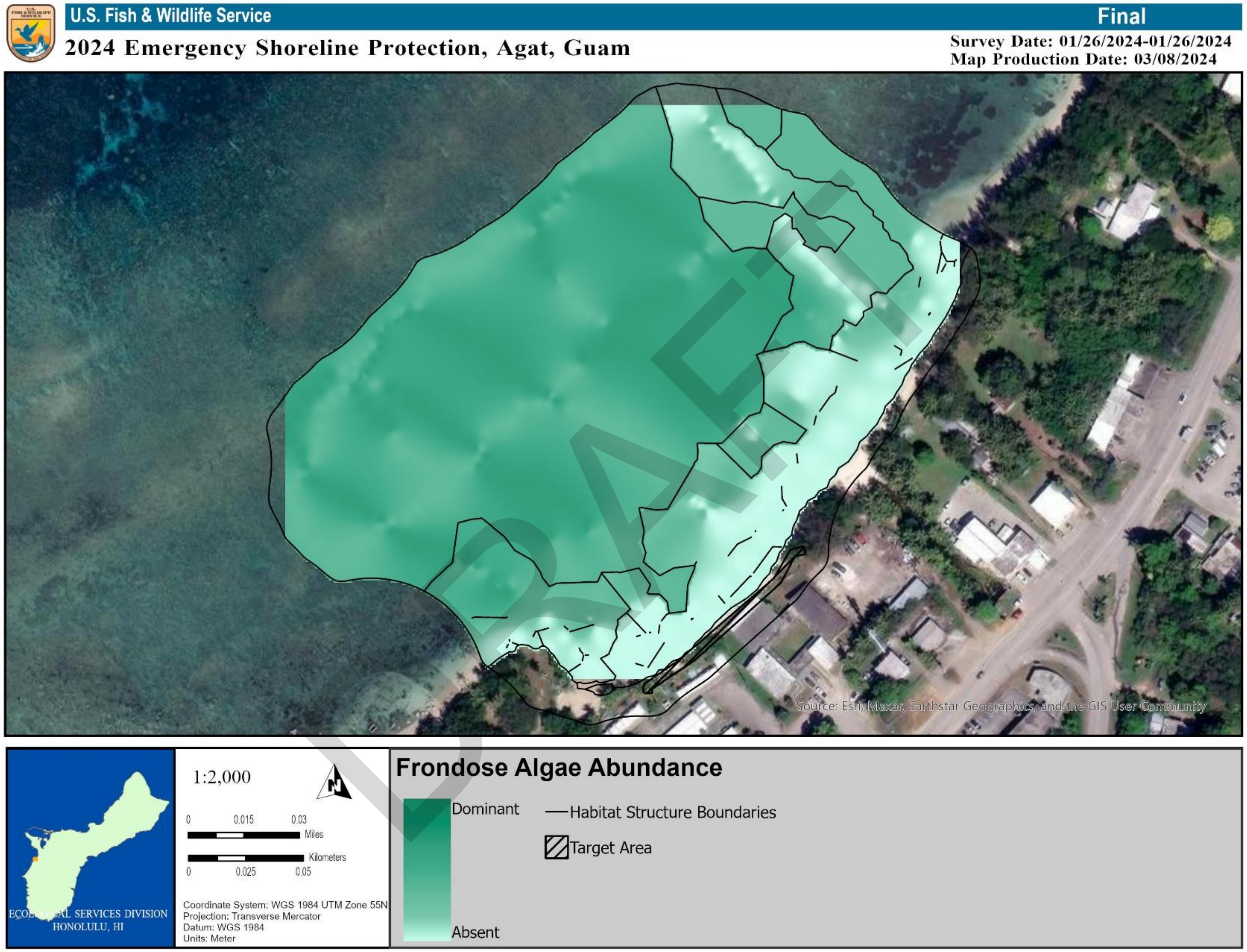

Figure A11. Frondose Algae Abundance. Map of the frondose algae abundance observed in the Project Area.

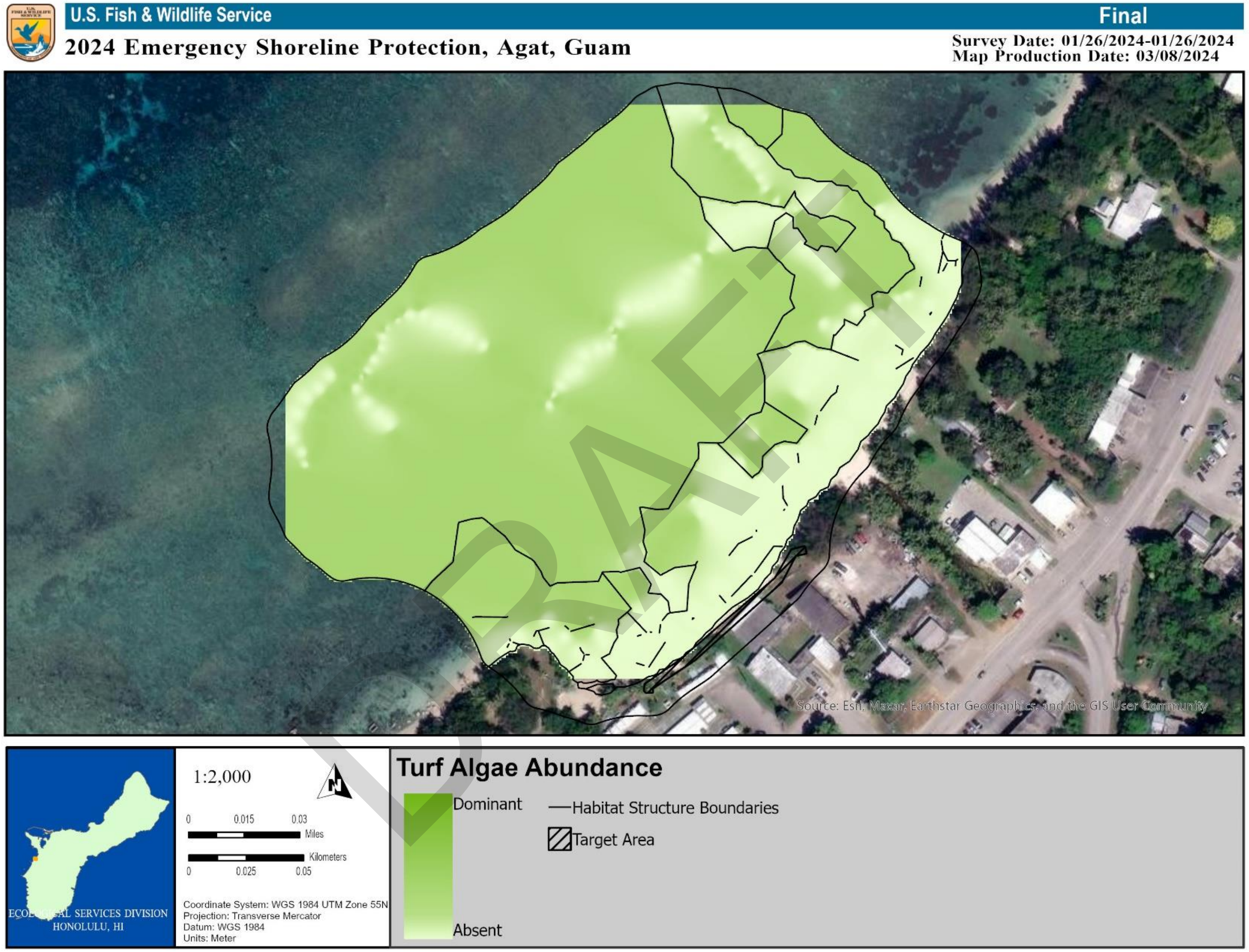

Figure A12. Turf Algae Abundance. Map of turf algae abundance observed in the Project Area.

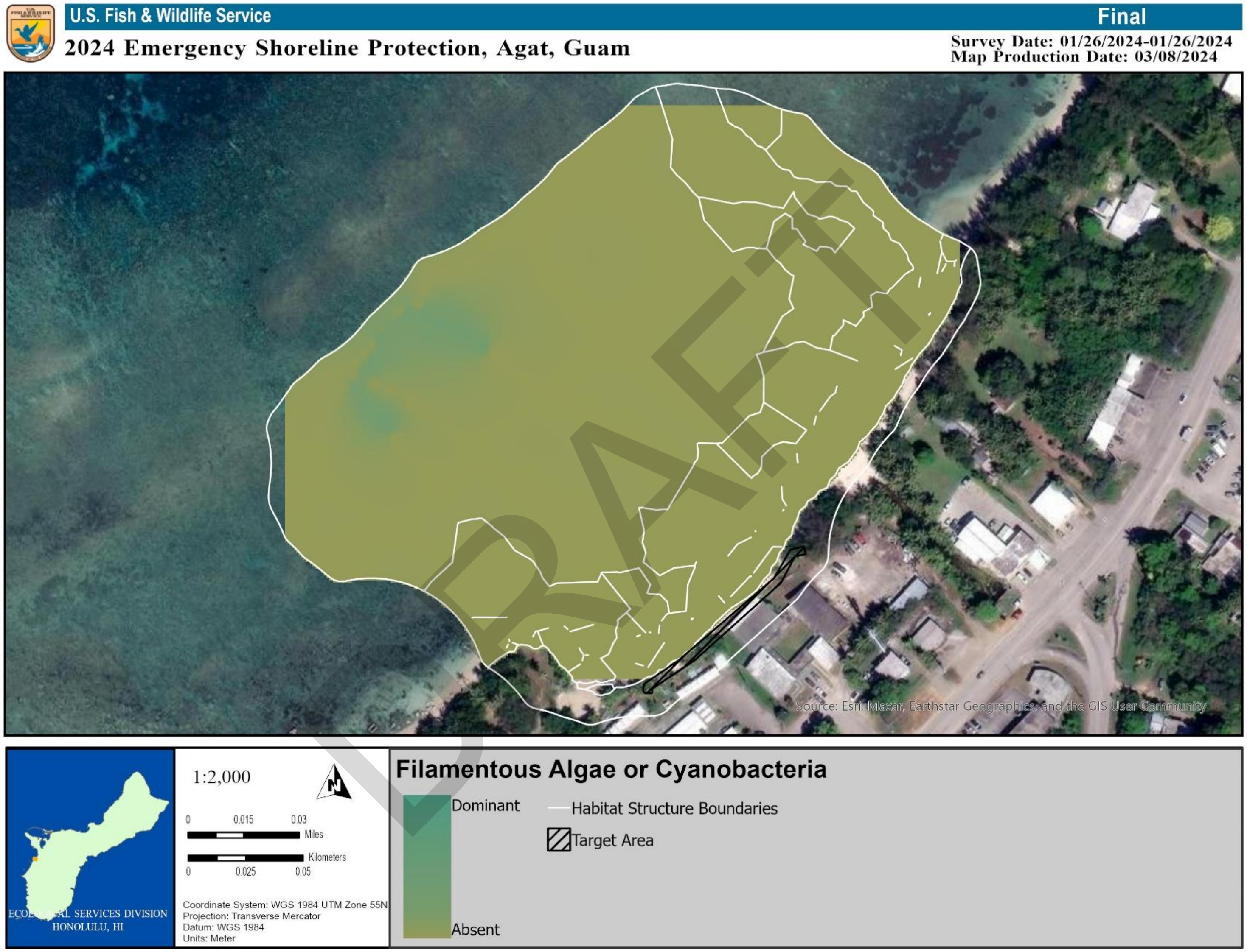

Figure A13. Filamentous Algae or Cyanobacteria. Map of the filamentous algae and cyanobacteria observed in the Project Area.

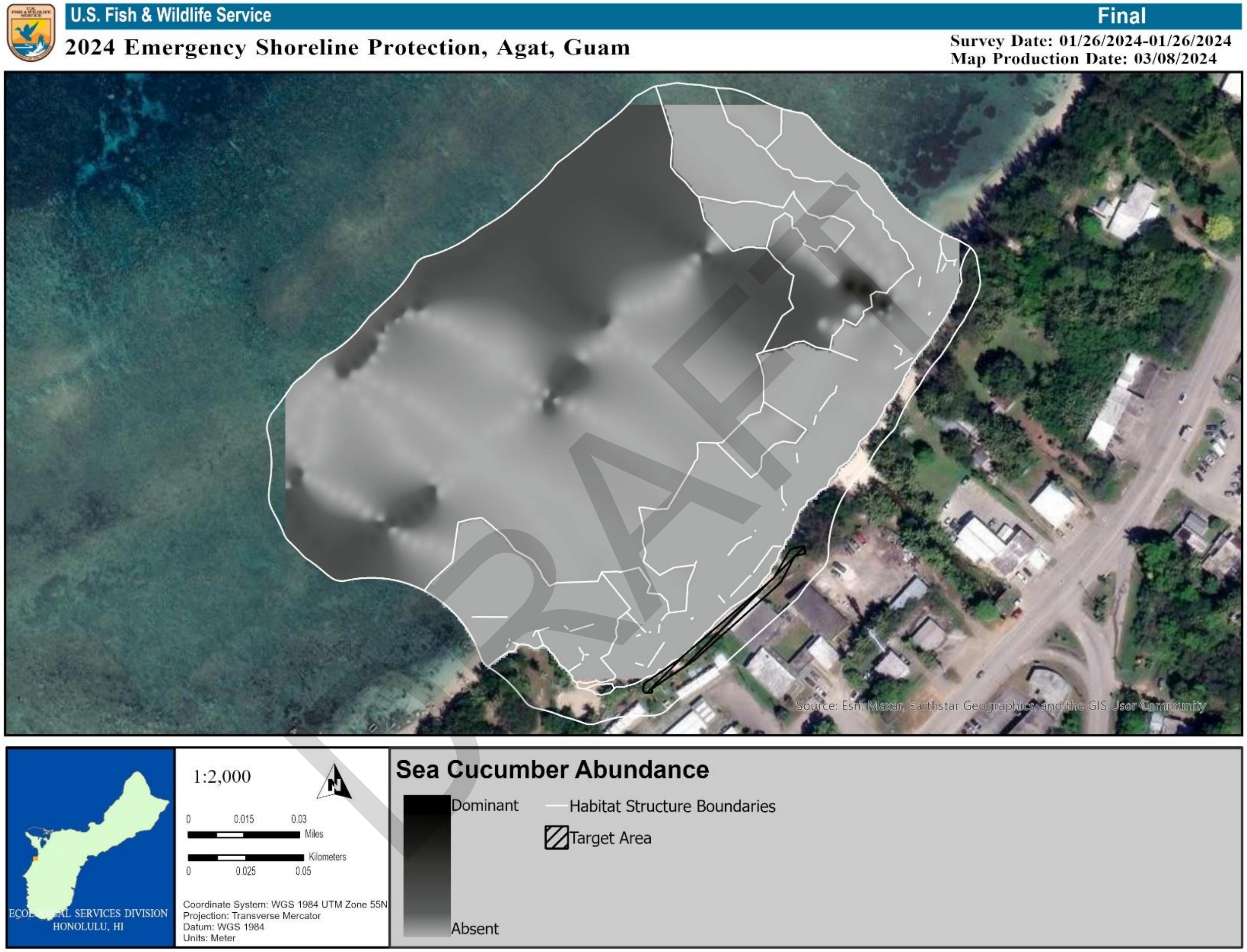

Figure A14. Sea Cumber Abundance. Map of the sea cucumber abundance observed in the Project Area.

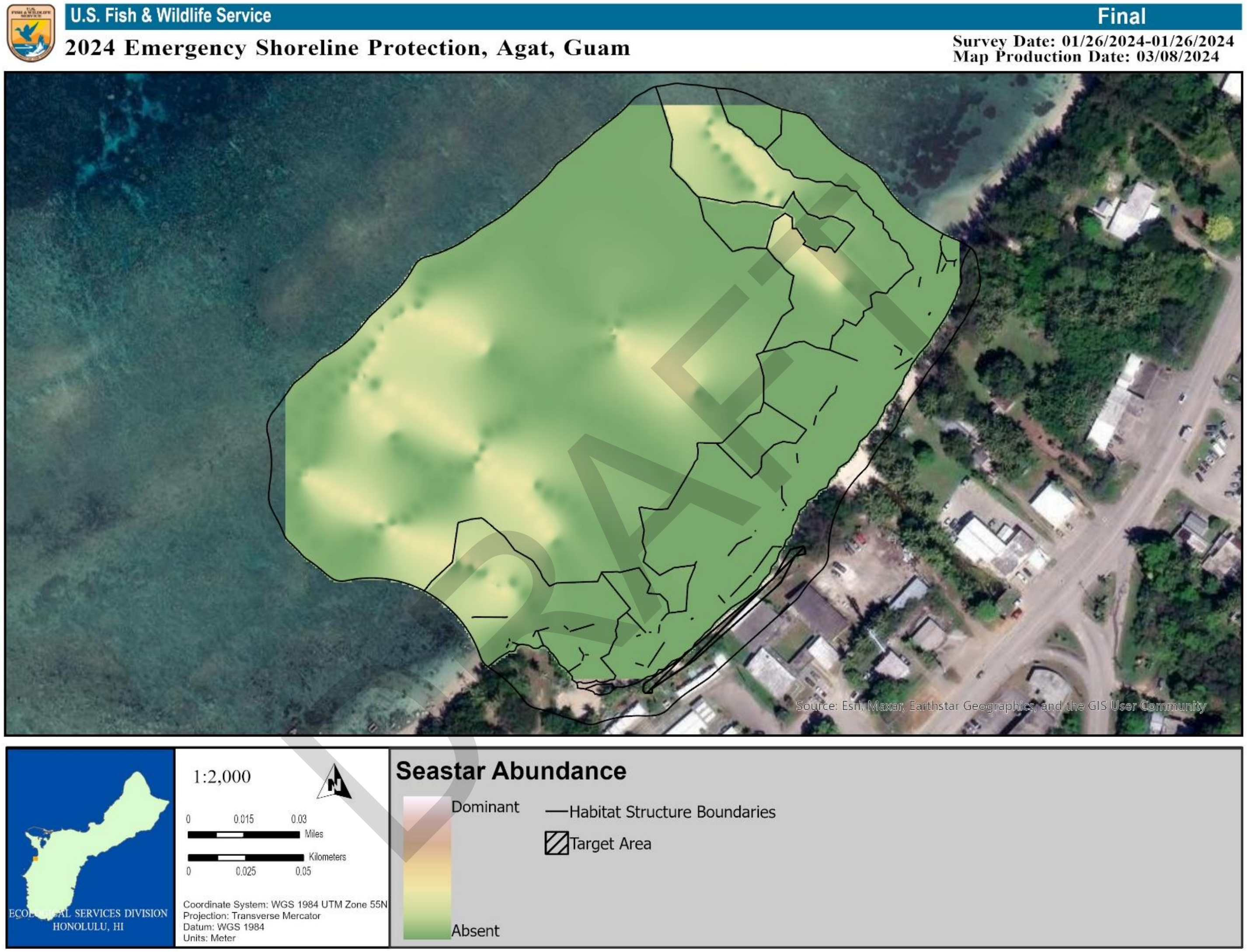

Figure A15. Sea Star Abundance. Map of the sea star abundance observed in the Project Area.

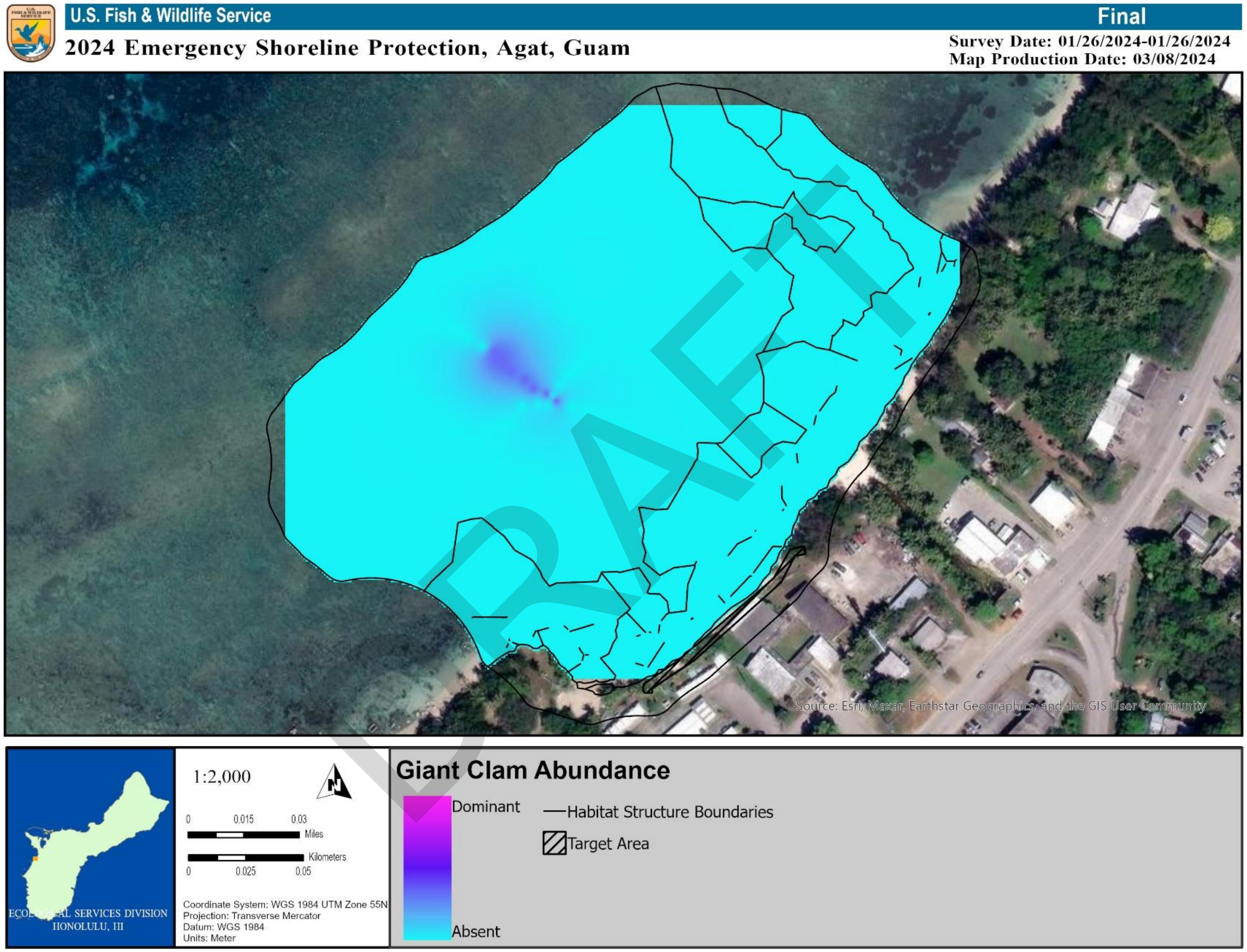

Figure A16. Giant Clam Abundance. Map of the giant clam abundance observed in the Project Area.

Figure A17. Sea Turtle Presence. Map showing locations of the two adult green turtles observed during surveys in the Project Area.

Figure A18. Debris Presence. Map showing the location of an observed abandoned gill net in the Project Area.

APPENDIX B: 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.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish And Wildlife Office
300 Ala Moana Boulevard, Box 50088
Honolulu, HI 96850-5000
Phone: (808) 792-9400 Fax: (808) 792-9580

In Reply Refer To: 05/13/2024 22:53:23 UTC
Project Code: 2024-0029693
Project Name: Agat Mayor's Complex

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened and endangered species, as well as designated critical habitat that may occur within the boundary of your proposed project and that may be affected by project related actions. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Please contact the Service's Pacific Islands Fish and Wildlife Office (PIFWO) at 808-792-9400 if you have any questions regarding your IPaC species list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may adversely affect threatened and endangered species and/or designated critical habitat.

Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a Biological

Evaluation, similar to a Biological Assessment, be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment or Biological Evaluation are described at 50 CFR 402.12.

Due to the significant number of listed species found on each island within PIFWO's regulatory jurisdiction, and the difficulty in accurately mapping ranges for species that we have limited information about, your species list may include more species than if you obtained the list directly from a Service biologist. We recommend you use the species links in IPaC to view the life history, habitat descriptions, and recommended avoidance and minimization measures to assist with your initial determination of whether the species or its habitat may occur within your project area. If appropriate habitat is present for a listed species, we recommend surveys be conducted to determine whether the species is also present. If no surveys are conducted, we err on the side of the species, by regulation, and assume the habitat is occupied. Updated avoidance and minimization measures for plants and animals, best management practices for work in or near aquatic environments, and invasive species biosecurity protocols can be found on the PIFWO website at: https://www.fws.gov/office/pacific-islands-fish-and-wildlife/library.

If a Federal agency determines, based on the Biological Assessment or Biological Evaluation, that a listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at: http://www.fws.gov/endangered/esa-library/index.

Non-federal entities can also use the IPaC generated species list to develop Habitat Conservation Plans (HCP) in accordance with section 10(a)(1)(B) of the Act. We recommend HCP applicants coordinate with the Service early during the HCP development process. For additional information on HCPs, the Habitat Conservation Planning handbook can be found at https://www.fws.gov/sites/default/files/documents/habitat-conservation-planning-handbook-entire.pdf.

Please be aware that wind energy projects should follow the Service's wind energy guidelines (http://www.fws.gov/windenergy) for minimizing impacts to migratory birds. Listed birds and the Hawaiian hoary bat may also be affected by wind energy development and we recommend development of a Habitat Conservation Plan for those species, as described above. Guidance for minimizing impacts to migratory birds for projects including communications towers can be found at:

- http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers
- http://www.towerkill.com
- http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation actions that benefit threatened and endangered species into their project planning to further the purposes of the Act in accordance with section 7(a)(1). Please include the Consultation Tracking Number associated with your IPaC species list in any request for consultation or correspondence about your project that you submit to our office. Please feel free to contact us at PIFWO_admin@fws.gov or 808-792-9400 if you need more current information or assistance regarding the potential impacts to federally listed species and federally designated critical habitat.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Bald & Golden Eagles
- Migratory Birds
- Wetlands

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Pacific Islands Fish And Wildlife Office
300 Ala Moana Boulevard, Box 50088
Honolulu, HI 96850-5000
(808) 792-9400

PROJECT SUMMARY

Project Code: 2024-0029693

Project Name: Agat Mayor's Complex

Project Type: Shoreline Stabilization

Project Description: The municipal government headquarters of Agat, commonly referred to as the “mayor’s office,” is located on the Territory of Guam’s west central coast in the village of Agat. The collection of buildings at this location includes the mayor’s office, emergency shelter and evacuation facility, post office, and Agat Sagan Bisita, a community gathering space. This complex spans approximately 450 feet (ft) along the shoreline.

The furthest oceanward building is just a few feet from a concrete rock masonry (CRM) seawall that protects it from the eroding shoreline. The proximity of these buildings and facilities to the seawall make them vulnerable to wave overtopping during high wave events. The seawall itself is vulnerable to undermining due to continued erosion of the beach.

The U.S. Army Corps of Engineers, Honolulu District (USACE) analyzed potential alternatives for implementation of emergency shoreline protection measures along the shoreline at the Agat Mayor’s Complex. The array of alternatives include: 1) no action, 2) concrete armor unit revetment, 3) open cell piling seawall, 4) secant pile seawall, and 5) relocation the of Mayor’s Complex. USACE identifies alternative 3) open cell piling seawall as the tentatively selected plan since it is the most practicable with respect to real estate considerations, costs, and logistics. Without this project, impacts to the reliability and accessibility of this key administrative center and multi-use community space are imminent.

The action area for the project is approximately 20.34 acres. A 320 ft long by 2 ft wide open cell piling seawall will be constructed in the project footprint. Construction of the seawall is expected to begin in 2027 and take approximately 6 months.

Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@13.38901255,144.6584286875805,14z

Counties:	Guam County, Guam

ENDANGERED SPECIES ACT SPECIES

There is a total of 16 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Mariana Fruit Bat (=mariana Flying Fox) *Pteropus mariannus mariannus* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2415	Threatened

BIRDS

NAME	STATUS
Guam Kingfisher *Todiramphus cinnamominus* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6	Endangered
Guam Rail *Gallirallus owstoni* Population: Wherever found, except where listed as an experimental population No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5112	Endangered
Mariana Swiftlet *Aerodramus bartschi* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8166	Endangered
Short-tailed Albatross *Phoebastria (=Diomedea) albatrus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/433	Endangered

REPTILES

NAME	STATUS
Green Sea Turtle *Chelonia mydas* Population: Central West Pacific DPS There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6199 General project design guidelines: https://ipac.ecosphere.fws.gov/project/EG45PBY7WZFJJAR4RTUFKXPA7A/documents/generated/6929.pdf	Endangered
Hawksbill Sea Turtle *Eretmochelys imbricata* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3656	Endangered
Slevin's Skink *Emoia slevini* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9767	Endangered

SNAILS

NAME	STATUS
Fragile Tree Snail *Samoana fragilis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4835	Endangered
Guam Tree Snail *Partula radiolata* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1530	Endangered
Humped Tree Snail *Partula gibba* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/61	Endangered

FLOWERING PLANTS

NAME	STATUS
Cebello Halumtano *Bulbophyllum guamense* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9753	Threatened
Dendrobium guamense No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9754	Threatened
Tuberolabium guamense No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9762	Threatened
Ufa-halomtano *Heritiera longipetiolata* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2526	Endangered

CONIFERS AND CYCADS

NAME	STATUS
Fadang *Cycas micronesica* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9763	Threatened

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

BALD & GOLDEN EAGLES

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act[1] and the Migratory Bird Treaty Act[2].

Any person or organization who plans or conducts activities that may result in impacts to bald or golden eagles, or their habitats[3], should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

---

1. The Bald and Golden Eagle Protection Act of 1940.
2. The Migratory Birds Treaty Act of 1918.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

THERE ARE NO BALD AND GOLDEN EAGLES WITHIN THE VICINITY OF YOUR PROJECT AREA.

MIGRATORY BIRDS

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats[3] should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

---

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

THERE ARE NO FWS MIGRATORY BIRDS OF CONCERN WITHIN THE VICINITY OF YOUR PROJECT AREA.

WETLANDS

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

ESTUARINE AND MARINE WETLAND

- M2US2N

ESTUARINE AND MARINE DEEPWATER

- M1RF1L

IPAC USER CONTACT INFORMATION

Agency: Army Corps of Engineers
Name: Connie Chan-Le
Address: 230 Otake Street
City: Fort Shafter
State: HI
Zip: 96858
Email connie.g.chanle@usace.army.mil
Phone: 8082895746

From:	Gombar, Laura P
To:	Chan Le, Connie G CIV USARMY CEPOH (USA); Flores, Jacqueline B; PIFWO_Admin, FW1
Cc:	Paahana, Jessie A CIV USARMY CEPOH (USA); Dean, Marian E CIV USARMY CEPOH (USA); Guild, Aurora C CIV USARMY CEPOH (USA)
Subject:	[Non-DoD Source] RE: [EXTERNAL] RE: Hagat Mayor's Complex – Species List Confirmation and Green Sea Turtle Critical Habitat Discussion
Date:	Wednesday, February 28, 2024 11:13:08 AM
Attachments:	image001.png image002.png

Hafa adai Connie,

My apologies for the delayed response. I've reviewed the species list and map that you have provided and consulted with some members of our team. Although you had stated it may be unlikely that some of the species on the list would be present in the project area, the Service does err on the side of the species and assumes presence. I would suggest having a biological survey of the project site performed to determine which listed species are present within the area. I have spoken to both our team biologist and Division of Aquatic and Wildlife Resources (DAWR) for further input, and there have been recordings of sea turtles along the beaches both north and south of the area outlined in red on the map. If you and your team would like, we can engage in technical assistance, and I can provide avoidance and minimization measures once your team has a chance to finalize the species list and project description. Please let me know if you have any questions or concerns.

Thank you,
Laura

Si Yu'us ma'ase,
Laura Alexandria Gombar
USFWS – Ecological Services
Pacific Islands Fish & Wildlife Office
mobile: 671-787-3819
lauraalexandria_gombar@fws.gov

From: Chan Le, Connie G CIV USARMY CEPOH (USA) <Connie.G.ChanLe@usace.army.mil>
Sent: Thursday, February 22, 2024 11:22 AM
To: Flores, Jacqueline B <jacqueline_flores@fws.gov>; Gombar, Laura P <lauraalexandria_gombar@fws.gov>; PIFWO_Admin, FW1 <pifwo_admin@fws.gov>
Cc: Paahana, Jessie A CIV USARMY CEPOH (USA) <Jessie.K.Paahana@usace.army.mil>; Dean, Marian E CIV USARMY CEPOH (USA) <Marian.Dean@usace.army.mil>; Guild, Aurora C CIV USARMY CEPOH (USA) <Aurora.Guild@usace.army.mil>
Subject: [EXTERNAL] RE: Hagat Mayor's Complex – Species List Confirmation and Green Sea Turtle Critical Habitat Discussion

Hi Laura and Jackie,

I'm checking in to see if you have a response on our IPaC generated species list. Please let me know if you have any questions.

V/r,

Connie Chan-Le
Environmental Planner
Civil & Public Works Branch
Honolulu District, U.S. Army Corps of Engineers
230 Otake Street, Room 304
Fort Shafter, HI 96858-5440

Connie.G.ChanLe@usace.army.mil
Cell: (808) 289-5746
Office: (808) 835-4018

From: Chan Le, Connie G CIV USARMY CEPOH (USA)
Sent: Thursday, February 1, 2024 5:06 PM
To: jacqueline_flores@fws.gov; Gombar, Laura P <lauraalexandria_gombar@fws.gov>; pifwo_admin@fws.gov
Cc: Paahana, Jessie A CIV USARMY CEPOH (USA) <Jessie.K.Paahana@usace.army.mil>; Dean, Marian E CIV USARMY CEPOH (USA) <Marian.Dean@usace.army.mil>
Subject: FW: Hagat Mayor's Complex – Species List Confirmation and Green Sea Turtle Critical Habitat Discussion

Aloha Laura and Jackie,

I am following up for a response to our official species list (Project Code: 2024-0029693) from late December. Please see the original message below, and we are available to answer any questions.

V/r,

Connie Chan-Le
Environmental Planner
Civil & Public Works Branch
Honolulu District, U.S. Army Corps of Engineers
230 Otake Street, Room 304
Fort Shafter, HI 96858-5440

Connie.G.ChanLe@usace.army.mil
Cell: (808) 289-5746
Office: (808) 835-4018

From: Chan Le, Connie G CIV USARMY CEPOH (USA)
Sent: Friday, December 22, 2023 1:03 PM
To: pifwo_admin@fws.gov
Cc: Gombar, Laura P <lauraalexandria_gombar@fws.gov>; Dean, Marian E CIV USARMY CEPOH (USA) <Marian.Dean@usace.army.mil>; Paahana, Jessie A CIV USARMY CEPOH (USA) <Jessie.K.Paahana@usace.army.mil>
Subject: Hagat Mayor's Complex – Species List Confirmation and Green Sea Turtle Critical Habitat Discussion

Aloha Pacific Islands Fish and Wildlife Office,

USACE Honolulu District would like assistance from the Service in confirming or refining our official species list (Project Code: 2024-0029693) for consultation under the Endangered Species Act (ESA) and to conference on the proposed green sea turtle critical habitat for Guam. Pursuant to Section 7 of the ESA, USACE requested technical assistance from the Service on December 12, 2023, and on December 21, 2023, received the provided list of species listed or proposed for listing under USFWS jurisdiction that may be present on or in the vicinity of the study area. Additionally, USACE hosted a resource agency workshop for the feasibility study of our project on July 17, 2023.

We are studying alternatives to provide emergency shoreline protection from coastal erosion at the Hagat Mayor's complex in the village of Hagat on the Territory of Guam's west central coast. The study area includes approximately 450 feet of shoreline that is adjacent to the Mayor's complex. The attached photo shows the study area in red, potential project staging areas in yellow, and the neighboring national park boundary in white. The Mayor's complex is currently protected by a damaged concrete rock masonry (CRM) and concrete block wall in danger of failure (images attached).

Our official species list from the IPaC website suggests that the following ESA-listed species may be potentially affected by construction activities in the defined project area that includes the shoreline and staging areas:

- Mariana fruit bat (*Pteropus mariannus mariannus*)
- Guam Kingfisher (*Todiramphus cinnamominus*)
- Guam Rail (*Gallirallus owstoni*)
- Mariana Swiftlet (*Aerodramus bartschi*)
- Short-tailed Albatross Phoebastria *(=Diomedea) albatrus*

- Green sea turtle (*Chelonia mydas*)
- Hawksbill Sea Turtle (*Eretmochelys imbricata*)
- Slevin's skink (*Emoia slevini*)
- Fragile tree snail (*Samoana fragilis*)
- Guam tree snail (*Partula radiolata*)
- Humped tree snail (*Partula gibba*)
- Cebello Halumtano (*Bulbophyllum guamense*)
- Dendrobium guamense
- Tuberolabium guamense
- Ufa-halomtano (*Heritiera longipetiolata*)
- Fadang (*Cycas micronesica*)

Most of these species are threatened or endangered because of the loss of unique forest habitats endemic to Guam and the Northern Mariana Islands; it seems unlikely that they would be present in the sparse, developed habitat available within and near the project study area. Green sea turtles have a year-round nesting season, but USACE has not found information that they nest on the shoreline adjacent to the Mayor's complex.

Thank you for your attention to this matter. Please feel free to contact myself should you have any questions.

V/r,

Connie Chan-Le
Environmental Planner
Civil & Public Works Branch
Honolulu District, U.S. Army Corps of Engineers
230 Otake Street, Room 304
Fort Shafter, HI 96858-5440

Connie.G.ChanLe@usace.army.mil
Cell: (808) 289-5746
Office: (808) 835-4018

From:	Joshua Rudolph - NOAA Federal
To:	Chan Le, Connie G CIV USARMY CEPOH (USA)
Cc:	Dean, Marian E CIV USARMY CEPOH (USA); Paahana, Jessie A CIV USARMY CEPOH (USA)
Subject:	[Non-DoD Source] Re: Hagat Mayor's Complex – Species List and Green Sea Turtle/Coral Critical Habitat Discussion
Date:	Wednesday, December 27, 2023 9:31:12 AM
Attachments:	image001.png

Aloha Connie,

The nearshore species NMFS PRD would expect may be present in the nearshore waters would be the following:

- Central West Pacific green sea turtle
- hawksbill sea turtle
- Indo-West Pacific scalloped hammerhead shark; and
- (coral) *Acropora globiceps*

Additionally, there are two proposed critical habitats you may want to consider in the analysis of your proposed action. Those being proposed coral critical habitat (https://www.fisheries.noaa.gov/action/proposed-rule-designate-critical-habitat-indo-pacific-corals) and proposed green sea turtle critical habitat (https://www.fisheries.noaa.gov/action/proposed-rule-designate-critical-habitat-green-sea-turtles).

Generally speaking for your planning purposes and consideration as you're discussing alternatives (I cannot remember if I/we had already made these points at the workshop or the breakout meeting in July- but figured I'd add it in this email to be safe). For these types of projects (any shoreline hardening), NMFS usually recommends/requests analyses of coastal processes to adequately evaluate proposed project's effects to ESA-listed species and their habitat; particularly when projects may potentially adversely affect/modify critical habitat(s). We usually recommend the USACE conduct or contract a study with modeling by a hydrogeomorphologist, coastal oceanographer, or a qualified scientist early on to predict changes to wave energy caused by a revetment(s) on sediment movement, nearby coral reefs, and other natural features like beaches. While a project may fix the issues occuring at one location, they can sometimes cause others elsewhere down the coast or on either side, if not properly considered initially.

We have observed geomorphologic changes in numerous similar projects. Therefore, we cannot assume that it would not occur at a specific geographical location without scientific modeling or scientific explanation of the natural processes that presently occur and how it is expected to occur moving forward. We'd also usually like to know how climate change is taken into account for these modeling processes. Typically, design of stabilization projects should minimize beach erosion or increased energy that could destroy sensitive [critical] habitats; or propose mitigative or restorative projects as part of the action to counter or reduce any impacts on natural processes that are predicted to occur from future projects of this nature (again, just generally speaking).

Please disregard this discussion if you do not feel they are applicable at this site (or if we already covered these at the previous meeting). We are not sure how the ESA listing process may evolve (or not), but considering your project will likely be later in time, it is something to consider in your forward thinking planning.

As far as the additional pelagic species, you would not need to consider them unless you had potential vessel transiting occuring offshore or in deep waters. If you can identify any vessel transiting routes, we can advise on any species that might be present. However, I suspect much of this work will be concluded from land and may not be applicable.

Regarding the candidate giant clam species noted in your email, those are all correct species we'd expect to occur in Guam. However, given they are still candidate species, USACE is not required to consult on them at this time. You may want to watch those species for any potential listing determinations depending on the time scale of your proposed project. In the future, you may want to consider *conferencing*, if applicable.

Lastly, regarding the sheet pile wall installation alternative; if USACE needs additional support for any acoustic analysis related to pile driving and those potential effects, our office would be happy to assist. Please let us know in that scenario.

Feel free to reach out if you have any additional questions, comments, or concerns. Finally I'll also note, I will defer any and all concerns related to EFH to the Habitat Conservation Division.

Respectfully,
Josh

On Fri, Dec 22, 2023 at 3:24 PM Chan Le, Connie G CIV USARMY CEPOH (USA) <Connie.G.ChanLe@usace.army.mil> wrote:

> Aloha Pacific Islands Regional Office,
>
> USACE Honolulu District would like assistance in refining the list of ESA-listed marine species occurring in the Marianas Archipelago for consultation under the Endangered Species Act (ESA) and to conference on the proposed critical habitat for green sea turtles and several coral species in Guam. Pursuant to Section 7 of the ESA, on December 22, 2023, USACE reviewed the provided list of species listed or proposed for listing under NOAA Fisheries jurisdiction that may be present on or in the vicinity of our study area. Additionally, USACE hosted a resource agency workshop for the feasibility study of our project on July 17, 2023.
>
> We are studying alternatives to provide emergency shoreline protection from coastal erosion at the Hagat Mayor's complex in the village of Hagat on the Territory of Guam's west central coast. Please see an attached document for a short project description. The study area includes approximately 450 feet of shoreline that is adjacent to the Mayor's complex. The attached photo shows the study area in red, potential project staging areas in yellow, and the neighboring national park boundary in white. The Mayor's complex is currently protected by a damaged concrete rock masonry (CRM) and concrete block wall in danger of failure

(images attached).

The marine protect species of the Mariana Islands list suggests that the following ESA-listed marine species may be potentially affected by construction activities in the study area:

- Blue Whale (*Balaenoptera musculus*)
- Fin Whale (*Balaenoptera physalus*)
- Western North Pacific Humpback Whale (*Megaptera novaeangliae*)
- Sei Whale (*Balaenoptera borealis*)
- Sperm Whale (*Physeter macrocephalus*)
- Dugong (*Dugong dugon*)
- Central West Pacific Green Turtle (*Chelonia mydas*)
- Hawksbill Turtle (*Eretmochelys imbricata*)
- Leatherback Turtle (*Dermochelys coriacea*)
- North Pacific Loggerhead Turtle (*Caretta caretta*)
- Olive Ridley Turtle (*Lepidochelys olivacea*)
- Indo-West Pacific Scalloped Hammerhead Shark (*Sphyrna lewini*)
- Giant Manta Ray (*Manta birostris*)
- Oceanic Whitetip Shark (*Carcharhinus longimanus*)
- *Acropora globiceps*
- *Tridacna derasa*
- *Tridacna squamosa*
- *Tridacna gigas*
- *Hippopus hippopus*
- Pacific Coral

It seems unlikely that most of these species would be present within and near the project study area. Green sea turtles can potentially bask on the shoreline adjacent to the Mayor's complex and they have a year-round nesting season, but USACE has not found information that this species nests at this location.

Thank you for your attention to this matter. Please feel free to contact myself should you have any questions.

V/r,

Connie Chan-Le

Environmental Planner

Civil & Public Works Branch

Honolulu District, U.S. Army Corps of Engineers

230 Otake Street, Room 304

Fort Shafter, HI 96858-5440

Connie.G.ChanLe@usace.army.mil

Cell: (808) 289-5746

Office: (808) 835-4018

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Joshua Rudolph, M.Sc.
Endangered Species Biologist
Protected Resources
Pacific Island Regional Office
NOAA Fisheries | U.S. Department of Commerce
Office: (808) 725-5147
www.fisheries.noaa.gov

Civil and Public Works Branch
Programs and Project Management Division

Mr. Earl Campbell
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawai‘i 96850

Dear Mr. Campbell:

The Honolulu District, U.S. Army Corps of Engineers (Corps) has initiated a feasibility study to evaluate measures to protect the Agat Bay shoreline bordering Agat Mayor’s Complex, Agat, Guam. The study is authorized under Section 14 of the Flood Control Act of 1946, authorizing the Corps to plan and construct emergency streambank and shoreline protection projects to protect endangered highways, highway bridge approaches, public facilities such as water and sewer lines, churches, public and private nonprofit schools and hospitals, and other nonprofit public facilities. The Government of Guam, represented by the Guam Department of Public Works, is the non-Federal sponsor for this study.

The tentatively selected plan, or proposed action, consists of replacing approximately 320 linear ft of the 450 ft existing, compromised seawall with a 1 ft wide Open Cell Piling Seawall totaling 1760 square feet along the Agat Bay coast. The top crest elevation needed for the design to meet the Corps’ 50-year design requirement for sea level change (SLC) and be adaptable to 100-year SLC under the intermediate scenario is 9 ft above Mean Sea Level (MSL), approximately 1 ft higher than the existing seawall. The seawall cap and splash apron will be approximately 4 ft wide, constructed parallel to the shoreline and extending landward. At this time, construction of project features will be predominately from the upland side with limited and temporary work occurring in the intertidal zone where the existing wall is.

The Corps hosted an interagency coordination meeting on July 17, 2023, that your agency attended, to present the project details and share information regarding resource impacts and concerns in preparation for a National Environmental Policy Act Environmental Assessment. Pursuant to Section 7 of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.), the Corps requested technical assistance from the U.S. Fish and Wildlife Service (USFWS) and received the following list of species listed or proposed for listing under USFWS jurisdiction (Table 1) 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 proposed study.

Table 1. Species and critical habitat protected under the Endangered Species Act potentially present within the Action.

Species	Status	Determination	Request
Green sea turtle, Central South Pacific Distinct Population Segment *Chelonia mydas*	Endangered	May Affect, not likely to adversely affect	Informal Consultation and Conference on Proposed Critical Habitat, Letter of Concurrence
Hawksbill sea turtle *Eretmochelys imbricata*	Endangered	No Effect	Informal Consultation, Letter of Concurrence
Slevin's Skink *Emoia slevini*	Endangered	No Effect	Informal Consultation, Letter of Concurrence
Mariana fruit bat *Pteropus mariannus mariannus*	Endangered	May Affect, not likely to adversely affect	Informal Consultation, Letter of Concurrence
Guam Kingfisher, sihek Todiramphus cinnamominus	Endangered	No Effect	Informal Consultation, Letter of Concurrence
Guam Rail Gallirallus owstoni	Endangered	No Effect	Informal Consultation, Letter of Concurrence
Mariana Swiftlet *Aerodramus bartschi*	Endangered	May Affect, not likely to adversely affect	Informal Consultation, Letter of Concurrence
Short-tailed Albatross *Phoebastria (Diomedea) albatrus*	Endangered	No Effect	Informal Consultation, Letter of Concurrence
Fragile Tree Snail *Samoana fragilis*	Endangered	May Affect, not likely to adversely affect	Informal Consultation, Letter of Concurrence
Guam Tree Snail *Partula radiolata*	Endangered	May Affect, not likely to adversely affect	Informal Consultation, Letter of Concurrence
Humped Tree Snail *Partula gibba*	Endangered	May Affect, not likely to adversely affect	Informal Consultation, Letter of Concurrence
Bulbophyllum guamense	Threatened	No Effect	Informal Consultation, Letter of Concurrence
Dendrobium guamense	Threatened	No Effect	Informal Consultation, Letter of Concurrence
Tuberolabium guamense	Threatened	No Effect	Informal Consultation, Letter of Concurrence
Heritiera longipetiolata	Endangered	No Effect	Informal Consultation, Letter of Concurrence
Cycas micronesica	Threatened	No Effect	Informal Consultation, Letter of Concurrence

The enclosed biological evaluation contains the following information recommended for inclusion in a biological assessment pursuant to 50 CFR 402.1-2(f):

(1) The results of an on-site inspection of the area affected by the action to determine if listed or proposed species are present or occur seasonally.

(2) The views of recognized experts on the species at issue.

(3) A review of the literature and other information.

(4) An analysis of the effects of the action on the species and habitat, including consideration of cumulative effects, and the results of any related studies.

(5) An analysis of alternate actions considered by the Federal agency for the proposed action.

As concluded in the biological evaluation, the Corps has determined that effects on Green Sea Turtle, Mariana fruit bat, Mariana Swiftlet, and the tree snails would be either insignificant or discountable and accordingly the proposed action may affect but is not likely to adversely affect listed sea turtles on land. Pursuant to Section 7 of the ESA, the Corps requests your concurrence on this determination and conferencing for the proposed green sea turtle critical habitat.

Thank you for your attention to this matter. Should you have any questions regarding the proposed action, please contact Ms. Marian Dean of my staff at (808) 379-8223 or via email at Marian.Dean@usace.army.mil.

Sincerely,

Digitally signed by ROUSE.MICHAEL.BARRY .1155134743
Date: 2024.09.24 16:10:27 -08'00'

Michael B. Rouse
Chief, Environmental Resources Section, Hawaii and Alaska Regional Planning Team

Enclosure

Civil and Public Works Branch
Programs and Project Management Division

Ms. Dawn Golden
Protected Resources Division, NOAA Fisheries, U.S. Department of Commerce
1845 Wasp Blvd., Bldg 176, Room 2884
Honolulu, Hawai‘i 96818

Dear Ms. Golden:

The Honolulu District, U.S. Army Corps of Engineers (Corps) has initiated a feasibility study to evaluate measures to protect the Agat Bay shoreline bordering Agat Mayor's Complex, Agat, Guam. The study is authorized under Section 14 of the Flood Control Act of 1946, authorizing the Corps to plan and construct emergency streambank and shoreline protection projects to protect endangered highways, highway bridge approaches, public facilities such as water and sewer lines, churches, public and private nonprofit schools and hospitals, and other nonprofit public facilities. The Government of Guam, represented by the Guam Department of Public Works, is the non-Federal sponsor for this study.

The tentatively selected plan, or proposed action, consists of replacing approximately 320 linear ft of the 450 ft existing, compromised seawall with a 1 ft wide Open Cell Piling Seawall totaling 1760 square feet along the Agat Bay coast. The top crest elevation needed for the design to meet the Corps' 50-year design requirement for sea level change (SLC) and be adaptable to 100-year SLC under the intermediate scenario is 9 ft above Mean Sea Level (MSL), approximately 1 ft higher than the existing seawall. The seawall cap and splash apron will be approximately 4 ft wide, constructed parallel to the shoreline and extending landward. At this time, construction of project features will be predominately from the upland side with limited and temporary work occurring in the intertidal zone where the existing wall is.

The Corps hosted an interagency coordination meeting on July 17, 2023, that your agency attended, to present the project details and share information regarding resource impacts and concerns in preparation for a National Environmental Policy Act Environmental Assessment. Pursuant to Section 7 of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.), the Corps requested technical assistance from the National Marine Fisheries Service (NMFS) and received the following list of species listed or proposed for listing under NMFS jurisdiction (Table 1) 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 proposed study area, though there is proposed Pacific coral critical habitat in Agat Bay and proposed green sea turtle habitat on Ga’an Point.

As documented in the attached Biological Evaluation, the Corps evaluated the potential effects of the proposed action on threatened and endangered species and designated critical habitat within the ESA Action Area. A summary of the species, listing status and effect determination is provided in the table below.

Table 1. Species and critical habitat protected under the Endangered Species Act potentially present within the Action Area.

Species	Status	Determination	Request
Indo-West Pacific scalloped hammerhead shark *Sphyrna lewini*	Threatened	No Effect	Informal Consultation, Letter of Concurrence
Green sea turtle (laumei ena`ena) *Chelonia mydas*	Endangered	Not Likely to Adversely Affect	Informal Consultation and Conference on Proposed Critical Habitat, Letter of Concurrence
Hawksbill sea turtle (laumei uga) *Eretmochelys imbricata*	Endangered	No Effect	Informal Consultation, Letter of Concurrence
Coral *Acropora globiceps*	Threatened	No Effect	Informal Consultation and Conference on Proposed Critical Habitat, Letter of Concurrence
Giant Clam *Tridacna derasa* *Tridacna gigas* *Hippopus hippopus*	Proposed Endangered Threatened	No Effect	Conference on Proposed Listing, Letter of Concurrence

The enclosed biological evaluation contains the following information recommended for inclusion in a biological assessment pursuant to 50 CFR 402.1-2(f):

(1) The results of an on-site inspection of the area affected by the action to determine if listed or proposed species are present or occur seasonally.

(2) The views of recognized experts on the species at issue.

(3) A review of the literature and other information.

(4) An analysis of the effects of the action on the species and habitat, including consideration of cumulative effects, and the results of any related studies.

(5) An analysis of alternate actions considered by the Federal agency for the proposed action.

As concluded in the biological evaluation, the Corps has determined that all impacts to the Green Sea Turtles would be either insignificant or discountable and accordingly the proposed action may affect but is not likely to adversely affect these listed Green sea turtles. Pursuant to Section 7 of the ESA, the Corps requests your concurrence on this determination and conferencing for the proposed green sea turtle and coral critical habitat, and proposed listing of giant clam.

Thank you for your attention to this matter. Should you have any questions regarding the proposed action, please contact Ms. Marian Dean of my staff at (808) 379-8223 or via email at Marian.Dean@usace.army.mil.

Sincerely,

Digitally signed by ROUSE.MICHAEL.BARRY .1155134743
Date: 2024.09.24 16:10:27 -08'00'

Michael B. Rouse
Chief, Environmental Resources Section, Hawaii and Alaska Regional Planning Team

Enclosure

Endangered Species Act Biological Assessment

CAP Section 14 Emergency Shoreline Protection Project

Agat Mayor's Complex, Agat, Guam

DRAFT

Action Agency:	Honolulu District, U.S. Army Corps of Engineers, Civil and Public Works Branch
Federal Action:	Construction of emergency shoreline protection at existing seawall
Authority:	Section 14 of the Flood Control Act of 1946
Consulting Agency:	National Marine Fisheries Service Pacific Islands Regional Office Protected Resources Division United States Fish and Wildlife Service Pacific Islands Fish and Wildlife Office

CONTENTS

1 Background

The Emergency Shoreline Protection Project at Agat Mayor's Compound is a cost-shared effort between the Honolulu District, U.S. Army Corps of Engineers (USACE) and the Government of Guam, represented by the Guam Department of Public Works (DPW). Section 14 of the Flood Control Act of 1946 (Section 14, Public Law 79-525), as amended, authorizes USACE to investigate feasible alternatives that provide emergency shoreline protection of public infrastructure 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. 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.

The Federal objective, as stated in the Council on Environmental Quality (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, and other Federal planning requirements. The planning objective for the study is to identify the least cost, environmentally acceptable alternative that provides shoreline protection to Agat Mayor's Compound, Sagan Bisita, and associated public utilities over a 50-year period of analysis. The least cost alternative plan is considered to be justified if the total cost of the proposed alternative is less than the cost to relocate the facilities.

The high cost of implementation in remote territories such as Guam is a study constraint. Section 1156 of the Water Resources Development Act (WRDA) 1986 provides a territorial waiver under the Feasibility and Design & Implementation phases of CAP studies. In 2021 when this feasibility study was initiated, the Section 1156 waiver was $511,000. While the intent of the territorial waiver is beneficial in most cases, under a Section 14 authority with a limited federal expenditure of $5 million, the territorial waiver hinders the study's ability to qualify under a CAP Section 14 authority. 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 Guam. Given the recent period of high inflation and the high costs associated with mobilizing equipment and personnel to remote territories such as Guam, there may be a limited number of alternatives that qualify within the range of coastal erosion management measures and alternatives that may be considered and selected under this authority.

The location and configuration of the existing seawall places another spatial planning constraint on the formulation of potential solutions: any improvements to the portion of damaged seawall resulting from this study cannot further exacerbate or induce damages to other portions of the seawall. The boundary of the Ga'an Point subunit of War in the Pacific (WAPA) National Historical Park (NHP) and the location of infrastructure further constrain the formulation of potential solutions. The wall can only be replaced outside of the NHP boundary (green polygon on Figure 1) and infrastructure limits the area for construction.

USACE and DPW have initiated a feasibility study to evaluate measures to protect the Agat Mayor's Compound, Sagan Bisita, and public utilities in the area, from coastal erosion. The study area includes 320 feet of the west central coast of Guam in the village of Agat.

USACE has prepared a Draft Integrated Feasibility Report and Environmental Assessment (IFR/EA) for the Agat Mayor's Compound, Guam - 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 (NEPA). The IFR/EA 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 draft IFR/EA will be released for a 30-day public and agency comment period in October 2024.

Concurrent to and informing the preparation of the draft IFR/EA, USACE has prepared this Biological Assessment (BA) to evaluate the potential effects of the Proposed Action 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.

To reduce duplication and retain informational integrity and consistency, USACE incorporates by reference all applicable sections of the USACE-NMFS Standard Local Operating Procedures for Endangered Species in the Central and Western Pacific Region (Pac-SLOPES) Consultation dated March 2, 2022. The proposed action constitutes activity categories: 1. Site Preparation for Above-water, Over-water, or In-Water Construction, and 10. Maintenance of Existing Bank Stabilization Structures, which are under the USACE-NMFS Pac-SLOPES (USACE 2022). To USACE's knowledge, ESA consultation did not occur for the original structure.

Early coordination and pre-consultation with National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), and Guam Division of Aquatic and Wildlife Resources (GDAWR) on threatened and endangered species was conducted in a resource agency workshop during the Charette on July 17, 2023 (HST) and conversations since then.

1.1 Project Purpose and Need

USACE is proposing structural measures to restore protection of the Agat Mayor's complex and other essential infrastructure along the shoreline of Agat Bay in Agat, Guam. Guam is in an area of the Pacific Ocean that has a high risk for tropical storms and typhoons. The Study area is located on the western coast of Guam (Figure 1). The Agat Mayor's Compound is operated by the Department of Public Works (DPW) of the Government of Guam on property owned by the Government of Guam. The Mayor's

Compound is the main community building of the village of Agat. It is the core operation center and emergency shelter for the disadvantaged community.

Figure 1: Ga'an Point subunit of War in the Pacific National Historical Park in green with the buildings of the Mayor's Compound. *Image source: National Park Service (NPS), November 2023*

An existing seawall constructed between the shoreline and the buildings in the study area is threatened by shoreline erosion and is collapsing, leaving the buildings and utilities vulnerable to increased future damage (USACE 2020). The proposed project consists of replacing approximately 320 linear ft of existing, compromised seawall. USACE has developed potential alternative plans for shoreline stabilization over a 50-year period of analysis (2028-2078) 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. To combat coastal erosion, a final array of structural alternative plans has been formulated through combinations of screened management measures. Final Study alternatives included:

- Alternative 1: No Action
- Alternative 2: Concrete Armor Unit Revetment
- Alternative 3: Open Cell Piling Seawall
- Alternative 4: Secant Pile Seawall
- Alternative 5: Relocation of the Mayor's Compound

The top crest elevation needed for the design to meet the USACE 50-year design requirement for sea level change (SLC) and be adaptable to 100-year SLC under the intermediate scenario is 6ft above Mean Sea Level (MSL). Alternative 3: Open Cell Piling Seawall was selected as the Recommended Plan.

2 Description of the Proposed Action

2.1 Proposed Action

This Proposed Action would replace 320 linear feet of the 450-foot existing seawall with a 1 ft wide Open Cell Piling Seawall totaling 1760 square feet (Figure 2) along the Agat Bay coast. The proposed action would temporarily impact 230 square feet and permanently impact 80 square feet (the portion of the current seawall that is at or below mean high high water (MHHW)) of the intertidal zone.

Figure 2: Construction footprint and staging areas.

Alternative 3 consists of removal of the existing seawall from the beach side with a maximum excavation width of 4 feet, and the construction of an open cell piling seawall. The open cell piling seawall will be 320 ft long and consist of 1 ft wide vinyl cells filled with reinforced concrete installed to the consolidated limestone shelf. The individual wall panels will be anchored with a 2-inch diameter pin pile installed into the limestone. The seawall will have a 2 ft wide pile cap and a 4 ft wide splash apron, and it will have a top elevation of approximately 6 ft MSL and will extend down to -6 ft MSL. The height of the seawall will be about 12 ft above the limestone, 1 to 3 feet above the beach sand, with the top of the seawall approximately 0-3 ft above the existing grade of the mayor's complex. Figure 3 displays the conceptual design for the open cell piling seawall. The project includes the following components:

- Demolition and removal of the existing seawall
    - Removal of approximately 12 trees
    - Up to a 4 ft wide excavation would be made on the seaward side of the wall to remove the toe
    - 142 cubic yards (cy) of block, concrete, and rock rubble taken to a landfill for disposal
    - Excavated beach sand replaced to restore the beach profile
- Vibratory mandrel hammer installation of vinyl open cell sheet piling until refusal to bedrock
- Removal of beach sand from the interior of the cells by pumping a jet of water into the annular space and clearing the sand (approximately 284 cy of sand can be added to the beach)
- Core bedrock 5 ft deep to install 2-inch diameter pin piles to anchor the vinyl open cell sheet piles (approximately 118 cy of rock taken to a landfill for disposal)
- Install weep holes to aid in proper drainage backshore, alleviate water pressure on the landward side, allowing for more efficient drainage and reducing the potential for erosion on adjacent properties
- Backfill cells with reinforced concrete fill and top with a 2 ft wide concrete cap
- Dig 6 inch wide by minimum of 3 ft deep trenches every 8 ft for placement of 10 ft long tieback rods that will attach to 40 2 ft by 2 ft reinforced concrete deadman anchors (approximately 356 cy of soil to be stored and backfilled)
    - The excavation required to place the tiebacks could be completed with a shovel
    - At the location of the Mayor's office building, the 2 x 2 x 2 ft square space required to place the deadman anchors will be hollowed and then re-laid in the concrete porch
    - The excavation required to place the tiebacks could be completed with a shovel, demonstrating the minimal excavation effort required
- Backfill trenches with the excavated native soil
- The individual panels will be tied together at the top with a 2 ft wide reinforced concrete pile cap
- Installation of a 4 ft concrete splash apron behind the crest of the structure
- Installation of concrete stairs for recreational water access
- Excavated beach sand replaced to restore the beach profile
- Replace 12 trees and reseed the upland side of the wall

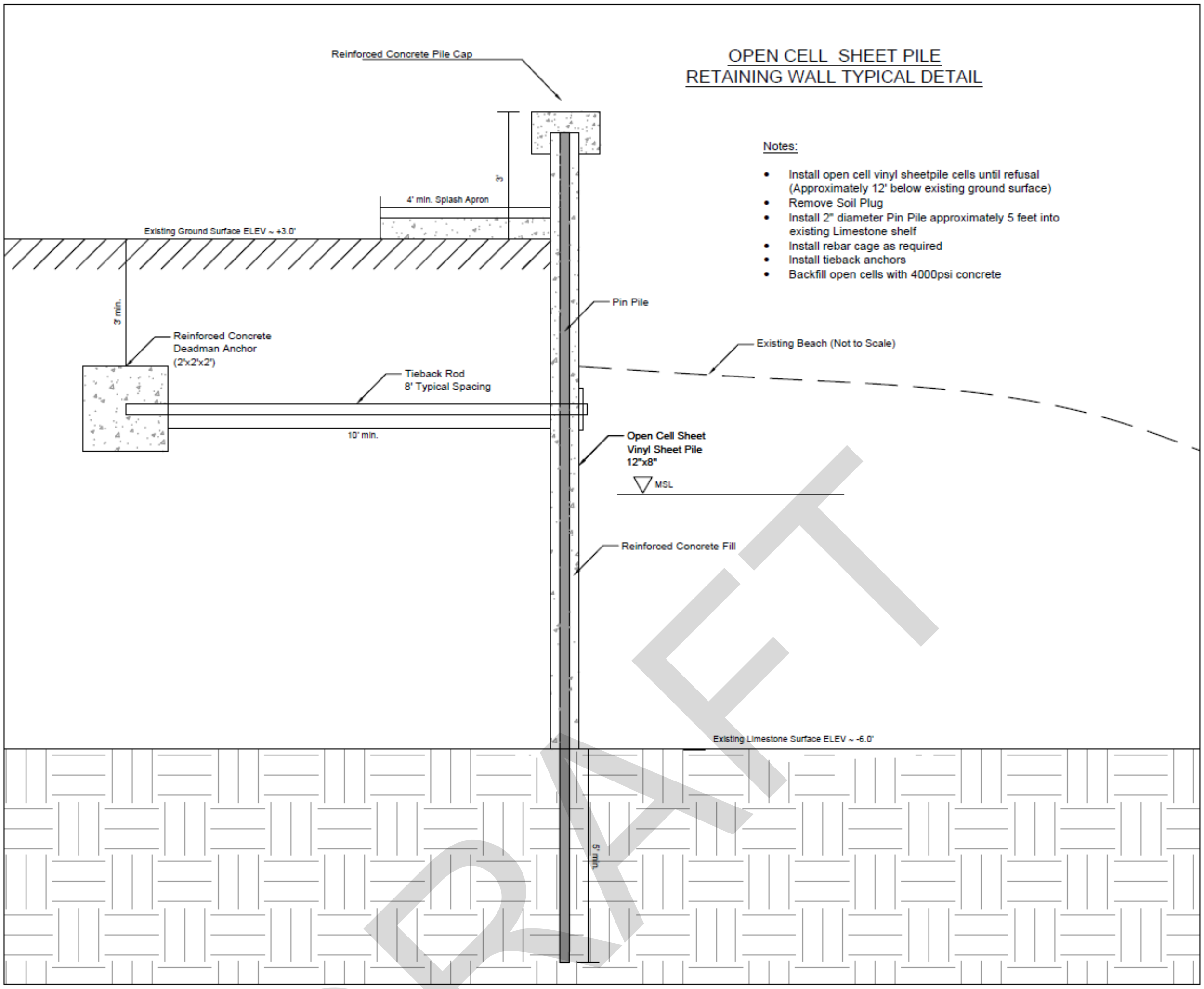

Figure 3: Open Cell Piling Seawall Cross Section

Construction of the open cell piling seawall would begin in 2027 and take 6 months. Construction would not occur between 12 July to 9 August 2027 to avoid impacts to the peak coral spawning period during in-water activities.

Table 1: Project Dimensions

Project Feature	**Approximate Area (square feet)**
Open Cell Piling Seawall	1,280
Construction Area/Access	2,560
Existing seawall excavation	5,760
Staging Area1	40,080
Staging Area 2	17,860
Staging Area 3	40,080
Total Project Area	103,780

Maintenance of the seawall will be the responsibility of the Government of Guam and may include filling cracks/holes with pressurized epoxy as needed (does not need to be watertight), filling depressions behind the wall (if falling through cracks), replacement of single cells as needed (likely not needed for a minimum of 20 years), clearing of vegetation, and cleaning out weep holes.

2.2 Proposed Mitigation

USACE considers and applies a progressive approach to mitigation: avoidance first, followed by minimization and lastly, compensatory mitigation. The following mitigative measures are proposed because USACE has determined they are appropriate, feasible, practicable and commensurate to anticipated adverse effects. USACE welcomes any additional avoidance and minimization measures USFWS and NMFS may recommend to avoid, minimize, or otherwise mitigate for adverse effects to ESA listed species and designated critical habitat.

2.2.1 Pac-SLOPES BMPs

USACE reviewed the Pac-SLOPES General and Activity-Specific BMPs (USACE and NMFS 2022) for applicability and determined the proposed action is consistent with the Pac-SLOPES covered action described at, *Site Preparation for Above-water, Over-water, or In-Water Construction* and *Maintenance of Existing Bank Stabilization Structures*. All applicable Pac-SLOPES BMPs are listed in Attachment 1 of this BE, in addition to other agency-recommended BMPs and Essential Fish Habitat Conservation Recommendations. USACE understands that inclusion and implementation of these BMPs are necessary to ensure that project-related impacts to ESA listed species are discountable or insignificant.

2.2.2 Standard BMPs from USFWS

USACE reviewed the April 2022 Recommended Standard Best Management Practices For Work In or Around Aquatic Environment (USFWS 2022b), DRAFT Recommended Measures to Minimize Potential Project Impacts to Threatened and Endangered Species and Critical Habitats in the Mariana Islands (USFWS 2023b), and Migratory Bird Protections in Guam (USFWS 2023c) for applicability. All applicable BMPs are listed in Attachment 1 of this BE, in addition to other agency-recommended BMPs and Conservation Recommendations. USACE understands that inclusion and implementation of these BMPs are necessary to ensure that project-related impacts to ESA listed species are discountable or insignificant.

2.2.3 Project Specific BMPs

USACE has consulted and coordinated this project action with engineering professionals and environmental resource agencies, including NMFS Protected Resources Division, to develop BMPs that would modify the design in such a manner so as to avoid and/or minimize the impacts to the aquatic and surrounding environment to the greatest extent practicable. Compiled BMPs are provided as Attachment 1 to this BE. Such BMPs will be implemented by the contractor and enforceable through contract specifications.

3 Description of the ESA Action Area

The proposed Action Area for this project will include an area of permanent impact required for placement of the open cell piling seawall and an area of temporary impact for access, construction, and staging areas (COSA) (Figure 4).

An 8-foot wide construction access route is planned alongside the TSP's project feature totaling 2560 square feet. Three construction laydown areas (COSAs) totaling 98,020 square feet are planned in close proximity to the project feature (Figure 2). 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. It is anticipated that personnel, equipment, and imported materials would access project construction along public roadways. Construction is anticipated for six (6) months.

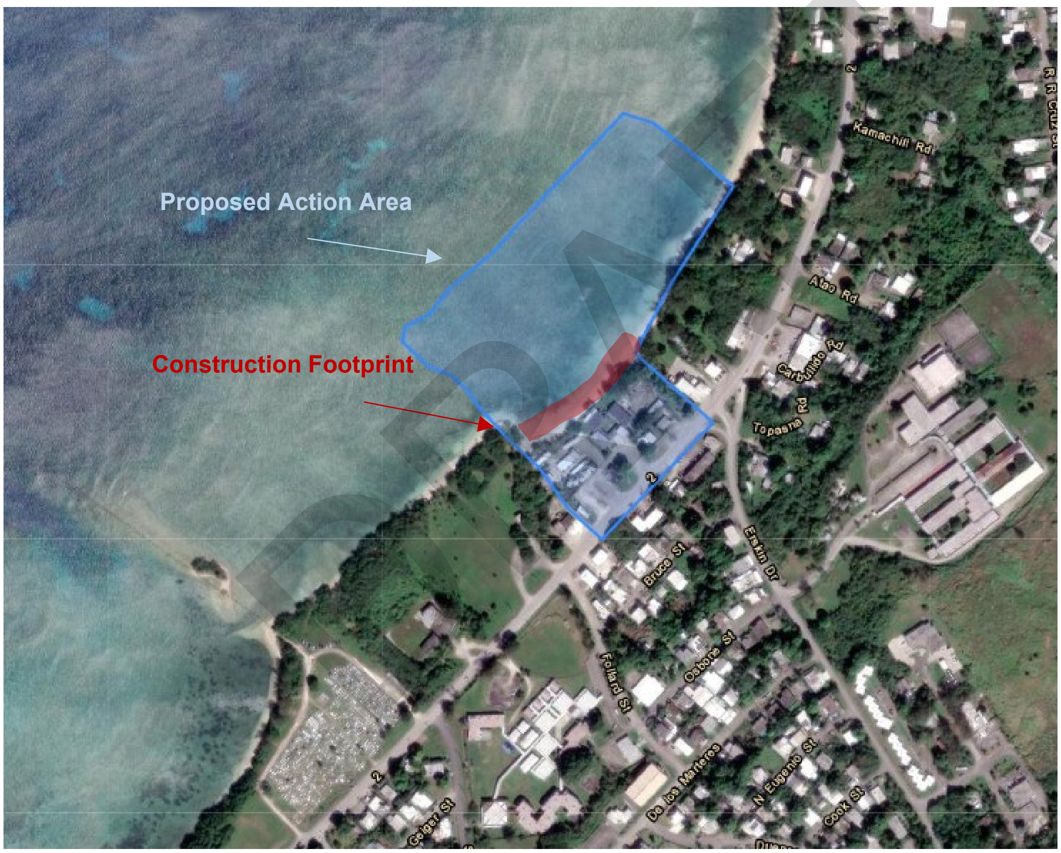

Figure 4: Location of Proposed Action Area and Construction Footprint. *Image source: USFWS IPaC, May 2024*

The natural environment of the proposed action area encompasses an extensive reef flat and 20-40 feet of intertidal sandy beach habitat along 320 ft of shoreline fronting the 2-acre Mayor's Complex and Sagan Bisita (USFWS 2024a, USACE 2022, NOAA 2005). The reef flat is primarily Hard Bottom Pavement with smaller areas of Unconsolidated Sediment (Mud, Sand, and Rubble) and Mixed Habitat Structure consisting of Scattered

Coral Rock in Unconsolidated Sediment (Figure 5). Habitat complexity at the reef flat was low. The closest coral observed was approximately 150 ft (46 m) away from the existing wall (Figure 6, USFWS 2024a).

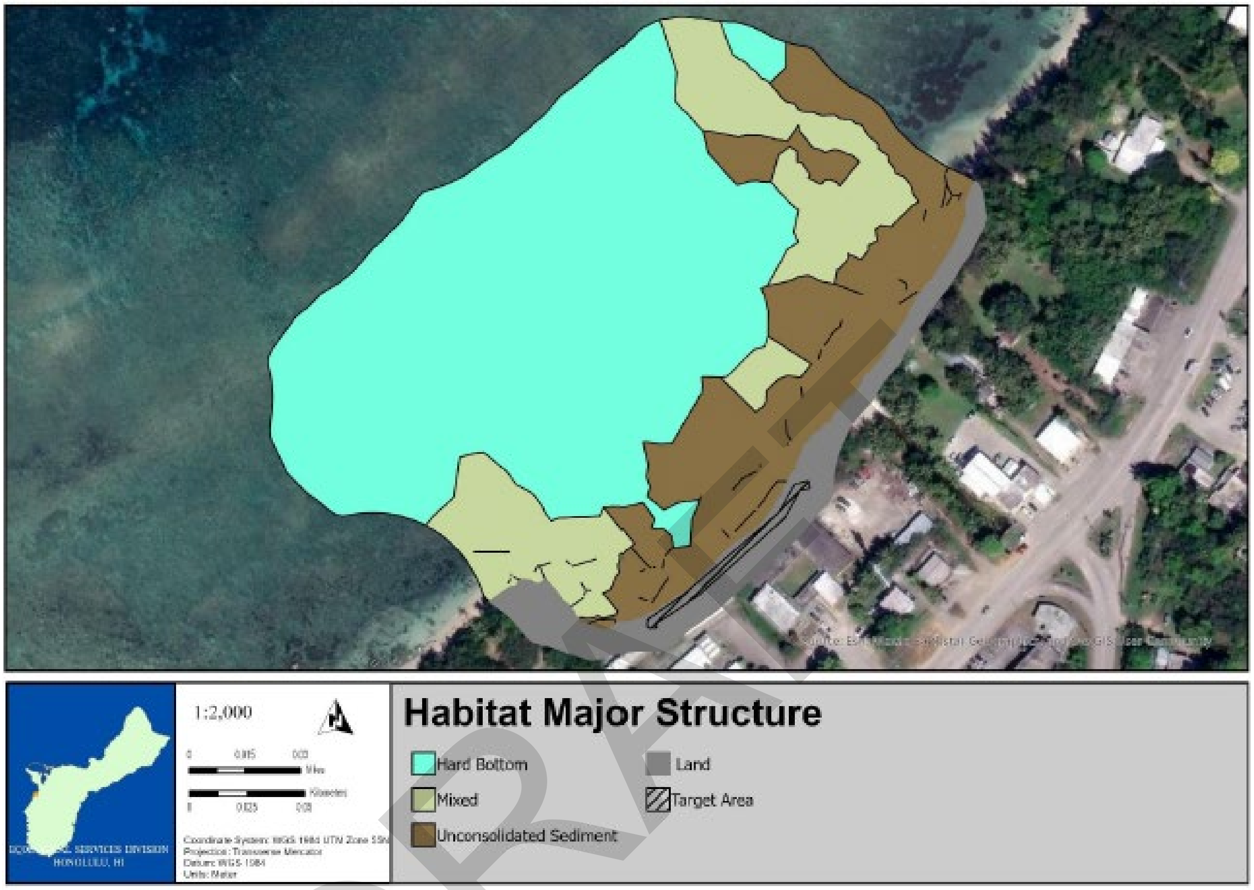

Figure 5: Map of major habitat structure types observed in the Action Area (USFWS 2024a).

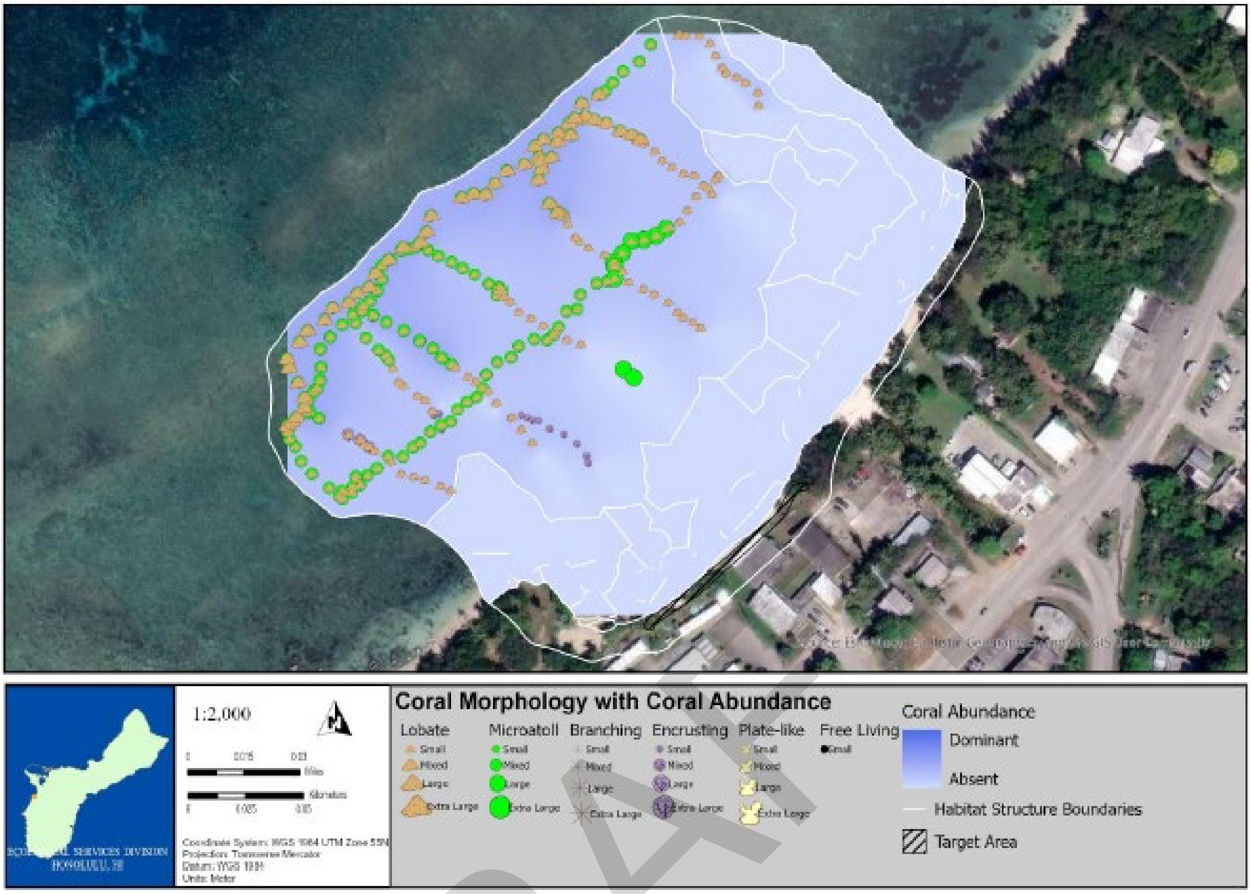

Figure 6: Coral morphology and abundance (USFWS 2024a).

The terrestrial or land habitat that makes up 99% of the project construction footprint is predominantly buildings and pavement with a strip of vegetation varying from 12 to 63 ft wide between the Mayor’s Complex and Sagan Bisita structures and the existing seawall. The vegetation within the proposed action area consists of coconut palm (*Cocos nucifera*), ironwood (*Casuarina equisetifolia*), sea hibiscus (*Hibiscus tiliaceus*), and beach morning glory (*Ipomoea pes-caprae*) (Figure 7 and 8). Maintained lawn fills the open areas surrounding the buildings in the proposed action area. Twelve trees (coconut palm and sea hibiscus) are in the construction area and will require removal and replacement.

Figure 7: The shoreline facing northeast fronting the Mayor's Office Complex during calm high tide conditions. Photo on the left by Jeremy Raynal, USFWS, 2024. Photos of individual plants on the right, USACE, 2022.

Figure 8: The Action Area shoreline facing southwest toward Ga'an Point Park, which is in the background and on the opposite side of a stream mouth. Photo by Jeremy Raynal, USFWS, 2024.

4 Listed species & Critical habitat in the action area

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. The initial list of threatened and endangered species for Agat Bay and its shoreline included the species and proposed critical habitat listed in Table 2. USACE requested technical assistance from NMFS on protected species in Agat Bay and NMFS PRD narrowed the list for consultation to Central West Pacific green sea turtle and its proposed critical habitat, hawksbill sea turtle, Indo-West Pacific scalloped hammerhead shark; and the coral *Acropora globiceps* and its proposed critical habitat, and conferencing on the giant clams when proposed (Rudolph, personal communication, 2023). NMFS published the proposed giant clam listing in the Federal Register on July 25, 2024. NMFS clarified that pelagic species would only require consideration if the project included vessel transiting offshore or in deep waters (Rudolph, personal communication, 2023). As currently designed, all project work will be concluded from land and will not include vessel transit.

USACE requested technical assistance from USFWS on the IPAC generated species list for the Agat Mayor's Complex. USFWS clarified that the Guam office errs on the side of the species assuming presence and suggested a biological survey of the project site to determine which listed species are present within the area (Gombar, personal communication, 2024). The Project Delivery Team visited the project site in January 2022 and did not observe any of the species listed in Table 2 at that time. USFWS dive surveys conducted in Agat Bay in 2023 observed green sea turtles swimming within the ESA Action Area but no other ESA listed species (USFWS 2024a). During an informal survey of Agat Mayors complex in June 2024 with USACE personnel, Dr. Curt Fielder stated it was very unlikely that tree snails would be found in the location. No other ESA listed species were observed at that time. NPS Pacific Islands Inventory and Monitoring Program (PACN) has inventoried and continues to monitor natural resources in the Agat subunit of WAPA (green polygon on Figure 1).

This USACE BA will consider effects of the project on the following federally listed species which are potentially affected by project activities along Agat Bay shoreline in front of the Mayor's Compound and are considered in detail in this BE:

Table 2: ESA Listed Species potentially present on or in the vicinity of the study area. Only Green sea turtles were observed during the USFWS surveys in 2024.

Common Name	Scientific Name	Status	Effective Listing Date / FR Notice	Critical Habitat	Recovery Plan	Jurisdiction	Observed in Action Area	Effects Determination
			Fish					
Indo-West Pacific scalloped hammerhead shark	*Sphyrna lewini*	Threatened		No		NMFS	No	No Effect
			Reptiles					
Green sea turtle, Central South Pacific Distinct Population Segment (DPS)	*Chelonia mydas*	Endangered	05/06/2016 81 FR 20057	Proposed 07/19/2023 88 FR 46572 Not in Action Area	01/12/1998 NMFS 1998	NMFS in ocean. USFWS on land	No	NLAA
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered	06/03/1970 35 FR 8491	Not in Action Area	5/22/1998 63 FR 28359	NMFS in ocean. USFWS on land	No	No Effect
Slevin's Skink	*Emoia slevini*	Endangered	11/02/2015 80 FR 59424	No		USFWS	No	No Effect
			Mammals					
Mariana Fruit Bat	*Pteropus mariannus mariannus*	Endangered	03/30/2010	Not in Action Area 10/28/2004 69 FR 62944	Draft Revision 03/30/2010 USFWS 2010	USFWS	No	NLAA
			Birds					
Guam Kingfisher, sihek	*Todiramphus cinnamominus*	Endangered	08/27/1984 49 FR 33881-33885	Not in Action Area 10/28/2004 69 FR 62944	10/03/2008	USFWS	No	No Effect
Guam Rail	*Gallirallus owstoni*	Endangered	04/11/1984 49 FR 14354 14356	No	09/17/2008	USFWS	No	No Effect
Mariana Swiftlet	*Aerodramus bartschi*	Endangered	08/27/1984 49 FR 33881-33885	No	08/20/2019	USFWS	No	NLAA
Short-tailed Albatross	*Phoebastria (Diomedea) albatrus*	Endangered	6/02/1970 35 FR 8491-8498	No	09/17/2008	USFWS	No	No Effect
			Invertebrates					
small-polyp stony coral	*Acropora globiceps***	Threatened	10/10/2014 79 FR 53852	Proposed 11/27/2020 85 FR 76262	06/22/2015 NMFS 2015	NMFS	No	No Effect
Giant Clam	*Tridacna derasa* *T. gigas* *Hippopus hippopus*	Endangered Threatened	07/25/2024 89 FR 60498; 50 CFR 223-224	No	No	NMFS	No	No Effect
Fragile Tree Snail	*Samoana fragilis*	Endangered	11/02/2015 80 FR 59424; 50 CFR 17	No	Draft 11/10/2022 USFWS 2022a	USFWS	No	No Effect
Guam Tree Snail	*Partula radiolata*	Endangered	11/02/2015 80 FR 59424; 50 CFR 17	No	Draft 11/10/2022 USFWS 2022a	USFWS	No	No Effect
Humped Tree Snail	*Partula gibba*	Endangered	11/02/2015 80 FR 59424; 50 CFR 17	No	Draft 11/10/2022 USFWS 2022a	USFWS	No	No Effect
			Flowering Plants					
Cebello Halumtano	*Bulbophyllum guamense*	Threatened	11/02/2015 80 FR 59424	No	Draft 11/10/2022 USFWS 2022a	USFWS	No	No Effect
	Dendrobium guamense	Threatened	11/02/2015 80 FR 59424	No	Draft 11/10/2022 USFWS 2022a	USFWS	No	No Effect
	Tuberolabium guamense	Threatened	11/02/2015 80 FR 59424	No	Draft 11/10/2022 USFWS 2022a	USFWS	No	No Effect
Ufa-halomtano	*Heritiera longipetiolata*	Endangered	11/02/2015 80 FR 59424	No	Draft 11/10/2022	USFWS	No	No Effect

Common Name	Scientific Name	Status	Effective Listing Date / FR Notice	Critical Habitat	Recovery Plan	Jurisdiction	Observed in Action Area	Effects Determination
					USFWS 2022a			
Conifers and Cycads								
Fadang	*Cycas micronesica*	Threatened	11/02/2015 80 FR 59424	No	Draft 11/10/2022 USFWS 2022a	USFWS	No	No Effect

No threatened or endangered species were seen during the USFWS 2024(a) surveys at or near the proposed project site although sea turtles are known to use the waters immediately offshore.

4.1 Scalloped Hammerhead Shark Indo-West Pacific Distinct Population Segment (DPS) (*Sphyrna lewini*)

4.1.1 Listing Status, Distribution, and Habitat

USACE incorporates by reference the species data provided in Sections 3 and 4 of the USACE-NMFS Pac-SLOPES BE dated March 2, 2022, which describe in detail the listing status, species life cycle information, population trends, threats to the species, and suitable and critical habitat for scalloped-hammerhead shark. The Indo-West Pacific DPS comprises the scalloped hammerheads present in Guam. For the purposes of this analysis, the Indo-West Pacific DPS of scalloped hammerhead was evaluated for effects resulting from project implementation. NMFS has jurisdiction over sharks.

4.1.2 Critical Habitat

There is currently no designated critical habitat for scalloped hammerhead shark.

4.1.3 Potential for Occurrence in Project Area

The geographic range of the Indo-West Pacific DPS includes all coastal and oceanic waters from 40° N. latitude to 36° S. latitude. Although this range covers the territorial waters of Guam, NMFS states there is very little information on the occurrence, distribution, or use of habitat by the scalloped hammerhead shark and that information is anecdotal (NMFS 2015). In Guam, anecdotal reports include Apra Harbor, Sasa Bay, northern Piti, the Pago Bay river mouth, the Ylig River mouth, Pago Bay and Tarague Beach with most observations over 15 years old. Scalloped hammerheads have never been recorded in Guam during official NMFS reef surveys (NMFS 2015a). NPS (2024) has not recorded scalloped hammerheads in the Agat Bay Unit of War in the Pacific National Historical Park. USFWS (2024) did not observe sharks during their surveys. Therefore scalloped hammerheads are not anticipated to occur in the ESA Action Area.

4.2 Central West Pacific Green Sea Turtle (*Chelonia mydas*)

4.2.1 Listing Status, Distribution, and Habitat

USACE incorporates by reference the species data provided in Sections 3 and 4 of the USACE-NMFS Pac-SLOPES BE dated March 2, 2022, which describe in detail the listing status, species life cycle information, population trends, threats to the species, and suitable and critical habitat for Green sea turtle. The Central West Pacific Distinct Population Segment comprises the green sea turtles present in Guam. For the purposes of this analysis, the Central West Pacific DPS of green sea turtle was evaluated for effects resulting from project implementation. NMFS has jurisdiction over sea turtles while they are in the water and USFWS has jurisdiction over sea turtles on land, including sea turtle eggs, nesting females, and hatchlings on the beach (USACE and NMFS 2022).

4.2.2 Critical Habitat

Currently there is no designated critical habitat for green sea turtles in Guam. However, NMFS and USFWS have proposed critical habitat for Central West Pacific green sea turtles. Detailed information on NMFS proposed Central West Pacific green sea turtle critical habitat is available at: https://www.fisheries.noaa.gov/action/proposed-rule-designate-critical-habitatgreen-sea-turtles. Detailed information on USFWS proposed critical habitat is available at: https://www.govinfo.gov/content/pkg/FR-2023-07-19/pdf/2023-14225.pdf. Figure 9 depicts the proposed critical habitat designation in Agat Bay, well outside the project area.

Figure 9: Ga’an Park, Project Location, and Proposed Critical Habitat. Map showing Ga’an Park with the Target Area to the northeast, the proposed Critical Habitat for nesting turtles to the southwest, and the low-profile jetty and shoal and islet features in between. Source: USFWS 2024a.

4.2.3 Potential for Occurrence in Project Area

Within the Marianas, green turtles are reasonably common and present year-round in the waters. Approximately 22 green sea turtles are known to nest in Guam (Seminoff et al. 2015). In Guam, nesting habitat tends to be in areas isolated from human activity. Nesting has not been observed in the proposed project/action area (USFWS 1992).

The USFWS Guam biologist and Guam Division of Aquatic and Wildlife Resources (DAWR) have recorded sea turtles along the beaches both north and south of the action area (Gombar, personal communication, 2024). USFWS divers observed 2 green sea turtles swimming in the water during their surveys and 2 were seen from the beach before and after surveys but not recorded, for a total of 4 green turtles observed in the water (USFWS 2024a).

Figure 10: Sea turtles observed during January 2024 USFWS dive surveys (USFWS 2024a).

Green sea turtle enter Agat Bay and have previously been reported using the shoreline for foraging habitat. However, the turtles have not been recently documented to use nearshore habitat in the project area. Given the above, it is unlikely that the green sea turtle will enter the project area.

4.3 Hawksbill sea turtle (*Eretmochelys imbricata*)

4.3.1 Listing Status, Distribution and Habitat

USACE incorporates by reference the species data provided in Sections 3 and 4 of the USACE-NMFS Pac-SLOPES BE dated March 2, 2022, which describe in detail the listing status, species life cycle information, population trends, threats to the species, and suitable and critical habitat for Hawksbill sea turtle.

NMFS has jurisdiction over sea turtles while they are in the water and the USFWS has jurisdiction over sea turtles on land, including sea turtle eggs, nesting females, and hatchlings on the beach.

4.3.2 Critical Habitat

Hawksbill Sea Turtle critical habitat is only designated for areas of Puerto Rico (50 CFR § 17.95(a). There is no critical habitat designated for Hawkbill sea turtles in the Pacific.

4.3.3 Potential for Occurrence in Project Area

No Hawksbill sea turtles were observed during the January 2024 USFWS dive surveys (USFWS 2024a). NPS (2024) reports Hawksbill sea turtles are occasionally in the Bay. Given the above, it is unlikely that the Hawksbill sea turtle will enter the project area.

4.4 Coral (*Acropora globiceps*)

4.4.1 Listing Status, Distribution, and Habitat

USACE incorporates by reference the species data provided in Sections 3 and 4 of the USACE-NMFS Pac-SLOPES BE dated March 2, 2022, which describe in detail the listing status, species life cycle information, population trends, threats to the species, and suitable and critical habitat for coral.

4.4.2 Critical Habitat

Currently there is no designated critical habitat for the coral species. However, NMFS proposed designated critical habitat on November 27, 2020; for seven threatened corals in U.S. waters in the Indo-Pacific (1/26/21; 85 FR 76262), including portions of Agat Bay (Figure 11). A revised proposal was published in 2023 and comments closed in February 2024 (NMFS 2023f).

The proposed coral critical habitat consists of substrate and water column habitat characteristics essential for the reproduction, recruitment, growth, and maturation of the listed corals. Sites that support the normal function of all life stages of the corals are natural, consolidated hard substrate or dead coral skeleton free of algae and sediment at the appropriate scale at the point of larval settlement or fragment reattachment, and the associated water column.

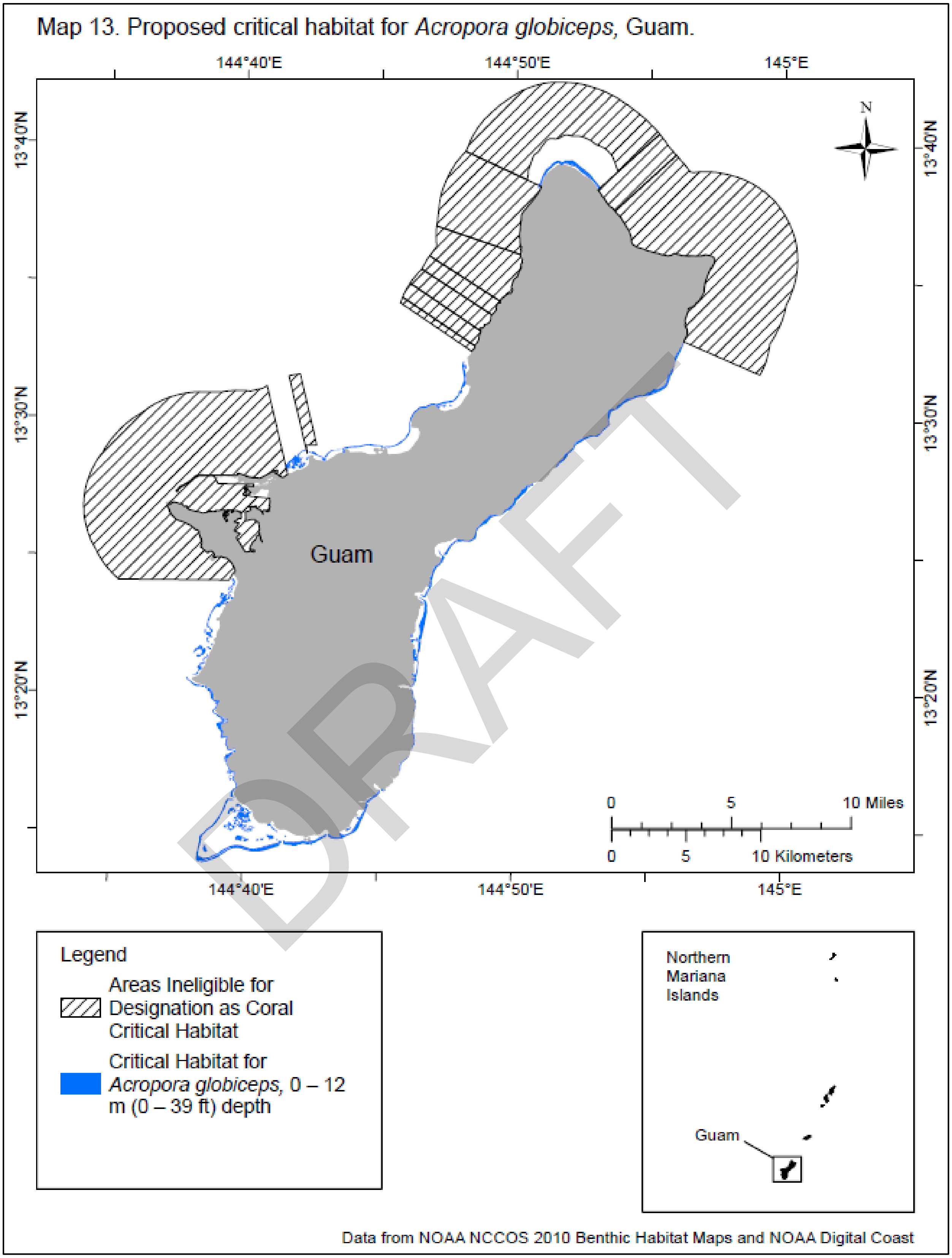

Figure 11: Proposed Critical Habitat for *Acropora globiceps* in Guam (NMFS 2023f).

Several attributes of these sites determine the quality of the area and influence the value of the associated feature to the conservation of the species:

1. Substrate with presence of crevices and holes that provide cryptic habitat, the presence of microbial biofilms, or presence of crustose coralline algae;

2. Reefscape (all the visible features of an area of reef) with no more than a thin veneer of sediment and low occupancy by fleshy and turf macroalgae;

3. Marine water with levels of temperature, aragonite saturation, nutrients, and water clarity that have been observed to support any demographic function; and

4. Marine water with levels of anthropogenically-introduced (from humans) chemical contaminants that do not preclude or inhibit any demographic function.

While *A. globiceps* proposed critical habitat includes the edges of Agat Bay at a depth of 0 – 39 ft (0 – 12 m), it does not include managed areas (e.g., harbors, navigation channels, anchorages, etc.) or artificial substrates (e.g., aids-to-navigation, seawalls, wharves, boat ramps, fishpond walls, pipes, submarine cables, wrecks, mooring balls, docks, aquaculture cages, etc.) (NMFS 2023f).

4.4.3 Potential for Occurrence in Project Area

The National Park Service Pacific Islands Inventory & Monitoring Network found less than 1% cover of Agat Bay transects by *Acropora* species in 2008-2010 and 2014-2019, and specifically reported 0% *Acropora* species in 2019 (McCutcheon and McKenna 2021). Maynard et al. (2017) report that Ga'an Point had low resilience to coral bleaching events and specifically *Acropora globiceps* was not observed during their surveys across Guam. No *A. globiceps* were observed during the USFWS surveys (USFWS 2024a) accordingly, *A. globiceps* is not anticipated to occur within the ESA Action Area.

4.5 Giant Clam (*Tridacna spp. and Hippopus spp.*)

Giant clams are the largest living marine bivalves (weighing up to 500 pounds, measuring up to 4.5 feet in length, and living for 100 years) and typically inhabit tropical coral reefs in coastal regions throughout the Indo-Pacific Ocean. Modern giant clams are distributed along shallow shorelines and on reefs in the Indo-West Pacific in the area confined by 30° E and 120° W (*i.e.,* from South Africa to beyond French Polynesia) and between 36° N and 30° S (*i.e.,* from Japan in the North to Australia in the South) and excluding New Zealand and Hawaii, although there are reports that at least two species have been introduced in Hawaii (*T. derasa* and *T. squamosa*). Although most extant giant clams mainly occur within the tropical Indo-Pacific region, three species (*T. maxima, T. squamosa* and *T. costata*) are found as far west as East Africa or the Red Sea. (89 FR 60498, July 25, 2024).

4.5.1 Listing Status

On 25 July 2024 NMFS proposed listing the giant clams *H. porcellanus, T. mbalavuana, T. squamosina, T. derasa*, and *T. gigas* as endangered species and *H. hippopus* as a threatened species under the ESA (89 FR 60498, July 25, 2024). Of these, only *H. hippopus, T. derasa*, and *T. gigas* are found in Guam. *T. squamosa* and *T. maxima* are proposed for listing as threatened under section 4(e) of the ESA for similarity of appearance but are not applicable to this analysis since the proposed action does not include collection. Therefore, this analysis will only focus on *H. hippopus, T. derasa*, and *T. gigas.*

4.5.2 Critical Habitat

There is no designated or proposed critical habitat for giant clams (89 FR 60498, July 25, 2024).

4.5.3 Distribution and Habitat

Giant clam distribution is not uniform, with greater diversity found in the central Indo-Pacific. Although giant clams are typically associated with and are prominent inhabitants of coral reefs, this is not an obligate relationship. Giant clams are typically found living on sand or attached to coral rock and rubble by byssal threads, but they can be found in a wide variety of habitats, including live coral, dead coral rubble, boulders, sandy substrates, seagrass beds, macroalgae zones, etc. (89 FR 60498, July 25, 2024).

Historical reports and fossil evidence indicate that *H. hippopus, T. derasa, T. gigas, and T. squamosa* are all native to Guam (Collins et al., 1983; Newman & Gomez, 2000), but according to Neo et al. (2017), *T. squamosa* is the only one of the seven species in this report that still occurs there, albeit at very low abundance. The other three species are reportedly extirpated (Munro & Heslinga, 1983; Sant, 1995; S. Wells, 1997).

Guam Aquaculture Development and Training Center and University of Guam Marine Laboratory have imported *T. derasa, T. gigas* and *T. squamosa* for mariculture and reintroduction, however, the effectiveness of this has not been documented. More recently, the Division of Aquatic and Wildlife Resources in Guam initiated a community-led giant clam (*T. maxima*) mariculture program in 2021, with funding from NMFS, to establish a sustainable source of food and income for local communities and revitalize cultural ties to giant clams as a natural resource (NOAA 2024e).

4.5.4 Potential for Occurrence in Project Area

NMFS report that *H. hippopus* is extinct, and *T. derasa*, and *T. gigas* are reintroduced through mariculture in Guam (NMFS 2024). USFWS divers observed only one giant clam (*Tridacna maxima*) in the Project Area (USFWS 2024a), accordingly, *H. hippopus, T. derasa*, and *T. gigas* are not anticipated to occur within the ESA Action Area.

4.6 Tree Snails (*Partula gibba, Partula radiolata, Samoana fragilis*)

4.6.1 Listing Status

Partula gibba, *Partula radiolata, and Samoana fragilis* were listed as endangered in Guam on November 2, 2015 (80 FR 59424; 50 CFR 17).

4.6.2 Critical Habitat

No critical habitat has been designated for tree snails in Guam.

4.6.3 Distribution and Habitat

The humped tree snail (*Partula gibba*; akaleha, denden), fragile tree snail (*Samoana fragilis*; akaleha dogas, denden), and Guam tree snail (*Partula radiolata*; akaleha, denden) are endemic to the forest ecosystem of Guam. The species' historical range included Guam and the Northern Mariana Islands. Tree snails occur in cool, high humidity, shaded forest habitat with sufficiently high and dense growth to provide shade, to conserve moisture, and to effect the production of a rich humus. Tree snails do not appear to require specific host plants but can be found on many different species of large-leaved plants (trees, shrubs, herbaceous plants, and even ferns) both native and introduced. Stability of environmental factors (temperature, relative humidity and light) are critical factors for juvenile survival. They need live and decaying plant material, as their diet consists of fungi and microalgae (USFWS 2024b-e).

At the time of listing, in 2015, only 1 site on Guam was occupied by the humped tree snail and had no more than 150 individuals (USFWS 2024e). The only humped tree snail reported by Dr. Fiedler from 2015-2019 were in the Haputo Ecological Reserve Area (Fiedler 2018).

Historically, the fragile tree snail was known from 13 populations on Guam. As of 2019, only six populations are known from Guam. All populations appear to be small (<100 individuals) & narrowly dispersed, with the exception of the population at the northern portion of the Haputo Ecological Reserve Area at Finegayan (USFWS 2024c and d). None are reported near Agat (Fiedler 2018).

The Guam tree snail appears widely distributed on Guam. Prior to its listing in 2015, there were approximately 20 known populations of Guam tree snail, but extensive surveys in 2019 identified more than 50 populations (USFWS 2024b and d). *P. radiolata* have been reported in Agat in 2016 and 2017 but not since (Fiedler 2018).

4.6.4 Potential for Occurrence in Project Area

Based on species specific information received in consultation with USFWS, USACE determined a survey for tree snails was not feasible during this Feasibility phase. Due to the mobility of tree snails that can be further accelerated by heavy wind and rain, survey results are current for approximately 6 months or until the next storm or typhoon that could redistribute snails to beyond survey boundaries. If a survey were to show presence of the species currently, USACE does not have the authority to address these species in the current Feasibility phase. USACE would have authority to address the species in Design and Construction, which could be 3 to 10 years in the future, at which time any survey conducted during feasibility would be obsolete.

While a survey for tree snails was not conducted during Feasibility, the ESA Action area lacks suitable habitat for tree snails. Additionally, tree snails have not been previously reported in the area. Vegetation within the Action Area consists of actively maintained grassy lawn and sparse landscaping on and behind the existing wall. Dr. Curt Fiedler visited the project site in June 2024 and observed that tree snails were unlikely to be found in the Agat Mayor's Complex (Terlaje 2024).

4.7 Mariana fruit bat (*Pteropus mariannus mariannus*)

The Mariana fruit bat is a medium-sized fruit bat in the family Pteropididae that weighs 0.66 to 1.15 pounds (330 to 577 grams) and has a forearm length ranging from 5.3 to 6.1 in (13.4 to 15.6 cm); males are slightly larger than females. The underside (abdomen) is colored black to brown, with gray hair interspersed, creating a grizzled appearance. The shoulders (mantle) and sides of the neck are usually bright golden brown, but may be paler in some individuals. The head varies from brown to dark brown. The well-formed and rounded ears and large eyes give the face a canine appearance; members of the family Pteropodidae often are referred to as flying foxes (USFWS 2022a).

4.7.1 Listing Status

Mariana Bat was listed as endangered on August 27, 1984 (49 FR 33881-33885). It is managed by USFWS.

4.7.2 Critical Habitat

Although critical habitat has been designated on Guam by the USFWS for Mariana Fruit Bat (*Pteropus mariannus mariannus*) (50 CFR § 17.95(a)), the Action Area (Agat Bay Shoreline) is not included within any designated or proposed critical habitat areas (Figure 12).

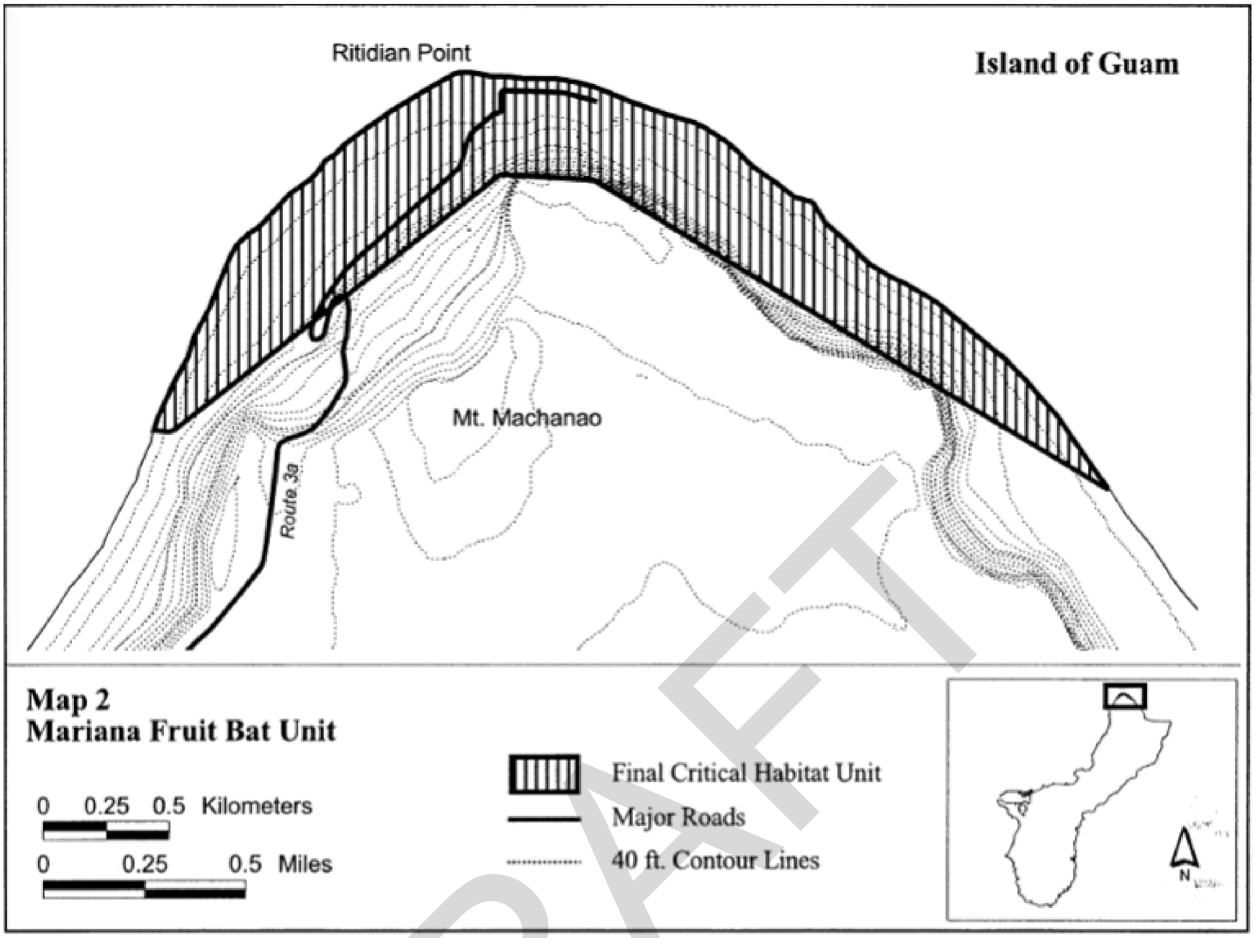

Figure 12: Mariana Fruit Bat Critical Habitat. Federal Register/Vol. 69, No. 208/Thursday, October 28, 2004/Rules and Regulations 62981

Within this area, the primary constituent elements required by the Mariana fruit bat for the biological needs of foraging, sheltering, roosting, and rearing of young are found in areas supporting limestone, secondary, ravine, swamp, agricultural, and coastal forests composed of native or introduced plant species. These forest types provide the primary constituent elements of:

- Plant species used for foraging, such as *Artocarpus sp.* (breadfruit), *Carica papaya* (papaya), *Cycas circinalis* (fadang), *Ficus spp.* (fig), *Pandanus tectorius* (kafu), *Cocos nucifera* (coconut palm), and *Terminalia catappa* (talisai); and
- Remote locations, often within 328 ft (100 m) of clifflines that are 260 to 590 ft (80 to 100 m) tall, with limited exposure to human disturbance; land that contains mature fig, *Mammea odorata* (chopak), *Casuarina equisetifolia* (gago), *Macaranga thompsonii* (pengua), *Guettarda speciosa* (panao), *Neisosperma oppositifolia* (fagot), and other tree species that are used for roosting and breeding.

- Critical habitat does not include existing features and structures within the boundaries of the mapped units, such as buildings, roads, aqueducts, antennas, water tanks, agricultural fields, paved areas, lawns, and other urban landscaped areas not containing one or more of the primary constituent elements.

4.7.3 Distribution and Habitat

In 2020 GDAWR counted 82 bats on Guam (USFWS 2020a). The primary constituent elements required by the Mariana fruit bat for the biological needs of foraging, sheltering, roosting, and rearing of young are found in areas supporting limestone, secondary, ravine, swamp, agricultural, and coastal forests composed of native or introduced plant species. Plant species used for foraging include *Artocarpus* sp. (breadfruit), *Carica papaya* (papaya), *Cycas circinalis* (fadang), *Ficus* spp. (fig), *Pandanus tectorius* (kafu), *Cocos nucifera* (coconut palm), and *Terminalia catappa* (talisai). Remote locations, often within 328 ft (100 m) of clifflines that are 260 to 590 ft (80 to 100 m) tall, with limited exposure to human disturbance; land that contains mature fig, *Mammea odorata* (chopak), *Casuarina equisetifolia* (gago), *Macaranga thompsonii* (pengua), *Guettarda speciosa* (panao), *Neisosperma oppositifolia* (fagot), and other tree species are used for roosting and breeding (USFWS 2024b).

4.7.4 Potential for Occurrence in Project Area

NPS (2024) reports historical records of fruit bats in the Agat Unit of War in the Pacific National Historical park, but currently reports fruit bats are not in the park. Therefore, USACE does not anticipate the Marian fruit bat to be present during the project.

4.8 Birds

4.8.1 Listing Status

ESA listed birds that may occur in the Action Area include the endangered Guam Kingfisher (*Todiramphus cinnamominus*), Guam Rail (*Gallirallus owstoni*), and Mariana Swiftlet (*Aerodramus bartschi*), listed in 1984, and the endangered Short-tailed Albatross (*Phoebastria (Diomedea) albatrus*), listed in 1970.

4.8.2 Critical Habitat

No critical habitat has been designated for the Guam Rail, Mariana Swiftlet, or short-tailed albatross.

There is final critical habitat for Guam Micronesian Kingfisher (published in the Federal Register on October 28, 2004). The Action Area does not overlap the critical habitat (Figure 13). The primary constituent elements required by the Guam Micronesian kingfisher for the biological needs of foraging, sheltering, roosting, nesting, and rearing of young are found in areas that support limestone, secondary, ravine, swamp, agricultural, and coastal forests composed of native and introduced plant species. These forest types include the primary constituent elements of:

- Closed canopy and well-developed understory vegetation; large (approximately 43 cm (17 in) diameter at breast height), standing dead trees (especially *Tristiropsis obtusangula* (faniok), *Pisonia grandis* (umumu), *Artocarpus spp*. (breadfruit), *Ficus spp*. (fig), and *Cocos nucifera* (coconut palm)); mud nests of *Nasutitermes spp*. termites; and root masses of epiphytic ferns for breeding;
- Sufficiently diverse structure to provide exposed perches and ground surfaces, leaf litter, and other substrates that support a wide range of vertebrate and invertebrate prey species for foraging kingfishers; and
- Sufficient overall breeding and foraging area to support kingfisher territories of approximately 25 ac (10 ha) each.
- Critical habitat does not include existing features and structures within the boundaries of the mapped units, such as buildings, roads, aqueducts, antennas, water tanks, agricultural fields, paved areas, lawns, and other urban landscaped areas not containing one or more of the primary constituent elements.

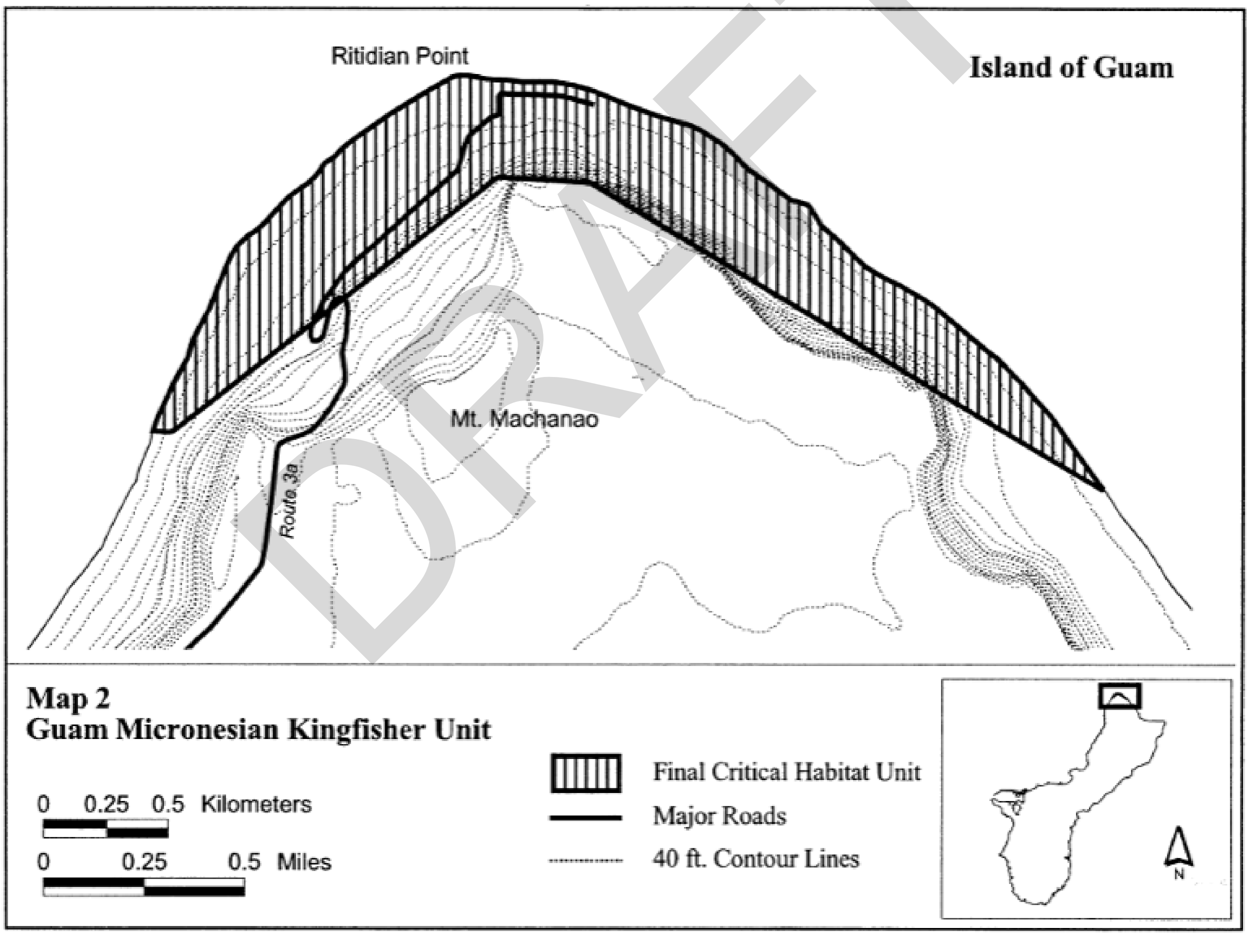

Figure 13: Guam Micronesian Kingfisher Critical Habitat. Federal Register/Vol. 69, No. 208/Thursday, October 28, 2004/Rules and Regulations 62981

4.8.3 Distribution and Habitat

Prior to its extirpation from the wild by 1988, the Guam kingfisher was found only on the island of Guam in all habitats except pure savanna and wetlands (Marshall 1949, Baker 1951, Tubb 1966, Jenkins 1983). This species is now found only in captivity (Bahner and Bier 2007). There are currently 135 sihek in captivity distributed across 25 institutions (24 Association of Zoos and Aquariums accredited institutions in the mainland United States and a breeding facility on Guam) (Newland and Ferrie 2020).

The Guam rail has been extirpated in the wild since 1985 (Wiles et al. 1995) and currently consists of 2 populations: 1 maintained in captivity by the Guam Department of Agriculture, Division of Aquatic & Wildlife (DAWR), and a reintroduced population on Cocos island established through a Safe Harbor Agreement. The species prefers edge habitats, especially grassy or secondary vegetation areas which provide good cover (USFWS 2018).

Swiftlets next in caves. Currently there are 3 caves with colonies in southern Guam, none in northern Guam (USFWS 2020b). There are no caves near the ESA Action Area.

Short-tailed albatross do not breed in Guam or the Marianas (USFWS 2020c).

4.8.4 Potential for Occurrence in Project Area

Guam Kingfisher and Guam rail are not likely to be found in the Project Area because they are believed extinct on Guam except for captive breeding populations. NPS (2024) reports Micronesian kingfisher and Guam rail were historically but not currently found in WAPA. The Short-tailed Albatross is not found in the park. The Mariana swiftlet is probably present, but not nesting (NPS 2024).

4.9 Slevin's Skink (*Emoia slevini*)

Slevin's skink is a small lizard in the family Scincidae and is the only lizard endemic to the Mariana Islands. Historically, the species has been recorded from Guam, Rota, Aguiguan, Tinian, Sarigan, Alamagan, Pagan, and Asuncion; it is currently extant on Sarigan, Alamagan, and Asuncion, and was recently rediscovered on Cocos Island off southern Guam. The species is found in leaf litter and tree debris in several forest types including native limestone, mixed native, *Casuarina equisetifolia* (ironwood), and coconut (*Cocos nucifera*) forests (Brown and Falanruw 1972, p. 110; McCoid et al. 1995, p. 72; Berger et al. 2005, p. 175; Vogt in litt. 2007; Lardner in litt. 2013; Mathies pers comm. 2019). Slevin's skink is extant on four islands with a moderate degree of threats and has a high recovery potential; however, not much is known about the species' life history. With a better understanding of its life history as well as habitat and threat management, recovery of the species could be achieved by 2052 (USFWS 2022a).

4.9.1 Listing Status

Sklevin's skink was listed Endangered November 2, 2015.

4.9.2 Critical Habitat

There is no critical habitat for Slevin's skink.

4.9.3 Distribution and Habitat

One population is found in Guam on Cocos Island (USFWS 2024f).

4.9.4 Potential for Occurrence in Project Area

Slevin's skink is not reported to be present in WAPA (NPS 2024). Slevin's skink is only found on Coco Island and therefore not expected to be in the ESA Action Area (USFWS 2024f).

4.10 Terrestrial Plants

4.10.1 Listing Status

Flowering Plants under the jurisdiction of USFWS include the endangered Ufa-halomtano (*Heritiera longipetiolata*) and the threatened Cebello Halumtano (*Bulbophyllum guamense*), *Dendrobium guamense*, and *Tuberolabium guamense* listed on 11/02/2015 (80 FR 59424).

Conifers and Cycads under the jurisdiction of USFWS on Guam include the threatened Fadang (*Cycas micronesica*) which was also listed on 11/02/2015 (80 FR 59424).

4.10.2 Critical Habitat

No critical habitat has been designated for any of the plants.

4.10.3 Distribution and Habitat

Bulbophyllum guamense (wild onion, siboyas halumtanu C, siboyan halom tano) is an epiphytic orchid (family Orchidaceae) characterized by leaf-bearing pseudobulbs that are spaced or clustered on a creeping or mat-like formation of fiber-covered rhizomes or stems. The species historical range included Guam, Northern Mariana Islands. *Bulbophyllum guamense* occurs on native trees and tall shrubs in native limestone forest and mixed introduced forest subtypes; however, *B. guamense* has also been observed growing on nonnative trees and tall shrubs. Occasionally, *B. guamense* is observed growing on unidentified dead trees. Native host tree species include *Hernandia labyrinthica, Elaeocarpus joga*, and *Pisonia umbellifera*. Nonnative host tree species include *Persea americana* (avocado) and *Areca catechu* (betelnut).

As of 2020, there were 3 populations with a total of fewer than 250 individuals on Guam (USFWS 2022a, 2024b).

Cycas micronesica is a gymnosperm in the cycad family (Cycadaceae) native to Guam, Rota, and tentatively Pagan, Palau (Republic of Palau) and Yap (Federated States of Micronesia). *Cycas micronesica* used to be the most common understory tree in the region's limestone forests and it can also be found in coastal strand habitat. It was the most abundant tree on Guam forest inventory surveys in 2002 with over 1.5 million trees we estimate that in 2020, there were 344,000 (123,000 to 538,000) individuals in 21 populations on Guam and fewer than 52,133 in 4 populations on Rota (USFWS 2020b).

Dendrobium guamense is an epiphyte and occasional lithophyte in the orchid family (Orchidaceae) known from native forests on Guam, Rota, Saipan, Tinian, and Aguiguan. In 2020, there were at least 21 populations with approximately 1,250 individuals distributed across the 5 islands (USFWS 2015, 2020c).

Heritiera longipetiolata (ufa halumtanu , ufa halom tano) is a tree in the hibiscus family (Malvaceae) endemic to the native forest on Guam, Rota, Saipan, and Tinian. In 2020, there were 11 known populations on Guam with 1,075 mature and 151 immature plants, and over 11,800 seedlings (USFWS 2020f).

Tuberolabium guamense (*Trachoma guamense* is a synonym) is an epiphyte in the orchid family (Orchidaceae) endemic to the forests of the Mariana Islands. The most recent surveys indicate there were 4 populations in southern Guam with 12,647 individuals, 5 populations in northern Guam with 14,020 plants (USFWS 2020n, p. 20-23).

4.10.4 Potential for Occurrence in Project Area

National Park Service vegetation inventories and monitoring at the Ga'an Point subunit of the Agat Unit have reported no significant or sensitive species (NPS 2005, 2014, 2024). No Orchidaceae at all were reported, *Cycas micronesica* was reported in the AG-b, MA, and MT units as uncommon in early surveys (NPS 2005) but was not reported later (NPS 2014). *Dendrobium guamense*, *Heritiera longipetiolata*, and *Tuberolabium guamense* were not reported (NPS 2005, 2014, 2024), therefore these plants are not expected to occur within the ESA Action Area.

5 Potential Impacts

Based on the known locations of sensitive species and habitat within the study area, the following impact analysis evaluates the potential for impact to ESA species and designated habitat from constructing the seawall within the ESA Action Area. Compared to other alternatives considered under the feasibility study, implementation of the open cell piling seawall was tentatively determined to be economically justified, environmentally sound and engineeringly feasible.

Potential vectors for impact per resource are discussed below. BMPs described at Section 2.2 are intended to avoid and/or minimize the following impacts.

5.1 Direct Impacts

5.1.1 Sea Turtles

Construction of the Open Cell Piling Seawall in the ESA Action Area would temporarily disturb the current beach, involving increased human presence and use of heavy machinery on the beach prior to and during construction, with minimal, limited, and temporary in-water work. Construction activities would likely involve the use of heavy machinery, operated from the land, for clearing vegetation growing in the existing seawall, excavation of the existing seawall, and construction of the open cell piing seawall. If construction must occur at night, artificial lighting may be required.

Potential vectors of impact from in-water and nearshore work include disturbance from human activity and equipment operation, exposure to elevated noise levels, exposure to elevated turbidity and sedimentation, exposure to wastes and discharges, disorientation caused by artificial lighting and loss of nesting habitat. Construction of the precast concrete seawall has the potential to directly strike ESA-listed species should those animals be present when the equipment is operating within the ESA Action Area. Potential injuries and their severity will depend on the animal's proximity to the heavy machinery when struck, the angle of the strike, and the body part impacted, but may include cuts, bruises, broken bones, cracked or crushed carapaces, and amputations, any of which could result in the animal's death. However, sea turtles on land can be clearly seen and avoided and move relatively slowly and construction activities can either be halted or moved to avoid direct impact until the species vacates the action area of its own accord.

Increased presence of humans, e.g., construction personnel, at the beach may impact sea turtles by causing the turtles to avoid the area, or by causing a startle reaction and resulting stress should the construction activity interact with the species. The reaction could range from one extreme where an animal calmly approaches and investigates the activity, to an opposite reaction of panicked flight, where an animal injures itself in an attempt to flee. However, sea turtles typically avoid human activity. Thus, the most likely effect of this interaction will be moderate level stress with a moderate to high energy avoidance behavior leading to the animal rapidly leaving project areas without injury.

Construction activities using heavy equipment within the ESA Action Area such as excavating and constructing the beach toe will elevate ambient noise levels and may cause sea turtles to avoid the in-water area during construction. USACE does not anticipate noise levels that would cause death or damage hearing because no pile driving is anticipated and because noise rapidly dissipates from uplands into marine waters.

Sea turtles breathe air and their ability to breathe should not be impacted by turbidity generated by minimal construction within the intertidal zone. Elevated turbidity levels in the ocean may affect predation and foraging by marine listed species. However, the intertidal zone within the ESA Action Area is comprised of coarse grain sediments such as sand and cobble and is expected to settle immediately upon disturbance causing no lasting elevated turbidity or sedimentation beyond the ESA Action Area.

Construction activities along the beach may involve use of plastic trash or other small ingestible trash that, if inadvertently consumed can cause digestive blockage or suffocation, or if large enough, along with discarded sections of ropes and lines, may entangle marine life. Equipment spills and discharges likely consist of hydrocarbon-based chemicals such fuel oils, gasoline, lubricants, hydraulic fluids, and other toxicants, which could expose protected species to toxic chemicals. Depending on the chemicals and their concentration, exposure could result in a range of effects, from avoidance of an area to death. Local and Federal regulations prohibit the intentional discharge of toxic wastes and plastics into the marine environment.

Construction of the precast concrete seawall will replace the existing seawall within the ESA Action Area. The precast concrete seawall is designed to prevent erosion of terrigenous sediments into the ocean which would benefit sea turtles by improving water quality. Direct impacts from beach loss are not anticipated because turtles do not nest or bask in the Action Area.

Potential effects to sea turtles that could result from implementation of the proposed action will be avoided and/or minimized using the BMPs listed in Attachment 1. USACE anticipates that sea turtles, in general would avoid the ESA Action Area during the daytime in response to increased human presence and elevated noise levels during construction. Should sea turtles approach the work area, their speed is considerably reduced on land and visibility on land by on-site personnel is uninhibited, allowing for construction activities to either halt immediately or adjust to avoid direct impacts to 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.

5.1.2 Coral and Giant Clams

Direct impacts to these marine species include direct physical impact with heavy machinery or humans. 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). Physical damage that reduces coral cover reduces ecological productivity and protection for other reef species including giant clams, increases opportunity for colonization by invasive algae, reduces resiliency to climate change and increases vulnerability to further physical damage.

Fast growing scleractinian “stony” 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, this characteristic 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). Clams have similar life stages and habitat preferences to coral and suffer similar effects, though clams are not always found in association with coral (82 FR 28946).

Direct physical impacts to coral and clams from the Proposed Action would be avoided through implementation of the BMPs in Attachment 1. Appropriate BMPs for the ESA-listed corals should be sufficient to prevent harm or harassment to the giant clams.

Based on a recent survey by USFWS of the ESA Action Area, the ESA Action Area is absent of ESA-listed clams and coral species, (USFWS 2024). Accordingly, the project would have no direct impact to ESA-listed corals and clams within the ESA Action Area.

5.1.3 Tree Snails

Tree snails prefer moist dense forests and are prone to desiccation in other environments (USFWS 2024 a-c; 2023). While the Action Area is sparsely vegetated, the Open Cell Piling Seawall construction will require the removal of as many as 12 trees. At USFWS (2023) request, a tree snail professional will survey the action area for tree snails prior to staging and construction.

If tree snails are found during surveys, the avoidance and minimization measures recommended by USFWS (Attachment 1) will be implemented. Due to the lack of suitable habitat and with the implementation of these recommended avoidance and minimization measures, direct impacts to tree snails are unlikely.

5.1.4 Birds and Mariana Fruit Bat

The shoreline along Agat Bay has been extensively altered by urban development, and the vegetation observed at the proposed project site during the January 2022 PDT visit reflected this. Construction of the open cell piling seawall requires the removal of 320 ft of the existing seawall requiring a maximum excavation width of 4 feet, and the construction of an open cell piling seawall resulting in a temporarily disturbed area of 8320 square feet. It is estimated that 12 trees would be removed during construction and replaced after construction with appropriate and desirable native species and all bare ground would be revegetated.

None of the trees within the Action Area are species used for roosting or foraging by Mariana fruit bat or ESA-listed birds. There are no caves nearby that would be used by the Mariana swiftlet. Impacts to Mariana fruit bat and birds would be temporary during construction. Construction of the alternatives would beneficially protect existing and restored terrestrial habitat between the wall and the road. Mariana fruit bat and ESA-listed birds may pass through the Action Area on their way to roosting or foraging areas at night, outside of project working hours.

Potential effects to fruit bats and birds that could result from implementation of the proposed action will be avoided and/or minimized using the BMPs in Attachment 1.

USACE anticipates that fruit bats in general would be roosting during the daytime and not in the ESA Action Area. The Proposed Action would not result in direct effects or loss of individual fruit bats or birds, 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. Due to the lack of suitable habitat and with the implementation of the recommended avoidance and minimization measures (Attachment 1), USACE anticipates direct impacts to Mariana fruit bats and birds to be unlikely.

5.1.5 Terrestrial Plants

The shoreline along Agat Bay has been extensively altered by urban development, and the vegetation observed at the proposed project site during the January 2022 PDT visit reflected this. No ESA-listed plants were observed by the PDT nor have they been reported by PACN field staff. Construction of the open cell piling seawall requires the removal of 320 ft of the existing seawall requiring a maximum excavation width of 4 feet, and the construction of an open cell piling seawall resulting in a temporarily disturbed area of 8320 square feet, predominantly lawn. It is estimated that 12 trees would be removed during construction and replaced after construction with appropriate and desirable native species and all bare ground would be revegetated. Due to the lack of suitable habitat and with the implementation of the recommended avoidance and minimization measures (Attachment 1), USACE anticipates direct impacts to Mariana fruit bats to be unlikely.

5.2 Indirect and long-term physical impacts

5.2.1 Sediment Erosion/Accretion

The Open Cell Piling Seawall would be constructed along and maintain the contours of the existing beach profile. Thus, USACE does not anticipate substantial or permanent exacerbation of erosion of soils or loss of topsoil in the long term.

5.2.2 Discharge of pollutants

Construction activities along the shoreline involving the use of heavy machinery has the potential for inadvertent spills and discharges that may consist of hydrocarbon-based chemicals such as fuel oils, gasoline, lubricants, hydraulic fluids and other toxicants, which could spread into the marine environment and expose protected species to toxic chemicals. Oil globules can adhere to coral tissue and soluble oil components can be absorbed from the water column by coral polyps (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. Chemical spills into the ocean can also indirectly impact sea turtles by affecting mobility and respiration and by degrading the turtles' food source.

Site preparation and excavation for the open cell piing seawall could result in indirect impacts to protected resources through the inadvertent exposure or discharge of excavated native subsurface soil and sediments into tidally influenced areas. Release of terrigenous sediments such as silt, clay and organic matter can elevate turbidity levels within and beyond the ESA Action Area through ocean circulation. These fine grain sediments are more easily suspended and take longer to settle out than coarse grain sand and cobble which settles almost immediately. The impact of sedimentation or settling of sediments on coral reefs, depends upon the thickness of the sediment layer and duration of coverage resulting in reduced photosynthesis and diverting energy away from lifecycle activities to sloughing and mucous production and on the extreme end, bleaching and death. Death of native biota can be followed by opportunistic proliferation of invasive species disrupting the balanced ecosystem. Elevated turbidity for extended periods of time reduces solar irradiation affecting photosynthetic organisms and can reduce visibility in the water column for visual foragers and increase vulnerability of prey.

Through best management practices (Attachment 1), 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 because of project activities.

6 Effects of the Action

Effects on ESA-listed species were considered adverse if implementation of the proposed Project would result in any of the following (Table 4):

- 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 interfere 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.
- Any effect that was not considered discountable (extremely unlikely to occur), insignificant (size of the impact should never cause take), or beneficial (contemporaneous positive effects without any adverse effects)

In consideration of the potential impacts described in Section 4.0, USACE has considered whether or not such impacts may affect and are likely or not likely to adversely affect ESA-listed species i.e., effects that are not discountable, insignificant or wholly beneficial. Additionally, USACE considered whether or not the proposed action would result in the destruction or adverse modification of critical habitat i.e., alterations that adversely modify any of those physical or biological features that were the basis for determining the habitat to be critical.

When considering the effect the proposed action would have on the Hawksbill sea turtle and Green sea turtle, USACE evaluated both direct and indirect impacts to sea turtles both in water and on land. In-water construction activities would be limited to the intertidal zone for site preparation purposes, if determined necessary at all, with no impediment to visual monitoring to ensure avoidance of direct impacts to sea turtles in water. Construction activities on the beach will have no impediment to visual monitoring coupled with daily surveys to ensure no direct impacts to sea turtles on land. Direct impacts to sea turtles in the water and on land are expected to be discountable. The indirect impacts of beach erosion and potential for loss of suitable nesting habitat is minimal as the open cell piling seawall will be constructed higher up on the beach profile and the area is not known for nesting. The indirect impacts to sea turtles from impaired water quality and exposure to construction debris and wastes, through implementation of BMPs will be insignificant. **Accordingly, USACE has determined that the proposed action will not affect Hawksbill sea turtles and may affect but is not likely to adversely affect Green sea turtles.**

When considering the effect the proposed action would have on the coral *Acropora globiceps*, *Tridacna derasa, T. gigas,* or *Hippopus hippopus* USACE understands that the ESA Action Area is absent of any listed species; therefore, USACE does not anticipate these species to be directly affected by the proposed action. However, although in-water work is not anticipated, the ESA Action Area minimally includes the intertidal area fronting the shoreline and provides a means of conveying project generated turbidity, wastes and discharges to the marine environment. Indirect impacts to water quality may affect listed corals near the ESA Action Area, specifically, *Acropora globiceps*, however, USACE anticipates that due to the work being sited predominately, if not entirely on land and through implementation of BMPs listed at Section 2.2, such adverse impacts are expected to be both insignificant and discountable. **Accordingly, USACE has determined that the proposed action will not affect *Acropora globiceps*, *Tridacna derasa, T. gigas, or Hippopus hippopus.***

When considering the effect, the proposed action would have on tree snails, USACE understands that the ESA Action Area is absent of habitat suitable for and preferred by these species. USACE does not anticipate these species to coincide in the ESA Action Area with the proposed action or otherwise be affected by the proposed action. Such direct impacts would be discountable. **Accordingly, USACE has determined that the proposed action will not affect tree snails.**

When considering the effect, the proposed action would have on the Mariana fruit bat and Mariana swiftlet, USACE understands that the ESA Action Area is absent of habitat suitable for and preferred by these species and these species have not been recorded in the area however, bats and swiftlets are presumed to pass through on their way to foraging and roosting areas. USACE does not anticipate this species to coincide in the ESA Action Area with the proposed action or otherwise be affected by the proposed action. **Accordingly, USACE has determined that the proposed action may affect but is not likely to adversely affect Mariana fruit bat or Mariana swiftlet**.

When considering the effect, the proposed action would have on plants, USACE understands that the ESA Action Area is absent of habitat suitable for and preferred by these species. USACE does not anticipate these species to coincide in the ESA Action Area with the proposed action or otherwise be affected by the proposed action. Such direct impacts would be discountable. **Accordingly, USACE has determined that the proposed action will not affect ESA-listed plants.**

Table 3: Summary of Effects on ESA-Listed Species potentially present on or in the vicinity of the ESA Action Area.

Common Name	Scientific Name	Status	Effect
Fish			
Scalloped hammerhead shark	*Sphyrna lewini*	Threatened	No Effect
Reptiles			
Green sea turtle	*Chelonia mydas*	Endangered	NLAA
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered	No Effect
Slevin's Skink	*Emoia slevini*	Endangered	No Effect
Mammals			
Mariana Fruit Bat	*Pteropus mariannus mariannus*	Endangered	NLAA
Birds			
Guam Kingfisher, sihek	*Todiramphus cinnamominus*	Endangered	No Effect
Guam Rail	*Gallirallus owstoni*	Endangered	No Effect
Mariana Swiftlet	*Aerodramus bartschi*	Endangered	NLAA
Short-tailed Albatross	*Phoebastria (Diomedea) albatrus*	Endangered	No Effect
Invertebrates			
small-polyp stony coral	*Acropora globiceps***	Threatened	No Effect
Giant Clam	*Tridacna derasa* *T. gigas* *Hippopus hippopus*	Endangered Threatened	No Effect
Fragile Tree Snail	*Samoana fragilis*	Endangered	No Effect
Guam Tree Snail	*Partula radiolata*	Endangered	No Effect
Humped Tree Snail	*Partula gibba*	Endangered	No Effect
Plants			
Cebello Halumtano	*Bulbophyllum guamense*	Threatened	No Effect
	Dendrobium guamense	Threatened	No Effect
	Tuberolabium guamense	Threatened	No Effect
Ufa-halomtano	*Heritiera longipetiolata*	Endangered	No Effect
Fadang	*Cycas micronesica*	Threatened	No Effect

There is no designated or proposed critical habitat for any ESA-listed species in the Action Area. **Accordingly, USACE has determined that the proposed action would cause no destruction or adverse modification of critical habitat.**

7 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 Green sea turtles, swiftlets, and bats. In general, direct impacts to listed coral species would not occur or are highly unlikely.

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USFWS Concurrence Letter

NMFS Concurrence Letter

EFH CONSERVATION RECOMMENDATIONS AND OTHER BMPs

for the Agat CAP Section 14 Emergency Shoreline Protection by the Honolulu District, U.S. Army Corps of Engineers Civil and Public Works Branch

USACE has developed and compiled the following environmental commitments in consultation with federal and territory resource and regulatory agencies to avoid and minimize adverse impacts to federal and territory trust resources. These commitments will become specifications of the contract for implementation by the contractor and enforcement by USACE. Standard measures have been adopted and tailored to reflect the specific proposed action at the Agat Mayor's Complex shoreline.

EFH CRs (USACE and NMFS 2022a)

Applicable (and slightly modified to ensure applicability) Conservation Recommendations (CRs) adopted from the EFH Programmatic Consultation dated July 29, 2022 (USACE and NMFS 2022a) are presented below. CRs applicable to the activity category that are not applicable to the proposed action either due to the scope of the proposed action or the location of the action area are struck out, with rationale provided, and will not become specifications of the contract.

VI.A. CRs for Physical Impacts to Benthic Communities

1. Equipment, anchors, structures, or fill shall not be deployed in project areas containing live corals, seagrass beds, or visible benthic organisms. Perform pre-deployment reconnaissance (e.g., divers, drop cameras, etc.) to ensure these resources are avoided.
2. Minimize direct impact (direct or indirect contact causing damage) by divers and construction related tools, equipment, and materials with benthic organisms, regardless of size, especially corals and seagrass.
3. Prevent trash and debris from entering the marine environment during the project.
4. Maintain all structures, gear, instrumentation, mooring lines, and equipment to prevent failures.
5. All objects lowered to the bottom shall be lowered in a controlled manner. Note: This can be achieved by the use of buoyancy controls such as lift bags, or the use of cranes, winches, or other equipment that affect positive control over the rate of descent. This often requires skilled in- water observation.
6. Select work platforms based on the following preferential hierarchy:
    a. conduct all work from land or an existing structure;
    ~~b. use a barge with auto-positioning systems where thrusters will not cause increased turbidity;~~
    c. ~~anchor barges to (1) shoreline infrastructure; (2) nearby existing moorings; and, (3) anchors or spuds on sand only (as possible, have SCUBA divers lay anchors by hand in sand areas).~~
7. ~~Ensure new structures minimize shading impacts to marine habitats. Note: Shade minimization measures include: maximizing the height of the structure and minimizing the width of the structure to decrease shade footprint; grated decking~~

~~material; using the fewest number of pilings necessary to support the structures; and, aligning the boardwalk in a north-south orientation for the path of the sun to cross perpendicular to the length of the structure to reduce the duration of shading.~~ Not applicable.

8. ~~Mooring systems (e.g., buoys, chains, ropes) must:~~
   a. ~~be kept taut to the minimum length necessary.~~
   b. ~~employ the minimum line length necessary to account for expected fluctuations in water depth due to tides or waves.~~
   c. ~~use a mid-line floats or other buoyancy devices to prevent contact with the ocean floor.~~
   d. ~~be properly maintained.~~ Not applicable
9. All temporary structures must be removed at the completion of construction and this timeframe will be defined as aligned with General Condition #30 of the Nationwide Permit Program.

VI.B. CRs for Increase in Sedimentation and/or Turbidity

1. Appropriate silt containment devices must be properly installed, monitored and maintained.
2. Debris and sediment that is removed from the water shall be disposed of at an appropriate upland location. Sediment and debris must be contained while in transit or on the shore.
3. Project operations must cease under unusual conditions, such as large tidal events, storms, and high surf conditions.
4. Conduct intertidal work at low and/or slack tide to the greatest extent feasible.
5. To minimize impacts to coral larvae, you shall avoid in-water work during mass-coral spawning times or peak coral spawning seasons. ~~Permittees shall coordinate with local~~ NMFS PIRO Habitat Conservation Division representatives ~~to determine the exact period when~~ peak coral spawning would occur for the given year at the project site 7 days before to 21 days after the July full moon. For 2027 this would be June 27 to July 25 (full moon will be on July 4, 2027).
6. Maintain baseline water flow, volume, and velocity of the waterbody.
7. ~~Use natural or bio-engineered solutions when feasible.~~ Not applicable.
8. Fully stabilize disturbed upland areas prior to removing silt fences and erosion prevention measures.
9. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction conditions and elevations.
10. ~~Utilize environmental clamshell buckets for mechanical dredging.~~ Not applicable.

VI.C. CRs for Increase in Nutrients, Pesticides and Herbicides, Contaminants, and/or Freshwater

1. Conduct work during the dry season when possible; stop work during storms or heavy rains.
2. Prevent discharges into the water.
3. Inspect all equipment prior to beginning work each day to ensure the equipment is in good working condition, and there are no contaminant (e.g., oil, fuel) leaks. Work must be stopped until leaks are repaired and equipment is cleaned. Equipment should always be stored in appropriate staging area designed to be preventative in terms of containing unexpected spills when equipment is not in use or during fueling.
4. Fueling of project-related vehicles and equipment shall take place at least 50 feet, or the maximum distance possible, from the water and within a containment area, preferably over an impervious surface.
5. ~~Use of treated wood that would be in contact with the water is not authorized.~~ (not applicable, not within scope of proposed action)
6. ~~Use diffusers on the end of subtidal discharge pipes to minimize impacts from discharges.~~ (not applicable, not within scope of proposed action)
7. ~~Prevent bentonite and other drilling fluids from contacting benthic organisms.~~ (not applicable, not within scope of proposed action)

VI.D. CRs for Increase in Acoustic Impacts

1. Use a vibratory hammer to install piles when possible. Under conditions where impact hammers are required, when possible, drive as deep as possible with a vibratory hammer prior to the use of an impact hammer.
2. Implement measures to attenuate the sound or minimize impacts to aquatic resources during pile installation. Methods to mitigate sound impacts include, but are not limited to, the following: surround the pile with a dewatered cofferdam and/or air bubble curtain system.

VI.E. Conservation Recommendations for Increase in Invasive Species

1. Prior to in-water work, sanitize equipment or dive gear that has been previously used in an area known to contain invasive species.
    a. In-water tool and dive gear (e.g., wetsuit, mask, fins, snorkel, BC, regulator, weight belt, booties) shall be disinfected by one of the following ways: a 1:52 dilution of commercial bleach in freshwater, a 3 percent free chlorine solution, or a manufacturer's recommended disinfectant-strength dilution of a quaternary ammonium compound in "soft" (low concentration of calcium or magnesium ions) freshwater.
    b. Small boats that have been deployed in the field will be cleaned and inspected daily for organic material, including any algal fragments or other organisms. Organic material, if found, will be physically removed and disposed of according to the ship's solid- waste disposal protocol or in approved secure holding systems. The internal and external surfaces of vessels will be rinsed daily with freshwater and always rinsed and be allowed to dry before redeployment.

2. Vegetated areas impacted during construction must be revegetated with appropriate native species.

Additional EFH CRs from previous consultation (NMFS 2023)

1. The demolition and removal of the existing seawall will be managed to avoid and minimize direct and indirect effects (e.g., noise, turbidity/sediment, pollution/discharge) to EFH.
2. Seawater retreat into the ocean that may otherwise become trapped behind the hardened infrastructure as a result of this project will be managed by installing weep holes in the wall to let the water that may be trapped escape. The connections between the individual panels will not be watertight so some water will be able to travel between the panels as well.
3. Rainfall that may otherwise become trapped behind the hardened infrastructure as a result of this project will be managed by installing weep holes in the wall to let the water that may be trapped escape. The connections between the individual panels will not be watertight so some water will be able to travel between the panels as well.
4. USACE ~~will~~ coordinated with NMFS Pacific Islands Regional Office to determine dates to use for planning to avoid peak coral spawning periods for in-water activities: 7 days prior and 21 days after the July full moon. For 2027 this would be June 27 to July 25 (full moon will be on July 4, 2027).

ESA BMPs from NMFS (USACE and NMFS 2022b)

Applicable (and slightly modified to ensure applicability) Best Management Practices (BMPs) per Pac-SLOPES dated March 2, 2022 (USACE and NMFS 2022b). Highlighted BMPs are applicable and will become specifications of the contract. BMPs not applicable to the proposed action either due to the scope of the proposed action or the location of the action area are struck out, with rationale provided, and will not become specifications of the contract.

A. General BMPs

1. The Corps will retain the right of reasonable access to projects authorized under Pac- SLOPES to monitor the compliance with and effectiveness of ~~permit conditions~~ contract specifications.

2. ~~For in-water work where ESA corals may occur, structures and substrate that could be affected by the proposed activity must be surveyed by personnel qualified to identify ESA- listed corals. Where divers are to be used, before entering the water, all divers shall be made aware of ESA-listed corals, and the requirement to avoid contact with the corals while performing their duties. This shall include taking measures to avoid kicking corals with fins and to secure dive and survey equipment in a manner that will prevent the equipment from being dragged across the substrate~~. (not applicable, the ESA Action Area was surveyed and determined that no ESA listed corals are present in the action area.)

3. To minimize impacts to coral larvae, notably the listed species covered in this programmatic consultation, the permittee shall avoid in-water work ~~and herbicide~~

~~application~~ during regionally-specific mass-coral spawning times or peak coral spawning seasons 7 days prior and 21 days after the July full moon, if practicable. ~~The Corps must consult with their local NMFS HCD biologist to determine the period and dates when coral spawning will occur for the given year.~~ (the coral spawning period was coordinated with NMFS PRD and HCD).

4. Constant vigilance shall be kept for the presence of ESA-listed marine species (sea turtles, marine mammals, sharks, rays) during all aspects of the proposed action. In particular, sea turtles are expected to occur in and around the harbor.
5. A responsible party (i.e. permittee/site manager/project supervisor) shall designate an appropriate number of competent trained observers[4] to survey the areas adjacent to the authorized work area (i.e. proposed action) for ESA-listed marine species. The competent observer will not be simultaneously engaged in any other activity (e.g. captaining, operating equipment, etc).
6. Surveys shall be made prior to the start of work each day, and prior to resumption of work following any break of more than one half hour. Additional periodic surveys throughout the work day are strongly recommended.
7. All work shall be postponed or halted when ESA-listed marine species are within 50 meters (54.7 yards, 164 feet) of the proposed work, and will only begin/resume after the animals have voluntarily departed the area.
    a. If ESA-listed marine species are noticed within 50 meters (54.7 yards, 164 feet) after work has already begun, that work may continue only if, in the best judgement of a biologist, the activity will not adversely affect (i.e. disturb or harm) the animal(s). For example: divers performing underwater work (excluding the use of toxic chemicals) such as surveys would likely be permissible, whereas operation of heavy equipment is not.
8. Project-related personnel shall NOT conduct activities resulting in a take of an ESA-listed species, a species proposed for listing, or listed or proposed critical habitat. “Take” as defined under the ESA means “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct”. Activities that would qualify as take include attempting to disturb, touch, ride, feed, or otherwise intentionally interact with any protected species.
9. Sensitive resource areas, such as corals, coral reefs and seagrass beds known to occur within a project area must be identified on project figures. Project staff must be instructed to avoid the sensitive resource areas to the greatest extent practicable, including avoiding anchoring in these areas, flagging the areas if appropriate, and securing all in-water equipment in a manner that will prevent the equipment from being dragged across the substrate.
10. Project construction must cease under unusual conditions, such as large tidal events and high surf conditions, except for efforts to avoid or minimize resource damage.
11. ~~When a diver is involved in the action, the diver will do their best to avoid ESA-listed species. If an animal traverses within 50 m, however, the diver will take into account his/her own personal safety. The diver will report the interaction via the reporting requirement in BMP A 13.b~~. (not applicable, no divers)

12. If an ESA-listed species is adversely affected as a result of the project, all work must stop until coordination with the Corps and NMFS has been completed.

13. Reporting

    a. ~~Any monk seal sightings:~~

        i. ~~At the time of observation, the observer will report the sighting to the NOAA Statewide Hawaii Marine Wildlife Hotline at 888-256-9840. The observer will be prepared to provide information to the hotline operator about the sighting location and other site-specific information to help the operator determine the most appropriate response, if any.~~

        ii. ~~The observer will email documentation of Hawaiian monk seal sightings (e.g., photos, video, reports, etc.) to: pifsc.monksealsighting@noaa.gov, with the subject line indicated as: "Monk seal sighting documentation per Pac- SLOPES ESA section 7 consultation." Documentation will always include the specific sighting location and the contact information of the reporting party.~~ (not applicable, no HMS in Guam)

    b. Observer logs. All non-take interactions with listed species (e.g. a species entering the shut-down zone and work is shut down correctly) must be documented and reported to the Corps and NMFS in monitoring logs (Table 2 in Appendix B).

        i. Monitoring logs shall be completed daily. If no ESA-listed species are observed, the observer will record "0" in the daily report.

        ii. The monitoring logs will be submitted in a digital and queryable to the NMFS reporting contact(s) in Table 1.

            1. total hours and dates of monitoring identification of which ESA species were observed and in what location and circumstances, including date, numbers of individuals of species observed, the outcome of the species observance relative to the authorized project, and any factors which may have affected visibility,

            2. if applicable, observed ESA species behaviors and movement types relative to the project activity at time of observation

        iii. All monitoring logs must be submitted to the NMFS within 90 calendar days of the completion of the project. The Corps will provide final reports to NMFS as part of the annual report. The final report will be comprised of summaries of monitoring efforts.

B. *BMPs for waste and discharge*

1. ~~A stormwater management plan, commensurate to the size of the project, must be prepared and carried out for any project that will produce any new impervious surface or a land cover conversion that will slow the entry of water into the soil to~~

~~ensure that effects to water quality and hydrology are minimized.~~ (not applicable, no new impervious surface or land cover conversion proposed)

2. An erosion control plan for the project site and adjacent areas must be prepared and carried out. Erosion controls must be properly installed before any alteration of the project area may take place.
3. A pollution control plan for the project site and adjacent areas must be prepared and implemented. At a minimum, this plan shall include:
    a. Proper installation and maintenance of equipment diapers, or drip pans.
    b. A contingency plan to control and clean spilled petroleum products, hydraulic leaks, and other toxic materials.
    c. Appropriate materials to contain and clean potential spills will be stored at the work site and be readily available.
    d. All project-related materials and equipment placed in the water will be free of pollutants.
    e. Daily pre-work inspections of heavy equipment and vessels for cleanliness and leaks, with all heavy equipment operations and vessel use postponed or halted until leaks are repaired and equipment is cleaned.
    f. Fueling of land-based vehicles and equipment shall take place at least 50 feet (15 meters) away from the water, preferably over an impervious surface.
    g. All construction discharge water (e.g., concrete washout, pumping for work area isolation, vehicle wash water, drilling fluids) must be treated before discharge.
    h. Debris and other wastes will be prevented from entering or remaining in the marine environment during the project.
4. Temporary access roads and drilling pads must avoid steep slopes, where grade, soil types, or other features suggest a likelihood of excessive erosion or failure; existing access routes must be utilized or improved whenever possible, in lieu of construction of new access routes.
5. Temporary fills must be removed in their entirety. All areas impacted by construction must be returned to pre-construction elevations. The affected areas must be stabilized and revegetated with native species as appropriate.
6. All disturbed areas must be immediately stabilized following cessation of activities for any break in work longer than 4 days.
7. ~~Drilling and dredging are restricted to uncontaminated areas, and any associated waste or spoils must be completely isolated and disposed of in an approved upland disposal location.~~ (not applicable, no drilling or dredging proposed)

C. *BMPs for Activities that may result in Direct Physical Impact*

1. Before any equipment, anchor(s), or material enters the water, a responsible party, i.e., permittee/site manager/project supervisor, shall verify that no ESA-listed marine animals are in the area where the equipment, anchor(s), or

materials are expected to contact the substrate. If practicable, the use of divers to visually confirm that the area is clear is preferred.

2. Equipment operators shall employ “soft starts” when initiating work each day and after each break of 30 minutes or more that directly impacts the bottom. Buckets and other equipment shall be sent to the bottom in a slow and controlled manner for the first several cycles before achieving full operational impact strength or tempo.
3. All objects lowered to the bottom shall be lowered in a controlled manner. This can be achieved by the use of buoyancy controls such as lift bags, or the use of cranes, winches, or other equipment that affect positive control over the rate of descent.

~~*D. BMPs for activities that may result in Entanglement*~~

1. ~~Temporary in-water tethers, as well as mooring lines for vessels and marker buoys shall be kept taut to the minimum length necessary and shall remain deployed only as long as needed to properly accomplish the required task.~~
2. ~~Mooring systems shall employ the minimum line length necessary to account for expected fluctuations in water depth due to tides and waves.~~
3. ~~Mooring systems shall be designed to keep the line as tight as possible, with the intent to eliminate the potential for loops to form.~~
4. ~~Mooring lines shall consist of a single line connected to the buoy float. No additional lines or material capable of entangling marine life may be attached to the mooring line or to any other part of the deployed system.~~
5. ~~Mooring systems shall be designed to keep the gear off the bottom, by use of a mid-line float when appropriate.~~
6. ~~Any permanent or long-term deployments shall include an inspection and maintenance program to reduce the likelihood of failures that may result in loose mooring lines lying on the substrate or hanging below a drifting buoy.~~
7. ~~Mooring systems, including those used for temporary markers, scientific sensor buoys, or vessel moorings, shall be completely removed from the marine environment immediately at the completion of the authorized work or the end of the mooring’s service life. The only exceptions to this rule shall be mooring anchors such as eyebolts that are epoxied into the substrate and which pose little or no risk to marine life.~~

E. BMPs for activities that may result in Exposure to Elevated Noise Levels

1. Maintenance dredging, in-water excavation, movement of large armor stones, and benthic core sampling shall not be undertaken if any ESA-listed marine animals are within 50 meters (54.7 yards, 164 feet) of the authorized work, and those operations will immediately shut- down if an ESA-listed marine animal enters within 50 meters (54.7 yards, 164 feet) of the authorized work. This condition is intended to ensure that no ESA-listed marine animals are exposed to sound levels anywhere near the TTS threshold isopleths.
2. ~~Operation of buoy acoustic release systems shall cease when ESA-listed marine~~

~~animals are within 250 meters (273 yards) (safety zone). It is further recommended that the permittee carefully survey the safety zone around the vessel/buoy from 30 minutes prior to activating the acoustic release, to 30 minutes following the end of transducer operations.~~ (not applicable, not within scope of proposed action)

G. Marina or Harbor Repair and Improvement Activities

1. Repair and replacement of over-water and in-water structures (such as piers, docks, and launch ramps) under Pac-SLOPES is expressly limited to their existing footprints.
2. ~~Replacement decking should be designed to reduce in-water shading to the greatest extent practicable.~~ (not applicable, not within scope of proposed action)
3. Repair and removal work will be accomplished in a manner that minimizes the potential spread of invasive species that may reside on the pilings such as immediate removal from the water upon extraction or other appropriate approved containment methods.
4. Removed materials must be disposed of at an approved upland disposal site.

J. Stranded, Injured, Sick , or Dead Marine Mammal or Turtle

1. If observers become aware of any injured, sick, or dead marine mammal or turtle (whether or not it may be related to the proposed action), they will immediately call the NOAA ~~Statewide Hawaii~~ Marine Wildlife Hotline at 888- 256-9840. The observer will be prepared to provide information to the hotline operator about the animal's condition, location, and other information specific to the situation to help the operator determine the most appropriate response.
2. The observers will submit photos and data as soon as possible regarding stranded, injured, sick, or dead marine animals that NMFS may use to inform NMFS-directed field responses and/or further analysis to determine whether a taking resulted (see 3. below). Photos and data submitted to NMFS regarding stranded, injured, sick, or dead marine animals will include date, time, location, species, and number of animals, as well as a description of the animal's condition, event type (e.g., entanglement, dead, floating), and behavior of live-stranded marine animals. The observers will email this documentation to: respectwildlife@noaa.gov, with the subject line indicated as: "Stranded animal information per Pac-SLOPES ESA section 7 consultation."
3. If NMFS responders determine the proposed action resulted in the taking, re-initiation of ESA consultation is warranted. The Corps will collect the following information and include it in the re- initiation request:
    a. Number of individuals and species of listed animals affected;
    b. The date, time, and location of each event (provide geographic coordinates);
    c. Description of the event;
    d. The time the animal(s) was first observed or entered the shutdown zone, and, if known, the time the animal was last seen or exited the zone, and

the fate of the animal;

e. Mitigation measures implemented prior to and after the take; and

f. If a vessel struck a marine mammal, the contact information for the observer on duty, or the contact information for the individual piloting the vessel if there was no observer on duty;

g. Photographs or video footage of the animal(s) (if available).

R. Contact Information

Table 1. Summary of agency contact information.

Reason for Contact	Contact Information
Consultation Questions	ESA email inbox (efhesaconsult@noaa.gov), and Consultation Biologist: Joshua.Rudolph@noaa.gov
Reports & Data Submittal (please include ECO tracking number in subject line)	efhesaconsult@noaa.gov, and CEPOH-~~RO~~Planning@usace.army. mil
NOAA Marine Wildlife Hotline for Notification of ~~Fisheries~~ ~~Hawai‘i Statewide~~ Marine Stranding, Entanglement, and Reporting ~~Hotline~~ (not related to project activities)	Stranding Hotline (24/7 coverage): (888) 256-9840
Oil Spill & Hazardous Materials Response	U.S. Coast Guard National Response Center: 1-800-424-8802
Illegal Activities (not related to project activities; e.g., feeding, unauthorized harassment, or disturbance to marine mammals)	NMFS Office of Law Enforcement: 1-800-853-1964
NMFS Pacific Islands Regional Office	808-725-5000
~~Corps~~ USACE Honolulu District ~~Regulatory Office~~Civil and Public Works Branch	CEPOH-~~RO~~Planning@usace.army.mil 808-835-4175~~303~~

ESA BMPs from USFWS

A. Applicable USFWS Standard BMPs for work in or around aquatic environments (USFWS 2022)

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.~~ (not applicable, not within scope of proposed action)

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.~~ (not applicable, dredging/filling not within scope of proposed action)

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, nonnative 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 http://www.haccp-nrm.org/Wizard/default.asp) 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.

B. *Applicable Recommended Measures to Minimize Potential Project Impacts to Threatened and Endangered Species and Critical Habitats in the Mariana Islands (USFWS 2023a)*

DELINEATE THE ACTION AREA AND ZONES OF RISK

1. Delineate the project's action area. The action area includes all areas that may be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. [50 CFR §402.02]. (Related: Indirect effects - those effects that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur. [50 CFR §402.02])
2. Delineate the various areas of the project footprint and map buffers around the project

footprint along the outer perimeter of areas that may be affected by various project stressors. Threat zones may be delineated within these perimeters. The project footprint should include staging areas outside the construction footprint as well as areas where off-site conservation actions will be conducted to offset project impacts. Delineate the action area within and surrounding the areas of project footprint. For example, include in the action area delineation those areas where project audible noise may exceed 60 decibels (draw a line on the map showing where 60 decibels will occur), and where lighting (the view shed for the increased light pollution), invasive species, increased wildfire threat, changes in water quality, deposition of pesticide, and general human disturbance including line of sight view of human movement and downwind scent from humans, could affect listed species or critical habitat as a result of the proposed action. Also include in the action area the area where edge effects may occur – such as where forest will be more exposed to wind damage due to removal of vegetation within the project footprint, areas where microclimate will be altered, areas where dust from the project site may affect plant photosynthesis, and where groundwater availability or water quality may be affected as a result of the proposed action.

3. Evaluate the stressors associated with different stages of the action that may have different effects with differing spatial and temporal characteristics. Assess the impacts of both the construction in addition to the future uses of the project. For example, clearing of land to construct a building may result in impacts to species during vegetation removal and soil disturbance. Construction may have impacts to a larger or smaller area. Operation and maintenance may entail various disturbances and their associated stressors.

GENERAL MINIMIZATION MEASURES (ALL SPECIES / CRITICAL HABITATS)

Map Native Habitat and Listed Species in the Action Area

To inform project plans, a qualified biologist should thoroughly survey the various threat zones within the action area to map the locations of all threatened and endangered species and their habitats, including host plant locations. A qualified biologist is an environmental professional with at least a bachelor's degree in Biology, Ecology, Natural Resources, Environmental Science, or similar, with significant experience over multiple years working with ESA-listed species and their habitats in Hawaii or the Pacific Islands.

Minimize Removal of Native Vegetation

Refine project site selection based on the information obtained in surveying the action area for listed species and native habitat. Locate development projects on previously-developed areas or areas without native vegetation. Develop the minimum area necessary to complete the project. During and after the completion of project actions, minimize the encroachment and colonization of invasive plant and vine species and restore native vegetation to project areas that do not need to be maintained as open space.

Train Personnel to Avoid Listed Species

Ensure all project personnel involved in construction or use of the proposed action undergo both classroom and field identification training for all listed species they may encounter and that they have systems in place to implement measures to avoid impacts to these species. Maintain records of all training, survey, and listed species observations.

Reduce Risk of Direct Physical Impact

Actions involving the use of heavy equipment such as backhoes and cranes or the placement of materials, such as large stones or concrete shapes, removing debris, clearing vegetation, grading, and dredging have the potential to injure or kill threatened and endangered plants and animals should those species be present during equipment use or project materials placement. Potential injuries and their severity will depend on the species proximity and the nature of the injury to the plant or animal. Refer to the species-specific conservation measures (e.g., buffer distances) below to reduce the potential for direct physical impacts to listed species and require that the project manager ensure the buffer distances are maintained and that all materials and equipment are operated in a controlled manner.

Reduce Entanglement Risk

Temporary or permanent deployment of items such as fencing, wiring, markers, mooring lines, erosion control matting, guy wires, aerial lines, and buoys pose an entanglement or strike risk to flying and swimming wildlife. To minimize the risk, situate these structures well away from areas that may be occupied by species that are vulnerable to strike or entanglement risk, design the structure to minimize entanglement or strike risk, and remove the structure when it is not in use. Use visibility markings on fences and minimized fencing lengths. Use well-maintained single-line moorings with minimal slack in both support and mooring lines, thus preventing loops from forming in the lines. Require the complete removal of mooring systems and fencing at the end of a project's life, along with inspection and maintenance for permanent or long-term deployments, minimizing the risk of entanglement. Use erosion control products with biodegradable netting, rectangular-shaped or flexible mesh with adequate openings will prevent entanglement from erosion control matting.

Avoid Wastes and Discharges

Construction- generated waste may include plastic trash, bags, ropes and lines that could cause digestive blockage, suffocation, or entanglement. Equipment spills and discharges from an action area could include hydrocarbon-based chemicals such as fuel oils, gasoline, lubricants, hydraulic fluids and other toxicants, which could expose protected species to toxic chemicals and contaminate soil or water sources during project implementation. Depending on the chemicals and their concentration, exposure could result in a range of effects, from avoidance of an area to the death of the exposed animal. Short-term effects of accidentally spilled hazardous material could include mortality of ESA-listed species, their prey, or plants that provide habitat. A high concentration of hazardous material may cause suffocation or poisoning of ESA-listed species. Spilled hazardous materials could also injure ESA-listed species or their prey without directly causing mortality through food web interactions. Long-term effects of spilled hazardous materials could include lingering elevated contaminant levels in soils and streambeds that could leach out and continue injuring or reducing reproductive success of ESA-listed species or their prey. Local and Federal regulations prohibit the intentional discharge of toxic wastes and plastics into the environment.

Reduce Wildfire Threat

Wildfire converts significant areas of native forest vegetation to grassland in the Mariana Islands. In a recent 2019 summary, for example, wildfire burned more than 800 acres of shrub and forest vegetation on Guam (https://www.pacificfireexchange.org/research-publications/category/2019-wildfire-summary-in-the-western-pacific). During dry periods, which typically occur February-June and which are more extensive during El Nino years (Aydlett 2017), fires that are otherwise limited to grassy areas burn native forest and shrubland (Athens and Ward 2004, p. 18, Greenlee 2010, entire; Kunz 2018 p. 1, Dendy 2019, entire; Trauernicht and Kunz 2019 p. 1, Trauernicht and Chimera 2020, p. 1 USDA Forest Service, Coral Reef Research Foundation, and Hawaii Wildfire Management Organization, 2023, entire). Where native trees and shrubs are killed by fire, grasses can outcompete native plant seedlings for light, water, and nutrients (Fosberg 1960, p. 40; Stone 1970, p. 184; D'Antonio, and Vitousek 1992, p. 68-70; Minton 2006 p. 21, pp. 25-29; NRCS 2011, p. 1; Johnson 2012, p. 27; and Leary 2018, p. 3-4). Areas converted to grass facilitate the spread of future fires and reduce the area of remaining native forest each successive dry season (Fujioka and Fujii 1980 in Cuddihy and Stone 1990, p. 93; D'Antonio and Vitousek 1992, pp. 70, 73–74; Tunison et al. 2002, p. 122). Implement the following measures to avoid wildfire impacts to listed species; Coordinate further with the Service for project-specific risk assessment assistance when projects will need to exceed the following limits:

1) Restrict activities entailing hot (500 °C or hotter) (or 300 °C for10 minutes or longer or 400 °C for 3 minutes) to areas that are kept bare of vegetation such as paved or

maintained gravel areas or keep grass mowed to less than 6-inches in height and develop and maintain wildfire suppression staffing and a system of firebreak roads surrounding the mowed area.

2) Where the above vegetation treatments are not built into the project design, restrict actions to wet times of year when the Keetch-Byram Drought Index (KBDI) is at or below 300 or to periods when KBDI is below 450 and there has been significant wetting rain within the previous 48 hours over the whole area where the high temperature may occur. Historic historic seasonal KBDI patterns are shown in Figure 1.

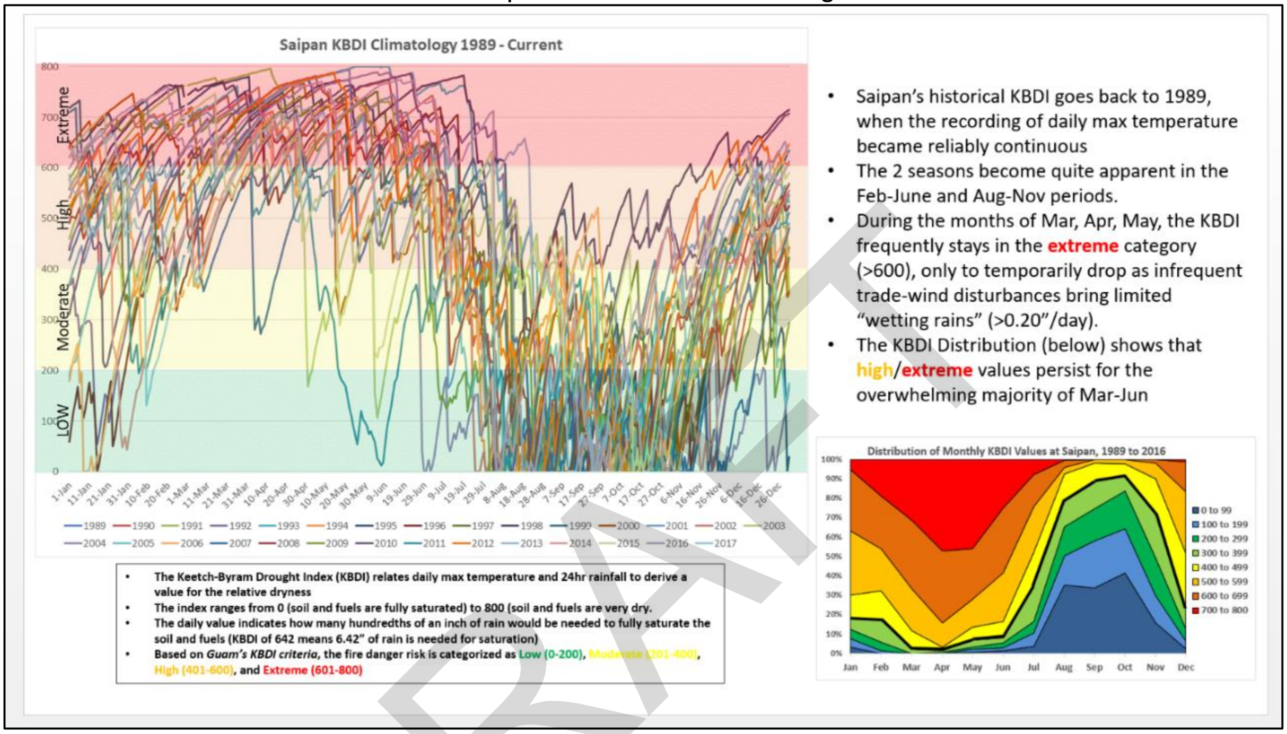

Figure 1. Historical patterns of Keetch-Byram Drought Index (Aydlett 2017).

Biosecurity Protocols

Ensure all work vehicles, machinery, and equipment are cleaned, inspected by its user, and found free of mud, dirt, debris and organisms prior to entry into and exit from the action area.

1) Vehicles, machinery, and equipment must be thoroughly pressure washed in a designated cleaning area (designated by the responsible land manager) and visibly free of mud, dirt, plant debris, insects, frogs (including frog eggs) and other vertebrate species such as rats, mice and non-vegetative debris. A hot water wash is preferred. Areas of particular concern include bumpers, grills, hood compartments, areas under the battery, wheel wells, undercarriage, cabs, and truck beds (truck beds with accumulated material (intentionally placed or fallen from trees) are prime sites for accidental transport of invasive species).
2) The interior and exterior of vehicles, machinery, and equipment must be free of garbage and food. The interiors of vehicles and the cabs of machinery must be vacuumed clean. Floor mats will be sanitized with a solution of at least 70-percent isopropyl alcohol or a freshly mixed 10-percent bleach solution.
3) Any machinery, vehicles, equipment, or other supplies found to be infested with ants (or other invasive species) must not enter action area. Treatment is the responsibility of the equipment or vehicle owner and operator.

Little Fire Ant:

1) Ensure all work personnel clothing and skin, and all vehicles, machinery, and equipment are

inspected for invasive ants prior to moving to the project site and prior to moving from areas occupied by the little fire ant into areas where the ant does not occur.

2) Ensure a visual inspection for little fire ants (*Wasmannia auropunctata*) is conducted prior to entry into action area or movement within the project site, from previously or currently ant-occupied areas, into areas where the ant does not occur.
3) Hygiene is paramount but even the cleanest vehicle may transport little fire ant. Place insect bait into refillable tamper resistant bait stations. Note larger vehicles, such as trucks, may require multiple stations. Monitor bait stations frequently (every week at a minimum) and replace bait as needed. If the station does not have a sticker to identify the contents, apply a sticker listing contents of the station. Refer to the Hawaii Ant Lab's little fire ant fact sheet, which can be downloaded here: https://littlefireants.com/wp-content/uploads/02a-LFA-Fact-Sheet_v2.5_May2020.pdf.
4) Do not use any machinery, vehicles, equipment, or other supplies found to be infested with ants (or other invasive species) or used in an area infested by ants, for any type of project work until it is sanitized and re-tested following a resting period of at least 24 hours. Infested vehicles must be sanitized following recommendations by the Hawaii Ant Lab (http://www.littlefireants.com) or other ant control expert and in accordance with all State and Federal laws. Treatment is the responsibility of the equipment or vehicle owner and operator.
5) Keep all base yards and staging areas inside and outside natural areas and native habitat free of invasive species.
   a) Ensure base yards and staging areas are inspected at least weekly for invasive species and any invasive found is to be removed immediately. Pay particular attention to where vehicles are parked overnight, keeping areas within 30-feet of vehicles free of debris. Parking on pavement and not under trees, while not always practical, is best.
   b) Project vehicles or equipment stored outside the project footprint, such as a private residence, are to be kept in a pest-free area as defined by the onsite land or project manager.
6) Ensure all cutting tools, including machetes, chainsaws, and loppers are sanitized to remove visible dirt and other contaminants prior to entry into action area and prior to the movement of the tool from an area occupied or formerly known to be occupied by the little fire ant, into an area where the ant is not known to occur. Sanitized using a solution of >70% isopropyl alcohol or a freshly mixed 10% bleach solution. One minute after sanitizing, you may apply an oil based lubricant to chainsaw chains or other metallic parts to prevent corrosion.

Coconut Rhinoceros Beetle (CRB)

The coconut rhinoceros beetle (CRB, *Oryctes rhinoceros*) is a large scarab beetle native to Southeast Asia. The species is an invasive pest, the adult beetles primarily attack coconut palms by boring into the crowns to feed on developing leaves. It is also known to feed on bananas, sugarcane, pineapples, oil palms, and pandanus trees. The larval grub stage burrow into and feed upon decomposing mulch and vegetation. On Pacific Islands it has no natural predators, which has led to severe declines and sometimes extirpations of palm species.

The following protocol is recommended for projects that involve green waste and occur on islands where CRB is currently found. For projects with large components of green waste disposal, particularly on Guam and Oʻahu, additional consultation with the Service is recommended. For more information about CRB including the current situation on Guam and high/low-risk areas on Oʻahu, please visit http://cnas-re.uog.edu/crb/ or https://www.crbhawaii.org/.

Best Management Practices for CRB:

1. Never transport green waste between islands in the Marianas, this also includes:

    1. Mulch, bark, compost
    2. Soil of any kind
    3. Potted plants of any kind
2. Designate secure and managed green waste disposal sites to reduce the number of potential oviposition (laying of eggs) sites and larval food.
3. Green waste disposal sites should be monitored with CRB traps. The following control measures should be utilized at green waste sites.
4. Netting - A gill net with a 1 inch mesh measured knot to knot, made from 0.25 mm nylon monofilament, should be laid over piles of green waste such as palm tree cuttings or decaying organic matter. The netting is helpful for trapping adult beetles emerging from the mulch.
5. If the green waste site is found within or adjacent to chain link fencing, we recommend use of the DeFence trap. These are simply constructed with a 12 ft piece of tekken netting, folded in half, and secured onto a fence line using zip ties. In the middle of the net, attach a solar powered uvLED light, and a CRB pheromone lure protected in a red Solo cup. This trap design is currently among the most effective methods because it does not require many materials and uses the least amount of space on the property.
6. If CRB are detected contact CNMI Forestry at (670) 256-3321 or Department of Lands and Natural Resources at (670) 322-9834 or Guam's Department of Agriculture Biosecurity Division (671) 477-7822 or email at guament@teleguam.net.

~~**Reduce Risks from Pesticide (Including Herbicide) Use**~~

~~Pesticide, including herbicide, may injure or kill listed plants and animals or their habitat. Impacts to animals include injury, mortality, abnormal behavioral changes, other sub lethal effects, including loss of prey species. Impacts of pesticide use to plants may include loss of pollinators. Use of herbicides may directly result in the removal, damage, or mortality of listed plant species. Unintentional impacts to listed plants may occur directly through applicator error, or indirectly through changes in adjacent habitat that modify the site-specific physical conditions (shading, removal of associated species) required for the plant to survive. Listed species and their habitat may be indirectly affected through a variety of mechanisms, including drift or volatilization and downwind deposition, changes in food web, amount of shading and other micro- or macro-level habitat changes that alter the ability for the species to complete life history requirements. Beneficial effects to covered species may occur as a result of pesticide application. These beneficial effects include interruption of trends toward community succession or dominance of invasive species that may decrease habitat suitability for the covered species and may result in increased habitat value for these species. For some projects, herbicide application may reduce the risk of wildfires, which may reduce the potential for local or regional population decline. Carefully assess and minimize the risks of pesticide use in and near areas occupied by listed species.~~ Not applicable to the project.

SPECIES-SPECIFIC MINIMIZATION MEASURES

Incorporate the following species-specific measures into the project design to minimize the potential for the project to adversely affect listed species.

All Listed Animals - Minimize Outdoor Lighting: Minimize nighttime lighting in forested and beach areas. Direct temporary lighting away from forest habitat. When installing new or replacing existing permanent lights, use downward-facing, full cut-off lens lights (with the lowest lumens necessary). Fully shield all outdoor lights so the bulb can only be seen from below bulb height and only use when necessary. Install automatic motion sensor switches and controls on all outdoor lights or turn off lights when human activity is not occurring in the lighted area. When activities must be conducted in forested areas where swiftlets may be roosting or foraging, use red light filtered flashlights and headlamps.

*Mariana Fruit Bat **(Pteropus mariannus mariannus)** (Gombar 2023)*

a. During all project work, monitor the project site and areas within 150 m (492 ft) of project activity for the Mariana fruit bat and if a bat moves into the area, delay work until the animal(s) have left the area of their own accord. Risks to transiting and foraging Mariana fruit bats will be project-specific; coordinate with our office for assistance assessing the project's disturbance duration and intensity in relation to risks to the bat.

Mariana fruit bats are a large-bodied colonial tree-roosting species. Mariana fruit bats are at their roost during the day and they forage, generally at night, on fruits, nectar, pollen, and some leaves from at least 45 different plant species. Colonies established by one or more bats can grow to over 1,000 individuals. A day roost occupied by one or more female bats is considered a maternal colony. Generally maternal colonies are occupied by a harem of bats – a single male with multiple females. Breeding occurs year-round. Bachelor colonies and solitary male bat roosts are also common. The mother bat carries its bat pups until they become too heavy. When these young bats that are not well developed enough to fly on their own, they are left at the maternal roost when the parents forage at night. Mariana fruit bats are vulnerable at their day roost and foraging habitat to predation by the brown treesnake, disturbance by the little fire ant, and human disturbance. When the Mariana fruit bat on its day roost or when foraging is startled or alarmed by disturbance including viewing human movement, human scent, and noise it is likely to have a stress response and take flight to move away from the disturbance. Prolonged or severe disturbance results in abandonment of the roost. It can take months for bats to return to an abandoned root, if they return at all. Because some members of the public still consider the Mariana fruit bat to be a delicacy and a valued gift to persons of importance, these bats are vulnerable to poaching when they are outside of areas that are actively protected by law enforcement. **Table 1** summarizes the Service's assessment of the potential consequences of human disturbance to the Mariana fruit bat.

Table 1. Summary of Consequences of Human Disturbance to the Mariana Fruit Bat.

Effect to the Colonial Tree-Roosting Bat	Potential Consequences
Startled female drops bat pup	Injury or death of bat pup
Bats abandon maternal colony (a day roost occupied by one or more female bats)	Breeding colony disperses. It can take months for bats to return to an abandoned roost, if they return at all.
	Breeding failure, reduced reproductive effort/success
	Female bat terminates pregnancy
	Increased pup mortality for pup born after dispersal of the colony
	Non-volent bat pup too heavy for the mother bat to carry is abandoned
	Interisland dispersal causes weight loss due to major energy expenditure of long flight; any bat dispersal to public land on Guam is likely to result in their mortality due to poaching.
Bats abandon bachelor colony or solitary male roost	Bachelor colony or solitary male roost is abandoned. It can take months for bats to return to an abandoned roost, if they return at all.
	Bats disperse - interisland dispersal causes weight loss due to major energy expenditure of long flight; any bat dispersal to public

	land on Guam is likely to result in their mortality due to poaching.
Foraging bat is flushed from feeding - at a site other than its day roost	Stress hormone response; weight loss from increased energy expenditure to get calories
	For the duration of the disturbance, feeding habitat in the project vicinity is removed; bats avoid the area
	Bats disperse - interisland dispersal causes weight loss due to major energy expenditure of long flight; any bat dispersal to public land on Guam is likely to result in their mortality due to poaching.
Nighttime flight / transit is disturbed - bat moves away from disturbance	Bats disperse - interisland dispersal causes weight loss due to major energy expenditure of long flight; any bat dispersal to public land on Guam is likely to result in their mortality due to poaching.
	For the duration of project disturbance, feeding habitat in the project vicinity is removed; bats avoid the area.

Implement the following measures to minimize potential project impacts to the Mariana fruit bat:

1. Avoid removal of and disturbance to (including noise, wildfire, invasive species, human scent, and lighting) bat breeding, feeding, and sheltering habitat.
2. Minimize nighttime lighting in forested areas. Direct temporary lighting away from forest habitat. When installing new or replacing existing permanent lights, use downward-facing, full cut-off lens lights (with the lowest lumens necessary). Fully shield all outdoor lights so the bulb can only be seen from below bulb height and only use when necessary. Install automatic motion sensor switches and controls on all outdoor lights or turn off lights when human activity is not occurring in the lighted area. When activities must be conducted in forested areas where bats may be roosting or foraging, use red light filtered flashlights and headlamps.
3. Avoid human activity within 150 meters (m) (492 feet (ft)) of a Mariana fruit bat day roost; avoid exposing a Mariana fruit bat day roost to any sound in excess of 60 decibels.
    a. To facilitate project design and section 7 consultation, complete surveys of all forest habitat within 150 m (492 ft) of the project site (or the sound-related action area, whichever is larger) for the presence of any Mariana fruit bat day roosts and for transiting or feeding Mariana fruit bats. Methods used to identify roost locations are under development and include watching above the tree canopy to see where bats are flying from when they take flight at dusk, pre-dawn surveys using infrared equipment to further refine bat roost location, and on-the-ground daytime surveys.
    b. No earlier than one week prior to project initiation, complete surveys of all forest habitat within 150 m (492 ft) of the project site (or the sound-related action area, whichever is larger) for the presence of any Mariana fruit bat day roosts and for transiting or feeding Mariana fruit bats. (Note: This measure is intended to minimize disruption to project schedules should a bat occur near the project site. Surveys may be conducted earlier to further facilitate project implementation.)
    c. During project implementation, continue to monitor the action area (the area within 150 meters of project activity or the sound/invasive species/wildfire/lighting/etc., action area, whichever is larger) for the establishment of a Mariana fruit bat day roost. Coordinate with our office for assistance determining the frequency of day roost surveys - survey frequency (daily, weekly, monthly) which may depend on the frequency and intensity of the anticipated project disturbance. If a Mariana fruit bat day roost is established within 150 m (492 ft) of project activity (or in the project's disturbance-related action area), halt project work and coordinate with our office.

Because Mariana fruit bats can establish a day roost in any forest habitat on Guam, we recommend formal consultation for projects lacking flexibility to implement full avoidance measures.

4. Avoid human activity within 150 meters (m) (492 feet (ft)) of a transiting or feeding Mariana fruit bat (these activities generally occur at night). During all project work, monitor the project site and areas within 150 m (492 ft) of project activity for the Mariana fruit bat and if a bat moves into the area, delay work until the animal(s) have left the area of their own accord. Risks to transiting and foraging Mariana fruit bats will be project-specific; coordinate with our office for assistance assessing the project's disturbance duration and intensity in relation to risks to the bat.

Endangered Pacific sheath-tailed bat (Emballonura semicaudata rotensis) and Mariana gray swiftlet:
~~The Pacific sheath-tailed bat and Mariana gray swiftlet are insectivorous. These species primarily roost in caves to which they have high site fidelity. Foraging occurs in both native forests and non-native forest areas (Esselstyn et al 2004). Threats include the disturbance of roosting sites, pesticide contamination, and the loss of native forests to agriculture and grazing and invasive species. Avoid destruction or alteration of forest habitat and implement the following measures to reduce project impacts to these species:~~

1. ~~In areas of known swiftlet or bat presence, have a qualified biologist, as defined herein, survey the action area to map habitat for these species, determine if the action area is occupied by swiftlets or bats, and determine if the action area is within 500 m (1,640 ft) of a roosting cave.~~
2. ~~Avoid actions that may increase human disturbance or noise within 500 m (1,640 ft) of a limestone cave entrance and within the caves themselves.~~
3. ~~Avoid construction of vertical structures that protrude into the forest canopy or above the height of shrub or grass vegetation and avoid use of guy wires as these may pose a flight hazard to swiftlets or bats.~~
4. ~~Avoid the use of pesticides within areas of known swiftlet or bat presence.~~
5. ~~Minimize nighttime lighting in forested areas. Direct temporary lighting away from forest habitat. When installing new or replacing existing permanent lights, use downward-facing, full cut-off lens lights (with the lowest lumens necessary). Fully shield all outdoor lights so the bulb can only be seen from below bulb height and only use when necessary. Install automatic motion sensor switches and controls on all outdoor lights or turn off lights when human activity is not occurring in the lighted area. When activities must be conducted in forested areas where swiftlets may be roosting or foraging, use red light filtered flashlights and headlamps.~~ Not Applicable.

Endangered Slevin's skink (Emoia slevini):
Slevin's skink is an insectivorous lizard, typically found on the ground or at ground level of the forests where individuals use leaf litter as cover. They are social and are active during the day. The skink feeds on invertebrates. Population decline has been attributed to habitat alteration or destruction and the presence of the brown treesnake and ungulates.

1. If work is happening in known skink habitat a daily survey will be done by (qualified biologist) such as a biologist from DAWR, before work is to commence.
2. A minimum of 20 feet will be maintained from areas where Slevin's skinks are found.
3. Avoid removal of forest vegetation outside existing developed areas. Avoid actions that may result in loss of understory vegetation in forested areas.
4. ~~On Cocos Island, limit all project activities to existing developed and mowed grass lawn areas.~~ Not Applicable~~.~~
5. Minimize nighttime lighting in forested areas. Direct temporary lighting away from forest habitat. When installing new or replacing existing permanent lights, use downward-facing, full cut-off lens lights (with the lowest lumens necessary). Fully shield all outdoor

lights so the bulb can only be seen from below bulb height and only use when necessary. Install automatic motion sensor switches and controls on all outdoor lights or turn off lights when human activity is not occurring in the lighted area.

Endangered Guam Micronesian kingfisher (Halcyon cinnamomina cinnamomina):

This kingfisher is forest-dwelling and was found in a variety of forested habitats including native, agroforest, riparian, and strand vegetation. Brown tree snakes were the primary cause of major population decline so that the species now only exists in captivity. Urbanization and development have also reduced available forest habitat for reintroduction efforts. The amount of Guam Micronesian kingfisher habitat remaining is nearly at the minimum needed for recovery of this species. Therefore, project-related removal of limestone forest, ravine forest, coconut plantation, or *Palma brava* grove should be avoided.

1. Avoid project-related removal of limestone forest, ravine forest, coconut plantation, or *Palma brava* grove.

Endangered Guam Rail (Gallirallus owstoni):

~~The Guam rail is a secretive, flightless, territorial species that is most easily observed as it bathes or feeds along roadsides or field edges and walkways. The rails were found in scrubby secondary growth or mixed forest. The rail nests year-round. As ground-dwellers, Guam rails are threatened by introduced predators such as monitor lizards, rats and cats. Individuals exist in the wild only on Cocos Island and Rota as introduced populations.~~

~~1. When working in areas occupied by the Guam rail (Rota and Cocos Island), conduct daily pre-field work surveys for the Guam rail using a qualified biologist such as a biologist from DAWR, prior to commencing project work.~~
~~2. To avoid reductions to reproductive effort or reproductive success, avoid project work within 150 m (492 ft) of any Guam rail; postpone work until the bird has left the area.~~
~~3. For foot traffic only: Do not walk within 20 feet from any Guam rail nest until the nest is determined to be no longer active.~~
4. ~~To minimize impacts to this species due to habitat loss, do not clear vegetation beyond a 33-foot (ten-meter) wide swath~~. Not Applicable.

Endangered Nightingale reed warbler (Acrocephalus luscinia)

~~Habitat destruction and modification on Saipan due to development and nonnative plants adversely impact native plant species and critical habitat by modifying the availability of light, altering soil-water regimes, modifying nutrient cycling, altering the fire characteristics (increasing the fire cycle), and ultimately converting native dominated plant communities to nonnative plant communities. Vehicle use should be restricted to existing roads and trails. If vegetation will be cleared as part of the proposed action, or when noise greater than 60 dB will be generated, a survey (following USFWS survey protocols) should be conducted to determine the presence of NIRW in the project area. If a territory is within 328 feet (100 meters) of the project site, noise should be limited to months (April through June and October through December) when breeding is less likely to occur and the USFWS and CNMI DFW should be contacted for further guidance.~~

~~1. Prior to project initiation, a qualified biologist will survey the action area to determine if the nightingale reed-warbler is present in the action area. If present, CNMI Division of Fish and Wildlife (DFW) and the Service will be notified prior to the commencement of work.~~
~~2. If an active nightingale reed-warbler nest is present, a 165 foot (50 meter) boundary will be clearly marked around the nests with guidance from a qualified biologist, and all actions will remain outside the boundary.~~
~~3. If warblers are found to be present, a qualified biologist will monitor any individual nightingale reed-warblers or nests daily throughout the duration of the project and brief workers of the last known location so that individuals or groups of birds can be avoided.~~

4. ~~When possible, the use of equipment that generates noise greater than 60 decibels will be limited to the non-active or non-peak breeding seasons from (April 1 to June 30) and (October 1 to December 31).~~
5. ~~Due to the reliance of warblers on native forest habitat, projects will minimize the encroachment and colonization of invasive plant and vine species to the greatest extent possible.~~ Not Applicable.

Endangered Mariana crow (Corvus kubaryi)

~~is known to occur across a broad range of forest habitats throughout the Island of Rota. The Mariana crow is now extirpated from Guam but prior to extirpation, resided in mature and secondary limestone forest with limited human disturbance. Loud, irregular and unpredictable activities, such as using heavy equipment or building a structure, near a crow nest may cause nest failure. Noise near nesting sites can alter feeding and breeding patterns or result in nest or chick abandonment. Nest disturbance can also increase exposure of chicks and juveniles to inclement weather or predators. .~~

1. ~~Ensure CNMI DFW staff complete Mariana crow surveys of all forested areas within project sites and additional areas where project noise, invasive species, increased wildfire threat, or other stressors may occur (the project action area).~~
2. ~~When the project action area is occupied by the Mariana crow, restrict all project work to periods outside the peak breeding and nesting season (August 1 through February 28).~~
3. ~~No limestone forest should be removed to implement any of the proposed actions.~~
4. ~~Ensure staff from the Service and Commonwealth of the Northern Mariana Islands Department of Fish and Wildlife (CNMI DFW) inspect the property during vegetation removal to ensure no Mariana crow habitat including limestone forest is removed~~. Not Applicable.

Endangered Mariana common moorhen (Gallinula chloropus guami):

~~The Mariana common moorhen is found in fresh and brackish-water marshes and ponds. Threats to this species include noise, habitat loss, and habitat degradation. We recommend you incorporate the following measures into your project description to minimize potential impacts to this waterbird species:~~

1. ~~For projects occurring within 100 ft (30 meters) of areas where standing water could persist, a biological monitor with experience surveying for Mariana common moorhen individuals and nests should conduct surveys at the proposed project site and areas within 30 m (100 ft) of any anticipated project work prior to project initiation.~~
2. ~~Establish and maintain a30-meter (100-ft) buffer around all active nests and/or broods until the chicks/ducklings have fledged. No project activities or habitat alteration should occur within this buffer.~~
3. ~~Any documented nests within the project vicinity should be reported to the Service and CNMI DFW or Guam DAWR within 48 hours.~~
4. ~~The Service should be notified immediately prior to project initiation and provided with the results of pre-construction waterbird surveys.~~
5. ~~A biological monitor should be present on the project site during all construction or earth moving activities to ensure that Mariana common moorhen and nests are not adversely impacted.~~
6. ~~If a Mariana common moorhen is observed within the project site, or flies into the site while activities are occurring, the biological monitor should halt all activities within 100 feet (30 meters) of the individual(s). Work should not resume until the listed waterbird(s) leave the area on their own accord.~~
7. ~~A post-construction report should be submitted to the Service with 30 days of the completion of the project. The report should include the results of Mariana common~~

~~moorhen surveys, the location and outcome of documented nests, and any other relevant information.~~ Not Applicable.

Endangered Micronesian megapode (Megapodius laperouse):

~~Threats to the Micronesian megapode include habitat destruction and fragmentation resulting from human development, agriculture, the impacts of nonnative ungulates such as pigs, goats, and deer, and invasive plants (including forest conversion to grassland due to wildfire), and predation by the brown treesnake and invasive predatory ants. If a Micronesian megapode is present within 492 ft (150 m) of the project site, the work must be postponed until the megapode has left the area. If a megapode is nesting (mound nest) within 984 ft (300 m) of the project site, the work must be postponed and the Service contacted immediately.~~

1. ~~Prior to project initiation, a qualified biologist will survey the action area to determine if it is occupied by a megapode.~~
2. ~~If present, a qualified biologist will monitor any individual megapodes or nests throughout the duration of the project and inform workers of the last known location so that individuals or groups of birds can be avoided.~~
3. ~~If an active megapode nest is present, a 150-foot boundary will be clearly marked around the nest with guidance from a qualified biologist, and actions will remain outside the boundary.~~
4. ~~Due to the reliance of these warblers on native forest habitat, projects will minimize the encroachment and colonization of invasive plant and vine species to the greatest extent possible.~~ Not Applicable.

Rota Bridled White-eye (Zosterops rotensis):

~~Threats to the Rota bridled white-eye include habitat destruction and fragmentation resulting from human development, agriculture, the impacts of nonnative ungulates such as pigs, goats, and deer, and invasive plants (including forest conversion to grassland due to wildfire), and predation by the brown treesnake and invasive predatory ants.~~

1. ~~If work will occur on Rota, implement the attached survey protocols to assess the presence of the Rota bridled white-eye within the action area.~~
2. ~~If a bridled white-eye is present within 492 ft (150 m) of the project site, postpone work until the bird has left the area. If a bridled white-eye is nesting within 984 ft (300 m) of the project site, postpone work until the nest is no longer active and please contact the Service immediately.~~ Not Applicable.

Green Sea Turtle & Hawksbill Sea Turtle (Gombar 2023)

To avoid or minimize potential project impacts to sea turtles and their nests you will implement the following conservation measures:

1. If work is to commence in potential sea turtle habitat daily searches will be conducted by a qualified biologist before work begins.
2. No vehicle use on or modification of the beach or dune environment during the sea turtle nesting or hatching season (May 1 to December 31 for Hawaii; throughout the year in the CNMI; October 1 to March 31 for American Samoa).
3. Do not remove native dune vegetation.
4. Have a qualified biologist familiar with sea turtles conduct a visual survey of the action area to ensure no basking sea turtles are present.

If a basking sea turtle is found within the action area:

1. Cease all mechanical or construction actions within 100 feet until the animal voluntarily leaves the action area;
2. Cease all actions between the basking turtle and the ocean.
3. Remove any project-related debris, trash, or equipment from the beach or dune if not actively being used.

4. Do not stockpile project-related materials in the intertidal zone, reef flats, or stream channels.

To avoid or minimize potential project impacts to sea turtles from lighting implement the following conservation measures:

1. Avoid nighttime work during the nesting and hatching season, which is year-round.
2. Minimize the use of lighting and shield all project-related lights so the light is not visible from the ocean shoreline.
3. If lights can't be fully shielded or if headlights must be used, fully enclose the light source with light filtering tape or filters to use warmer frequencies (red light).
4. Incorporate design measures into the action or operation of buildings adjacent to the beach to prevent ambient outdoor lighting from reaching the shoreline such as tinting or using automatic window shades for exterior windows that face the beach and reducing the height of exterior lighting to below three feet and pointed downward or away from the beach. In order to minimize light intensity, use low pressure sodium 18 watts, 35 watts and lighting sources that produce light of 580 nanometers or longer and, when possible, include timers and motion sensors (Florida Fish and Wildlife Commission, 2018).
5. To avoid impact to nests from foot traffic, implement a 6.1 meter (20 foot) buffer around each nest.

Endangered Mariana eight-spot butterfly (ababbang, Hypolimnas octocula marianensis) and wandering butterfly (Vagrans egistina):

~~Threats to the Mariana eight-spot butterfly include habitat destruction and fragmentation resulting from human development, agriculture, the impacts of nonnative ungulates such as pigs, goats, and deer, and invasive plants (including forest conversion to grassland due to wildfire), and predation parasites and invasive predatory ants. These butterflies are dependent on host plants for sufficient food sources to support various stages of larval growth and maintain habitat connectivity. Minimizing vegetation disturbance outside of existing developed areas is critical to promote butterfly populations. Cutting and removal of vegetation not only reduces habitat availability but also has the potential to increase microsite sunlight and wind conditions which may result in invasion of non-native plants or reduction in germination, growth, and reproduction of butterfly host plants.~~

1. ~~Where vegetation cutting is necessary, conduct a botanical and listed butterfly survey within, and extending 30 m (100 ft) beyond, the proposed disturbance area. A qualified biologist with experience surveying for and identifying the butterflies individuals, chrysalis, caterpillars, eggs, and host plants (*Elatostema calcareum, Procris pedunculata,* and *Maytenus thompsonii*) should survey the project action area, visibly mark the area occupied by the butterfly or host plant. Surveys should be conducted in the wet season along transects to identify the presence of butterflies (any life stage) or host plants when the likelihood of observation is greatest. In the event of an adult butterfly or butterfly host plant (*P. pedunculata, E. calcareum* and *M. thompsonii*) are discovered, conduct focused searches for five to thirty minutes to locate and identify any life stage of the listed butterflies. The number and life stage of any observation should be recorded and location documented (from Lindstrom and Benedict 2014). The duration of surveys is relative to the size of host plants and number of individual butterflies found. All butterfly host plants in and within 33 feet (10 meters) of the vegetation disturbance site should be marked with flagging to exclude personnel from walking within 33 feet (10 meters) of the plant.~~
2. ~~To minimize potential adverse effects to listed butterflies, avoid cutting or removing vegetation within 100 ft of a butterfly host plant. Minimize vegetation clearing to widths of~~

~~33 feet (10 meters) or less. Where vegetation removal does not need to be maintained, restore cleared areas using native plants including specific butterfly host plants.~~

3. ~~Implement the buffer distances in **Table 2** to avoid affecting the plant. Where project actions will occur within these buffer distances, additional coordination with the Service is required.~~
4. ~~Pesticide or herbicide application buffer distances: should be applied in accordance with **Table 2** if butterfly or host plants have to potential to occur within 150 feet of the project area. Insecticide use should be avoided.~~ Not Applicable.

Rota blue damselfly (Ischnura luta):

~~Threats to the Rota blue damselfly include stream habitat loss and degredation resulting from agricultural and domestic water extraction, the impacts of nonnative ungulates such as pigs, goats, and deer, and invasive plants (including forest conversion to grassland due to wildfire), and predation by the brown treesnake and invasive predatory ants. Aquatic invertebrates can be killed and their habitat can be destroyed by changes in the quality of their freshwater and anchialine environments. Avoid cutting or removing vegetation, disturbing the soil, or increasing wildfire threat in the vicinity of the Okgok stream watershed and the southern portion of the Sabana Plateau on Rota. If work within these stream buffers is unavoidable, implement the following measures into projects to minimize the potential for the project to result in degradation of water quality and potential adverse impacts to these aquatic species:~~

1. ~~Avoid turbidity and siltation from project-related work and contain it within the vicinity of the site through the appropriate use of effective silt containment devices and the curtailment of work during adverse stream discharge and weather conditions.~~
2. ~~Avoid dredging and filling in the aquatic environment to avoid or minimize the loss of special aquatic site habitat (streams, wetlands, anchialine pools, etc.) and ensure the function of such habitat is replaced.~~
3. ~~Avoid moving project-related materials and equipment (excavators, backhoes, etc.) within the Okgak stream watershed~~
4. ~~Avoid introduction of pollutants to the Okgak stream watershed, including the southern portion of the Sabana Plateau.~~
5. ~~Avoid use of insecticides on the Sabana Plateau.~~
4. ~~No project-related materials (fill, revetment rock, pipe, etc.) should be stockpiled in the Okgak watershed and southern portion of the Sabana Plateau.~~
5. ~~Avoid working within the aquatic environment.~~
6. ~~Ensure project-related activities don't result in contamination (trash or debris disposal, nonnative species introductions, attraction of nonnative pests, etc.) of the Okgak watershed. Implement a litter-control plan and develop a Hazard Analysis and Critical Control Point Plan (HACCP – see http://www.haccp-nrm.org/Wizard/default.asp) to prevent attraction and introduction of nonnative species.~~
7. ~~Fuel project-related vehicles and equipment away from the Okgak stream and southern portion of the Sabana Plateau and develop a contingency plan to control petroleum products accidentally spilled during the project. Ensure absorbent pads and containment booms are stored and available on-site, if appropriate, to facilitate the clean-up of accidental petroleum releases.~~
8. ~~Ensure any under-layer fills used in the project are protected from erosion with stones (or core-loc units) as soon after placement as practicable.~~
9. ~~Assure soil exposed near water is protected from from erosion (with plastic sheeting, filter fabric etc.) and stabilize it as soon as practicable (with native or non-invasive vegetation matting, hydroseeding, etc.).~~
10. ~~Groundwater withdrawal should be avoided to assure continued adequate freshwater flow to the Okgak stream.~~

11. ~~Avoid actions that may result in introduction of nonnative fish to streams, wetlands, ponds, and anchialine pools.~~ Not Applicable.

Tree snails (Partula gibba, Partula radiolata, Samoana fragilis)(Gombar 2023)

a. When work must be conducted in forested areas, a qualified biologist should survey the proposed action areas for the presence of tree snails following the approved Service survey protocol. *Dr. Curt Fiedler estimates a formal survey for tree snails at Agat Mayor's Complex would take 1 ½ days at $100/hr through contract with UOG RCOG program. He understands the stage we are in is "feasibility", and agrees for areas "very unlikely" to host tree snails, it is most economic to wait to complete an official survey until Design.*
b. If any tree snails are found, determine the extent of the colony by surveying outwards in all directions from the original sighting until individuals are no longer detected.
c. Avoid cutting or removing vegetation within 60 m (200 ft) of the known occurrence to minimize impacts to the tree snails and their habitat.
d. Mark the trees and shrubs occupied by tree snails with brightly colored flagging tape and keep foot traffic to a minimum of 10 m (33 ft) from marked vegetation to avoid inadvertently dislodging and trampling individuals.
e. Avoid clearing understory and canopy vegetation outside existing developed areas; intact vegetation is important for maintaining microclimates and air movement conditions necessary for tree snail survival.
f. Confine movement of heavy equipment to existing roadways.

The following conservation measures can be adapted for site-specific and project-specific use to minimize the potential for a project to adversely affect listed species. Where unavoidable impacts to listed species are anticipated due to limitations in project design, incorporate conservation measures to ensure the project, overall, will maintain the baseline (maintain the status of the species within the action area). Closely coordinate with the U.S. Fish and Wildlife Service (Service) for assistance developing plans for the translocation and off-site conservation of threatened and endangered species.

Threats to tree snails include habitat destruction and fragmentation resulting from the impacts of nonnative ungulates such as pigs, goats, and deer, habitat modification due to nonnative invasive plants (including forest conversion to grassland due to wildfire), and predation by nonnative reptiles, flatworms and snails.

1. Where work must be conducted in shrub or forested areas, survey proposed project sites for the presence of tree snails. Prior to project implementation, and at a minimum of every three years during project implementation, survey all areas within 100 m (328 ft) of any project area where walking or other project activity may occur for tree snails using the standard prioritized search procedure (Fiedler 2019, entire). If any tree snails are found, determine the extent of the colony by surveying outwards in all directions from the original sighting until individuals are no longer detected. Because tree snails may be downed and moved to new locations by strong winds, do not conduct project activity that may crush downed tree snails, other than snail survey work, within the 7-day period after typhoon winds in any project site within 100 m (328 ft) of a tree snail location. After any project site within 100 m (328 ft) of an area occupied by a listed tree snail is affected by typhoon-strength winds, re-do tree snail surveys and re-establish buffer protections for new tree snail locations prior to commencing project work. Surveys may only be conducted by a qualified biologist experienced in identifying tree snails and their suitable habitat, with specialized training and field experience surveying for threatened or endangered tree snails in the Pacific Islands.
   a. (Note: Snails, when present, are generally found within the first 5 minutes of

searching (Hopper and Smith 1992). At survey sites, qualified surveyors should visually inspect broad-leafed species for 30 min and leaf litter for 10 minutes in search of fresh ground shells. If no live snails or fresh shells are found, the site is believed to not support snails. If live snails are found, quantify snail presence of each species within four 25m^2 quadrats under dense understory and identify host plants (from Smith 2008)).

2. Physically cordon off, with fencing or netting, for the duration of the project activity, buffer areas to prevent project personnel from entering buffers of 33-ft (10-m) from the outermost snail detection. Alternate methods such as visually flagging buffer areas may be used in some types of projects including areas where field crew work will be restricted to designated roads and trails, and heavy equipment will not encroach into the buffer.
3. To avoid potential adverse effects to listed tree snails, avoid clearing understory and overstory forest vegetation outside existing developed areas. Intact vegetation is important for maintaining microclimates and air movement conditions that allow snails to survive in a given area.
4. Avoid cutting or removing vegetation within 200 feet of the known occurrence to minimize impacts to the tree snails and their habitat.
5. Avoid clearing shrub and forest vegetation outside existing developed areas. Intact vegetation is important for maintaining microclimates and air movement conditions that allow snails to survive in a given area.
6. Confine movement of heavy equipment to existing roadways. If helicopters are used to reach the project site, avoid affecting the occupied site with helicopter rotor wash that could dislodge snails by selecting alternate landing areas.
7. Avoid the use of insecticide within 100 m (328 ft) of any listed tree snail locations. Avoid the aerial application of insecticide via helicopters where listed tree snails occur.

All Listed Plants

1. Minimize disturbance outside of existing developed or otherwise modified areas.
2. When disturbance outside existing developed or modified sites is proposed, conduct a botanical survey of the action area for ESA-listed plant species. Ensure surveys are conducted by a botanist with documented experience identifying native plants during an appropriate time period for the potentially occurring protected species, such as during the wettest part of the year.
3. Avoid vegetation and soil disturbance due to project activities within the buffer distances detailed in **Table 2**.
4. Mark the boundary of the area occupied by ESA-listed plants with flagging by the surveyor and implement the buffer distances in **Table 2**. Where project actions will occur within these buffer distances, additional consultation with the Service is required.
5. Where disturbed areas do not need to be maintained as an open area, restore disturbed areas using native plants.

Table 2. Buffer Distances for Listed Plants and Butterfly Host Plants.

Proposed Action	**Buffer Distances**	
	Herbs/Shrubs	**Trees**
Vegetation removal (hand tools)	1 m (3 ft)	1 m (3 ft)
Vegetation removal (mechanical)	Variable[a]	Variable[a]
Vegetation removal (heavy equipment)	Variable[b]	250 m (820 ft)
Hand application of herbicide	3 m (10 ft)	Crown Diameter
Ground spray of herbicide (e.g., backpack sprayer)	15 m (50 ft)	76 m (250 ft)
Aerial spray of herbicide (ball applicator)	76 m (250 ft)	76 m (250 ft)

Aerial spray of herbicide (paintball or individual treatment)	30 m (100 ft)	30 m (100 ft)
Aerial spray of herbicide (boom)	Prohibited	Prohibited
Ground/soil disturbance (hand tools)	6 m (20 ft)	2 times Crown Diameter
Ground/soil disturbance (heavy equipment)	100 m (328 ft)	250 m (820 ft)
Surface hardening/soil compaction (trails)	6 m (20 ft)	2 times Crown Diameter
Surface hardening/soil compaction (roads/utilities/buildings)	100 m (328 ft)	250 m (820 ft)
Prescribed burns	Prohibited	Prohibited
Farming, ranching, and silviculture	250 m (820 ft)	250 m (820 ft)

Notes
[a] 3 feet, or the height of the vegetation to be removed, whichever is greater.
[b] 2 times the width of the equipment, plus the height of the vegetation to be removed. Not Applicable.

C. Migratory Bird Treaty Act BMPs (USFWS 2023b)

1) Migratory Bird Species List:
A list of the migratory bird species covered by the Migratory Bird Treaty Act, is available at this link.

2) IPaC:
The Information for Planning and Conservation tool, is an online tool through which users may use to generate a list of Threatened and Endangered Species (https://ecos.fws.gov/ipac/). Information in IPaC is incomplete for migratory birds, particularly for birds on Pacific islands.

3) Site-specific Bird Species Lists:
The best way to create a site-specific bird species list is for a biologist to visit the site and record bird occurrence throughout the year. If this is not possible, project proponents can generate a bird occurrence list in eBird which can inform your creation of a site-specific list of Migratory Birds.

Once you arrive at the eBird website, click “Explore,” and enter your state, county, province or country into the "Explore Regions" search bar. From there you can zoom into your specific project area, or select a hot spot that is closer to your project area.

3) Conservation Measures to reduce project effects on birds:

The Migratory Bird Treaty Act prohibits the take (killing, capturing, selling, trading, and transport) of migratory birds (and their nests, eggs, and parts) without prior authorization by U.S. Fish and Wildlife, even if that take occurs incidentally (i.e. unintentionally) to the purpose of otherwise legal activities (This rule was temporarily changed by Dept. of Justice solicitors in December 2017, but that change has since been revoked as of December 3rd 2021). Nests that are inactive can be removed without a permit, but cannot be kept or retained without a permit (More restrictive rules apply to eagles). If incidental take of migratory birds is likely at any point during the project, please contact your regional Migratory Bird Permit Office for further information.

Conservation measures geared toward specific activities may reduce your project's impacts on birds. Several fact sheets are available through the USFWS "Avoiding and Minimizing Incidental Take of Migratory Birds" site, as well as the Avian Knowledge Network "Beneficial Practices" site. Common stressors of migratory birds to keep in mind during project planning include vegetation alteration or removal, ground disturbance, water disturbance, structures, noise, light, chemicals, and human presence.

Information on birds and their nesting seasons can be found by searching for species name at Wikipedia, and Cornell's All About Birds web site.

FWCA Recommendations and BMPs from USFWS for Agat Mayor's Complex (USFWS 2024a)

1) The Service recommends going forward with a design that will minimize the project footprint, potential erosion, and plastic pollution:

The proposed seawall alternatives can minimize take of the narrow beach habitat at the project site and avoid direct impacts to the reef flat if constructed according to recommended practices.

The Service has some concerns use of PVC materials proposed in Alternative 3, though this material does appear to be appropriate for the proposed application as long as it is maintained properly. If PVC is to be used, a maintenance plan should be developed to ensure regular inspections of materials and replacement prior to breakdown of PVC components to avoid dispersal of fragments and microplastics. Presence of any cracking, abrasion, or other degradation (e.g. from exposure to UV, sand, etc.) should be assumed to indicate that the material is beyond a safe utilization period and should be immediately removed and disposed of properly.

Alternative 4 may be similarly effective to Alternative 3 in terms of preventing erosion, and potentially more appropriate when considering possible release of microplastics (though likely years down the line) associated with materials proposed in construction of Alternative 3. Alternatives that do not require plastics are preferred by the Service and should not be prematurely ruled out.

The chosen alternative should be constructed as far inland as possible to minimize loss of intertidal beach habitat.

2) The Service recommends all work be completed in a manner to minimize chances of 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 Guam, turtle nesting season is year-round but typically peaks from April to July. The service recommends planning work outside of these months, 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 nests. Surveys should be conducted daily for two weeks prior to construction and 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.

3) 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.

4) 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.*

5) 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 freshwater streams, the beach, or marine ecosystems.

6) The Service recommends that any project-related debris, trash, or equipment be removed from the beach or dune if not actively being used.

7) The Service recommends project-related materials not be stockpiled in the intertidal zone, reef flats, sandy beach, and adjacent vegetated areas.

8) The Service recommends that sediment production associated with trenching, filling, driving seawall panels (including cleaning, jetting, and removing and disposing of soil plugs, etc.) or any other part of the project be done in a manner that ensures sediment is trapped, dewatered, and disposed of appropriately to avoid releasing sediments to the beach, stream, reef flat, or sea.

9) The Service recommends the best management practices for work in or around aquatic environments.

Anticipated CZMA BMPs from GBSP (based on GBSP 2023 for East Hagatna)

A. Development Policy 5. Hazardous Areas.

Identified hazardous lands, including floodplains, erosion-prone areas, air installations, crash and sound zones and major fault lines shall be developed only to the extent that such development does not pose unreasonable risks to the health, safety or welfare of the people of Guam, and complies with the land use regulations.

1. The project is within a Special Flood Hazard Area, which is subject to Guam's Floodplain Management Ordinance, which can be found on pages 168-175 the 2022 Guidebook to Development Requirements on Guam. The guidebook can be made available upon request by the Guam Coastal Management Program.
2. Pursuant to Development Policy 5, Hazardous Areas, the federal agency shall be advised to ensure that the final design for the project meets the standards established for Special Flood Hazard Areas in the Floodplain Management Ordinance.

B. Resource Policy 2. Air Quality.

1. All activities and uses shall comply with all local air pollution regulations and all appropriate Federal air quality standards in order to ensure the maintenance of Guam's relatively high air quality.
2. Disturbance of the ground surface and other construction activities may result in temporary and localized effects to air quality as a result of the generation of fugitive dust. Appropriate BMPs should be used to address fugitive dust.
3. Pursuant to Resource Policy 2, Air Quality, the applicant shall use appropriate fugitive dust BMPs, including good housekeeping, dust suppression using water or chemical dust suppressants, covering open-body trucks when hauling material that may release material into the air, installing windbreaks or fences near ground disturbing activities and around storage piles.

C. Resource Policy 3. Water Quality.

1. Safe drinking water shall be assured, and aquatic recreation sites shall be protected through the regulation of uses and discharges that pose a pollution threat to Guam's waters, particularly in estuarine, reef and aquifer areas.
2. Any work that disturbs the ground's surface must be protected through appropriate implementation of erosion and sediment control (E&SC) BMPs, installed in accordance with the Guam Soil Erosion and Sediment Control Regulations (22 GAR [Ch.] 10). As required in the regulations, necessary permits must be secured prior to start of construction activities and earth-moving operations shall be performed so as not to violate applicable provisions of the Guam Water Quality Standards Regulations (22 GAR [Ch.] 05).
3. Construction BMPs must be installed in conformance with the design criteria of the 2006 CNMI & Guam Stormwater Management Manual, as implemented by Executive Order 2012-02 and the Guam Soil Erosion and Sediment Control Regulations (22 GAR [Ch.] 10), to adequately treat and carry surface water run-off into a catchment facility within the project site. These BMPs will prevent erosion damage and sedimentation that circumvents water quality impact or water degradation. BMPs must be provided at the source to ensure that water quality standard limitations are adequately met. The following are the Guam EPA recommended BMPs that will help minimize water quality impacts:
    a. During construction, the contractor must ensure that project materials, such as gravel and boulders, are free from silt or sediments or washed materials must be used. No materials are allowed to be stockpiled in marine waters.

   b. Project related materials and equipment are not allowed to be in the water. The contractor must ensure that equipment used at the project site will not cause oil leaks and a spill prevention kit must be readily available at the site. Providing oil drip pans with the equipment when parked is highly recommended.
   c. Appropriate erosion and sediment control measures must be provided by the contractor to prevent sediment to be carried by stormwater run-off or prevent any water flows into nearby water bodies.
   d. Dredge or excavated materials from the areas with waters must be stockpiled inside the berm or silt fence to ensure that water displacement from the dredge spoil will not carry sediment back into fresh or marine waters.
   e. Installing silt curtains or other appropriate sediment containment devices is highly recommended in areas where work in the water will be conducted to ensure that sediment will be contained in the work area --- avoiding any water quality degradation.
   f. Construction debris and other waste must be prevented from entering water bodies during construction and must be disposed of in a proper manner at Guam EPA permitted sites.
4. Prior to the start of construction, [the] contractor must prepare and submit the Environmental Protection Plan (EPP) and Erosion and Sediment Control Plan (E&SCP) as required [by] (22 GAR [Ch.] 10). The EPP will describe the environmental protective measures such as methods and equipment to be used, management of expected or anticipated environmental problems during and after construction, and methods on how to control or mitigate potential adverse effects on the environment during construction.
5. The construction contractor must ensure that construction activity will not violate the Guam Water Quality Standards regulations or contribute to significant degradation of the waters of Guam.
6. The proposed project is qualified under the coverage of the "Stormwater Construction General Permit" (CGP), under the National Pollutant Discharge Elimination System (NPDES) permit system. A Notice of Intent (NOI) and Stormwater Pollution Prevention Plan (SWPPP) must be submitted to the U.S. Environmental Protection Agency (USEPA). Copies of the Noi and SWPPP must also be submitted to Guam EPA as required by Section 10105.B.5.d of Guam's Soil Erosion and Sediment Control Regulations (22 GAR [Ch.] 10). Guam provisions stated in the NPDES Stormwater 2022 CGP must be strictly implemented to ensure water quality in the area is protected.
7. Any construction dewatering activities must be permitted prior to any dewatering actions. Provisions stated in the USEPA 2022 NPDES CGP. Section 2.4-dewatering requirements must be considered in the implementation of dewatering activities. Prior to discharge, all construction discharges must be treated to the degree that meets Guam water Quality Standards.
8. Best Management Practices must be established and employed at the project area to protect the vegetation, shoreline, and marine habitats along in Agat Bay. Although these habitats are not identified as Conservation Areas or Marine Protected Areas, they are habitats that support federally and locally protected species.
9. Pursuant to Resource Policy 3, Water Quality, the applicant shall
   a. implement appropriate E&SC BMPs, installed in accordance with the Guam Soil Erosion and Sediment Control Regulations, 22 GAR Ch. 10).
   b. Secure necessary permits prior to start of construction activities and earth-moving operations shall be performed so as not to violate applicable provisions of the Guam Water Quality Standards Regulations, 22 GAR Ch. 5.
   c. Install construction BMPs in conformance with the design criteria of the 2006 CNMI & Guam Stormwater Management Manual, as implemented by Executive Order 2012-02 and the Guam Soil Erosion and Sediment Control Regulations (22

GAR [Ch.] 10), to adequately treat and carry surface water run-off into a catchment facility within the project site. These BMPs will prevent erosion damage and sedimentation that circumvents water quality impact or water degradation. BMPs must be provided at the source to ensure that water quality standard limitations are adequately met.

d. During construction, the contractor must ensure that project materials, such as gravel and boulders, are free from silt or sediments or washed materials must be used. No materials are allowed to be stockpiled in marine waters.
e. Project related materials and equipment are not allowed to be in the water. The contractor must ensure that equipment used at the project site will not cause oil leaks and a spill prevention kit must be readily available at the site. Providing oil drip pans with the equipment when parked is highly recommended.
f. Appropriate erosion and sediment control measures must be provided by the contractor to prevent sediment to be carried by stormwater run-off or prevent any water flows into nearby water bodies.
g. Dredge or excavated materials from the areas with waters must be stockpiled inside the berm or silt fence to ensure that water displacement from the dredge spoil will not carry sediment back into fresh or marine waters.
h. Installing silt curtains or other appropriate sediment containment devices is highly recommended in areas where work in the water will be conducted to ensure that sediment will be contained in the work area --- avoiding any water quality degradation.
i. Construction debris and other waste must be prevented from entering water bodies during construction and must be disposed of in a proper manner at Guam EPA permitted sites.

10. Prepare and submit the Environmental Protection Plan (EPP) and Erosion and Sediment Control Plan (E&SCP) as required by 22 GAR Ch. 10.
11. Ensure that construction activity will not violate the Guam Water Quality Standards regulations or contribute to significant degradation of the waters of Guam.
12. Submit a Notice of Intent (NOI) and Stormwater Pollution Prevention Plan (SWPPP) to the U.S. Environmental Protection Agency (USEPA) relative to the Construction General Permit. Copies of the NOI and SWPPP must also be submitted to Guam EPA Guam provisions stated in the NPDES Stormwater 2022 CGP must be strictly implemented to ensure water quality in the area is protected.
13. Ensure that any construction dewatering activities is permitted prior to any dewatering actions.

D. Resource Policy 4. Fragile Areas.

1. Development in the following types of fragile areas shall be regulated to protect their unique character: historic and archeological sites, wildlife habitats, pristine marine and terrestrial communities, Limestone forests, and mangrove stands and other wetlands.
2. ~~Be advised to have a biologist on site to survey for nesting protected species of birds under the Migratory Bird Treaty Act one week prior to the project start date. Should any protected bird species be present, cease all work until the species leaves of its own volition. Nesting birds present should not be disturbed and all work within 150 feet should cease until completion of the nesting period. Cover all construction equipment and materials when not in use or stored on site, to avoid opportunistic nesting.~~ Not applicable – no migratory birds of conservation concern are expected to occur in this area (USFWS 2024b).
3. Be advised to install a buffer between the project site and the nearby seagrass colony.

E. Resource Policy 6. Visual Quality.

1. Preservation and enhancement of, and respect for the island's scenic resources shall be encouraged through increased enforcement of and compliance with sign, litter, zoning, subdivision, building and related land-use laws. Visually objectionable uses shall be located to the maximum extent practicable so as not to degrade significant views from scenic overlooks, highways and trails.
2. Demolition/rehabilitation/construction activities will result in the generation of solid waste which must be disposed of appropriately. Any temporary BMPs installed during the project must be removed when the rehabilitation/construction activities have been completed.
3. Pursuant to Resource Policy 6, Visual Quality, the applicant agency shall:
   a. ensure the height of the proposed seawall does not gravely diminish the view of the bay.
   b. ensure to save, transplant, or replant the equivalent biomass along the upland extent of the project area. This could allow for designing the structure to allow for intermittent tree planting integration.
   c. ensure proper disposal of all solid waste generated as a result of the project.
   d. remove any temporary BMPs installed during the project once rehabilitation/construction activities have been completed.

F. Resource Policy 8. Public Access.

1. The public's right of unrestricted access shall be ensured to all non-federally owned beach areas and all territorial recreation areas, parks, scenic overlooks, designated conservation areas and their public lands; and agreements shall be encouraged with the owners of private and federal property for the provision of releasable access to and use of resources of public nature located on such land.
2. Seasonal fish runs for Ti'ao, Manahac, E'e, and Atulai occurs throughout the year. During the seasonal fish run fishers will use the area more frequently. Reasonable access should be provided for fishers during the seasonal fish run.
3. The proposed development project is along an existing, narrow beach along much of its span and adjacent to submerged lands used as a recreational area. The demolition of the existing seawall and construction of the proposed seawall would limit access to the beach. The effect of the design height and material used in the seawall will impact public access to the shoreline.
4. Pursuant to Resource Policy 8, Public Access, the applicant shall:
   a. ensure reasonable access for fishers during the seasonal fish run is not impacted.
   b. ensure that public access to the recreational waters and the surrounding beach areas outside the project area are not restricted by the federal agency or its contractors.
   c. ensure that the final engineering design reasonably provides access to the recreational waters in Agat Bay.

References

GBSP. 2023. RE: Coastal Zone Management Act (CZMA) Federal Consistency Review for U.S. Army Corps of Engineers' Consistency Determination for its proposed Emergency shoreline protection of South Marine Corps Drive at Hagatna Bay (GCMP FC No. 2023-0079)

NMFS. 2023. Response USACE Shoreline Protection Project 508.

USACE and NMFS. 2022a. Magnuson-Stevens Fishery Conservation and Management Act, Programmatic Essential Fish Habitat Consultation.

USACE and NMFS. 2022b. Biological Evaluation of the Effects of Implementing Standard Local Operating Procedures for Endangered Species in the Central and Western Pacific Region (Pac-SLOPES).

USFWS. 2024a. Phase 1 Marine Habitat Characterization for Emergency Shoreline Protection Agat Mayor’s Complex, Agat, Guam, USA Fish and Wildlife Coordination Act Report. Final Report. April 2024.

USFWS. 2024b. List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project. Project Code: 2024-0029693 Project Name: Agat Mayor's Complex. Generated 09/05/2024 00:19:22 UTC.

USFWS. 2023a. DRAFT Recommended Measures to Minimize Potential Project Impacts to Threatened and Endangered Species and Critical Habitats in the Mariana Islands. August 3, 2023.

USFWS. 2023b. Migratory Bird Protections in Guam.

USFWS. 2022. U.S. Fish and Wildlife Service’s Recommended Standard Best Management Practices - Aquatic Environment. https://www.fws.gov/media/best-management-practices-work-or-around-aquatic-environments-bmps.

Civil and Public Works Branch
Programs and Project Management Division

Mr. Gerry Davis
Habitat Conservation Division, National Marine Fisheries Service
Pacific Islands Regional Office
1845 Wasp Blvd., Bldg. 176, Room 2884
Honolulu, HI 96818

Dear Mr. Davis:

The U.S. Army Corps of Engineers, Honolulu District (USACE) is evaluating feasible emergency shoreline protection measures along the shoreline fronting Sagan Bisita and the Mayor's Office (collectively referred to as Agat Mayor's Complex) in Agat, U.S. Territory of Guam. The existing seawall is at risk of further undermining due to anticipated erosion of the beach, leaving the Agat Mayor's Complex and essential public utilities vulnerable to damage. This feasibility study is cost-shared with the non-Federal sponsor, the Government of Guam, represented by the Department of Public Works, and is authorized pursuant to Section 14 of the Flood Control Act of 1946, as amended.

The tentatively selected plan, or proposed action, consists of replacing approximately 320 linear ft of existing, compromised seawall with an open cell piling seawall. The open cell piles will be driven into the ground in the previous seawall's footprint. The specific material composition of the cells is polyvinyl chloride. The open cells are reinforced with pin piles and filled with concrete. Lastly, a concrete cap, splash apron, and stairs for beach access will complete the seawall.

The crest of the wall is approximately 2 ft wide, and there will be a 4 ft wide concrete splash apron running along the land side of the wall (total structure width is 6 ft). Anchors that are 2 ft by 2 ft wide will be buried and spaced approximately every 8 ft along the project length and set 10 ft back from the wall. Tieback rods connecting the wall to the anchors will be buried by minimum of 3 ft deep. The wall height is 12 ft, from -6 ft mean sea level (MSL) to +6 ft MSL. Relative to the landward ground level, the seawall is about 3 ft high.

USACE has prepared an assessment in accordance with paragraph (e) of Title 50 Code of Federal Regulations Part 600.920 to evaluate the impact of the proposed action on Essential Fish Habitat (EFH) designated for federally managed fishery species. USACE has determined the proposed action may adversely affect EFH but does not have the potential to cause substantial adverse effects to EFH for Marianas

Bottomfish and Pelagic Fisheries. Accordingly, USACE transmits the enclosed EFH assessment and this written request to initiate abbreviated consultation with the National Marine Fisheries Service (NMFS) pursuant to Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act.

Based on this determination, the USACE requests written response from NMFS within 30-days of your receipt of this letter. Should NMFS respond with recommendations to conserve such habitat, USACE will respond within 30 days, and no less than 10 days prior to final agency action for any responses inconsistent with a conservation recommendation.

Thank you for your attention to this matter. Should you have any questions regarding the proposed action, please contact Ms. Connie Chan-Le of my staff at (808) 289-5746 or via email at Connie.G.ChanLe@usace.army.mil.

Sincerely,

Digitally signed by ROUSE.MICHAEL.BARRY .1155134743
Date: 2024.09.24 16:10:27 -08'00'

Michael B. Rouse
Chief, Environmental Resources Section,
Honolulu and Alaska Regional Planning Team

Enclosure

Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Assessment of Potential Adverse Effects to EFH from the CAP Section 14 Emergency Shoreline Protection at the Agat Mayor's Complex, Agat, Guam

Action Agency:	Honolulu District, U.S. Army Corps of Engineers, Civil and Public Works Branch
Federal Action:	Construction of emergency shoreline protection
Authority:	Section 14 of the Flood Control Act of 1946
Consulting Agency:	National Marine Fisheries Service Pacific Islands Regional Office Habitat Conservation Division

CONTENTS

1. Introduction

The Emergency Shoreline Protection Project for the Agat Mayor's Complex is being developed as a cost-shared effort between the Honolulu District, U.S. Army Corps of Engineers (USACE) and the Government of Guam, represented by the Guam Department of Public Works (DPW). Section 14 of the Flood Control Act of 1946 (Public Law 79-525), as amended, authorizes USACE to investigate feasible alternatives that provide emergency shoreline protection of public infrastructure. This feasibility study is evaluating measures to protect the Agat Mayor's Complex, composed of the Mayor's Office, Sagan Bisita, and public utilities in the area, from coastal erosion. The study area includes 320 feet of the west central coast of Guam in the village of Agat.

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, and other Federal planning requirements. The planning objective for the study is to identify the least cost, environmentally acceptable alternative that provides shoreline protection to Agat Mayor's Office, Sagan Bisita, and associated public utilities over a 50-year period of analysis. The least cost alternative plan is considered to be justified if the total cost of the proposed alternative is less than the cost to relocate the facilities.

The high cost of implementation in remote territories such as Guam is a study constraint. Section 1156 of the Water Resources Development Act (WRDA) 1986 provides a territorial waiver under the Feasibility and Design & Implementation phases of CAP studies. In 2021 when this feasibility study was initiated, the Section 1156 waiver was $511,000. While the intent of the territorial waiver is beneficial in most cases, under a Section 14 authority with a limited federal expenditure of $5 million, the territorial waiver hinders the study's ability to qualify under a CAP Section 14 authority. 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 Guam. Given the recent period of high inflation and the high costs associated with mobilizing equipment and personnel to remote territories such as Guam, there may be a limited number of alternatives that qualify within the range of coastal erosion management measures and alternatives that may be considered and selected under this authority.

The location and configuration of the existing seawall places another spatial planning constraint on the formulation of potential solutions: any improvements to the portion of damaged seawall resulting from this study cannot further exacerbate or induce damages to other portions of the seawall. The boundary of the Ga'an Point subunit of War in the Pacific National Historical Park and the location of infrastructure further constrain the formulation of potential solutions. The wall can only be replaced outside of the NHP boundary (green polygon on Figure 1) and infrastructure limits the area for construction.

USACE has prepared a Draft Integrated Feasibility Report and Environmental Assessment (IFR/EA) for the Agat Mayor's Complex, Guam - 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 (NEPA). The IFR/EA 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 draft IFR/EA will be released for a 30-day public and agency comment period on October 1, 2024.

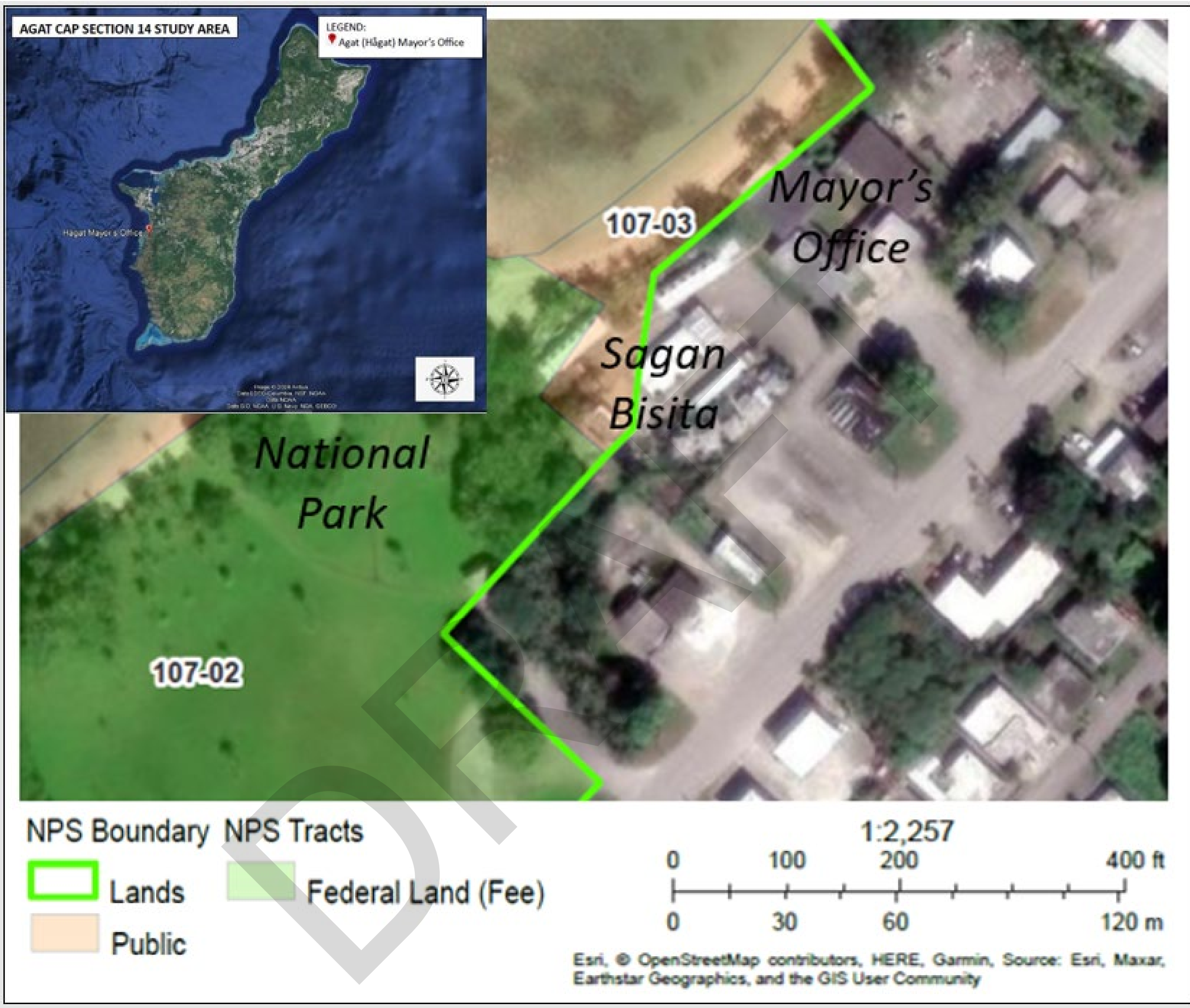

Figure 1: Ga'an Point subunit of War in the Pacific National Historical Park in green with the buildings of the Mayor’s Office. Image source: National Park Service (NPS), November 2023.

The proposed project by USACE constitutes a federal action. USACE has evaluated potential environmental effects and anticipates the federal action may adversely affect essential fish habitat (EFH) in the action area temporarily during construction. In accordance with Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended (16 U.S.C. 1801 *et seq.*), USACE has prepared and transmits this EFH Assessment (EFHA) to initiate abbreviated EFH consultation with the National Marine Fisheries Service, Pacific Islands Regional Office, Habitat Conservation Division (NMFS) on the proposed federal action.

To reduce duplication and retain informational integrity and consistency, USACE incorporates by reference all applicable sections of the USACE-NMFS Programmatic EFH Consultation dated July 29, 2022. The proposed action constitutes activity categories: 1. Maintenance, Repairs, Removal, and Replacement of Existing Structures in Waters of the U.S., and 10. Temporary Construction, Access, and Dewatering Activities, which are under the USACE-NMFS Programmatic EFH Consultation (USACE and NMFS, 2022). To USACE's knowledge, EFH consultation did not occur for the original structure.

This EFHA was prepared in accordance with the implementing regulations at 50 CFR 600.920(e), and includes the following mandatory contents:

1. Description of the action;
2. Analysis of the potential adverse effects of the action on EFH and the managed species;
3. Federal agency's conclusions regarding the effects of the action on EFH; and
4. Proposed mitigation, if applicable.

Mandatory contents are annotated in the Sections below, where documented. This EFHA will become part of the final IFR/EA.

Early coordination and pre-consultation with NMFS, regarding presence of and impacts to EFH, was conducted in a resource agency workshop during the Charette on July 17, 2023. NFMS advised USACE to investigate impacts related to titanium dioxide release from the Tentatively Selected Plan's (TSP) vinyl component during a staff-level coordination meeting on March 21, 2024. USACE spoke with an Environmental Contaminants Biologist from the U.S. Fish and Wildlife Service (USFWS) on April 9, 2024, and learned titanium dioxide toxicity is dependent on nanoparticle size, concentration, and release duration.

1.1 Project Purpose and Need

Section 14 of the Flood Control Act of 1946 (Public Law 79-525), as amended, authorizes USACE to investigate feasible alternatives that provide emergency shoreline protection of public infrastructure 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 purpose of this federal action is to evaluate the threat to critical infrastructure posed by coastal erosion and to identify potential emergency shoreline protection solutions that would provide stabilization over a 50-year period of analysis to critical infrastructure in Agat.

Currently, the municipal government headquarters of Agat, commonly referred to as the "mayor's office," is located directly on the coastline and under threat of coastal erosion (Figure 2). The furthest oceanward building in the Agat Mayor's Complex is just a few feet from a concrete rock masonry (CRM) seawall that protects it from the eroding shoreline. Adjacent to the mayor's office is another community facility, Agat Sagan Bisita, with pavilions along the shoreline and an adjoining section of CRM seawall. The proximity of these buildings and facilities to the seawall make them vulnerable to wave overtopping during high wave events.

Figure 2: Project location in the Village of Agat and main components of the Agat Mayor's Complex.

Guam is near a breeding ground for tropical storms and typhoons, and the low-lying coastline of Agat is subject to frequent storm wave attack. The much higher than usual wave heights reaching the shoreline during severe storm periods have caused erosion to the beach and have resulted in undermining of the existing seawall. This damage to the existing seawall has put the Agat Mayor's Complex and the Sagan Bisita and public utilities in the immediate vicinity of the project area at imminent risk. Future sea level rise will continue to exacerbate this condition and cause erosion and the resulting damage to accelerate.

The images below were captured by USACE Project Delivery Team (PDT) members on a site visit in January 2022, highlighting the deteriorating condition of the existing seawall and need for immediate protection. The furthest ocean ward building, the Community Center, is just a few feet from the existing CRM seawall (Figure 3). At high tide, the water line goes up to the eroding seawall, placing the building just feet away from the ocean. Failure of the existing seawall will result in the near-term collapse of the Community Center structure and eventually other structures within the Mayor's Complex property will also be compromised. Figure 4 depicts erosion flanking around the existing CRM seawall. The left and right images in Figure 4 show large rocks and concrete utility poles intentionally placed on the shoreline fronting the Community Center and Sagan Bisita for temporary ad hoc protection.

Figure 3: Undermining of the existing seawall fronting the Community Center.

Figure 4: Large rocks and utility poles for temporary protection to the Community Center and Sagan Bisita.

Failure of the seawall and exposure of the complex's structures and utilities to damage would decrease the Agat Mayor's Complex capability to provide year-round local municipality services to the village of Agat and the region and emergency response functionality during storm events. Without federal intervention, it is assumed that the Government of Guam will bear the full burden of protecting this key municipal center and community gathering space.

Incorporating concerns communicated by Guam DPW and with agency input, USACE has developed potential alternative plans to provide shoreline stabilization over a 50-year period of analysis (2028-2078). USACE and the Guam DPW evaluated the final array of alternatives and recommend Alternative 3: open cell piling seawall. This alternative has a 75+ year design life. It is considered most practicable with respect to real estate considerations, costs, and logistics as the TSP and is environmentally acceptable. While maximizing net benefits, USACE anticipates this alternative will have positive impacts on nearshore water quality (e.g., by minimizing future coastal erosion) and is supported by the Guam Government as the TSP.

1.2 Project History

A Resource Agency Workshop was held on July 17, 2023, as part of the project charette, and included representatives from the Agat Mayor's Office, Guam EPA, Guam Department of Land Management, Guam State Historic Preservation Office, Guam Bureau of Statistics and Plans, National Park Service, U.S. Fish and Wildlife Service, and the National Marine Fisheries Service. USFWS conducted marine surveys in the project area in January 2024, and the USACE project delivery team visited in January and March 2022.

2. Description of the Proposed Action *(1. Description of the Action)*

2.1 Proposed Action

The proposed action or 'federal action', is the construction of an open cell piling seawall with a structure footprint length and width of 320 ft long by 6 ft wide where the existing CRM seawall currently stands (Figure 5). The proposed action would replace 320 feet of the current and eroding 450-foot CRM seawall. Installation of the open cell piling seawall would occur using conventional equipment and a vibratory mandrel hammer attached to a landward based backhoe and also includes:

- Demolition and removal of the existing CRM seawall with a pneumatic breaker head attached to a landward based backhoe.
    - Removal of approximately 12 trees.
    - Up to a 4 ft wide excavation would be made on the seaward side of the wall to remove the toe.
    - Approximately 142 cubic yards (cy) of old seawall materials will be hauled offsite and disposed at a local waste facility.
- Excavated beach sand replaced to restore the beach profile.
- Limited excavation of native coastal soils.
- Installation of open cell sheet piling. The 1 ft wide vinyl form that serves as the exterior layer is made of polyvinyl chloride (PVC). A vibratory mandrel hammer on a landward based backhoe will drive the vinyl form until refusal to bedrock, and material removal from the interior of the vinyl form will be accomplished by pumping a jet of water into the annular space and clearing the sand. Approximately 284 cy of sand can be added to the beach. Following the removal of the annular soils, the existing bedrock will be cored approximately 5 ft for the installation of a 2" diameter pin pile to anchor the wall. Approximately 118 cy of rock can be taken to a landfill for disposal. The vinyl form will be filled with reinforced concrete and topped with a 2 ft wide concrete cap.
- Weep holes will be installed in the seawall to allow for the release of water during rainfall or wave events to prevent water retention. These will be installed within

the placed panels and not at the connection between the panels. Free draining gravel will be added to the back of the wall.

- Digging a 6” wide by minimum of 3 ft deep for each seawall attachment to 2 ft by 2 ft reinforced concrete deadman anchors with 10 ft long tieback rods. Approximately 356 cy of soil will be stored and backfilled. Due to the proximity of the seawall and the closest building, some anchors might be installed within the covered concrete walkway that is between the building and the seawall. The existing concrete will be cut, and the soil excavated by hand equipment to install the anchors. The excavated areas will be backfilled, and new concrete will be added. An estimated total of 40 anchors and tiebacks would be spaced every 8 ft along the landward length of the wall.
- Backfill the trenches with the excavated native soil.
- Installation of a 4 ft concrete splash apron landward of the crest of the structure.
- Installation of concrete stairs for recreational water access.
- Excavated beach sand replaced to restore the beach profile.
- Replanting of 12 trees and reseed the upland side of the wall.

The finished seawall will have a top elevation of approximately 6 ft above MSL and will extend down to 6 ft below MSL. The height of the seawall will be about 12 ft above the limestone bedrock and 4 to 6 ft above the beach surface. Relative to the landward ground level, the seawall is about 3 ft high. This alternative meets the USACE coastal engineering criteria for expected design life and adaptability to sea level change (SLC). Construction of the seawall is expected to begin in 2027 and take approximately 6 months.

The proposed action described above is similar to the following activity categories of the USACE-NMFS (2022) Programmatic EFH Consultation: 1. Maintenance, Repairs, Removal, and Replacement of Existing Structures in Waters of the U.S., and 10. Temporary Construction, Access, and Dewatering Activities. However, the proposed action is not eligible for coverage under the Programmatic Consultation with regard to activity category 1, since the existing seawall did not previously receive a permit from USACE and the open cell piling seawall is a replacement that does not meet the same size and character as the original structure. USACE proposes to implement the conservation recommendations (CRs) applicable to activity categories 1 and 10, as described in Section 2.2.1 below. The remaining activity categories are not discussed or considered further in this analysis.

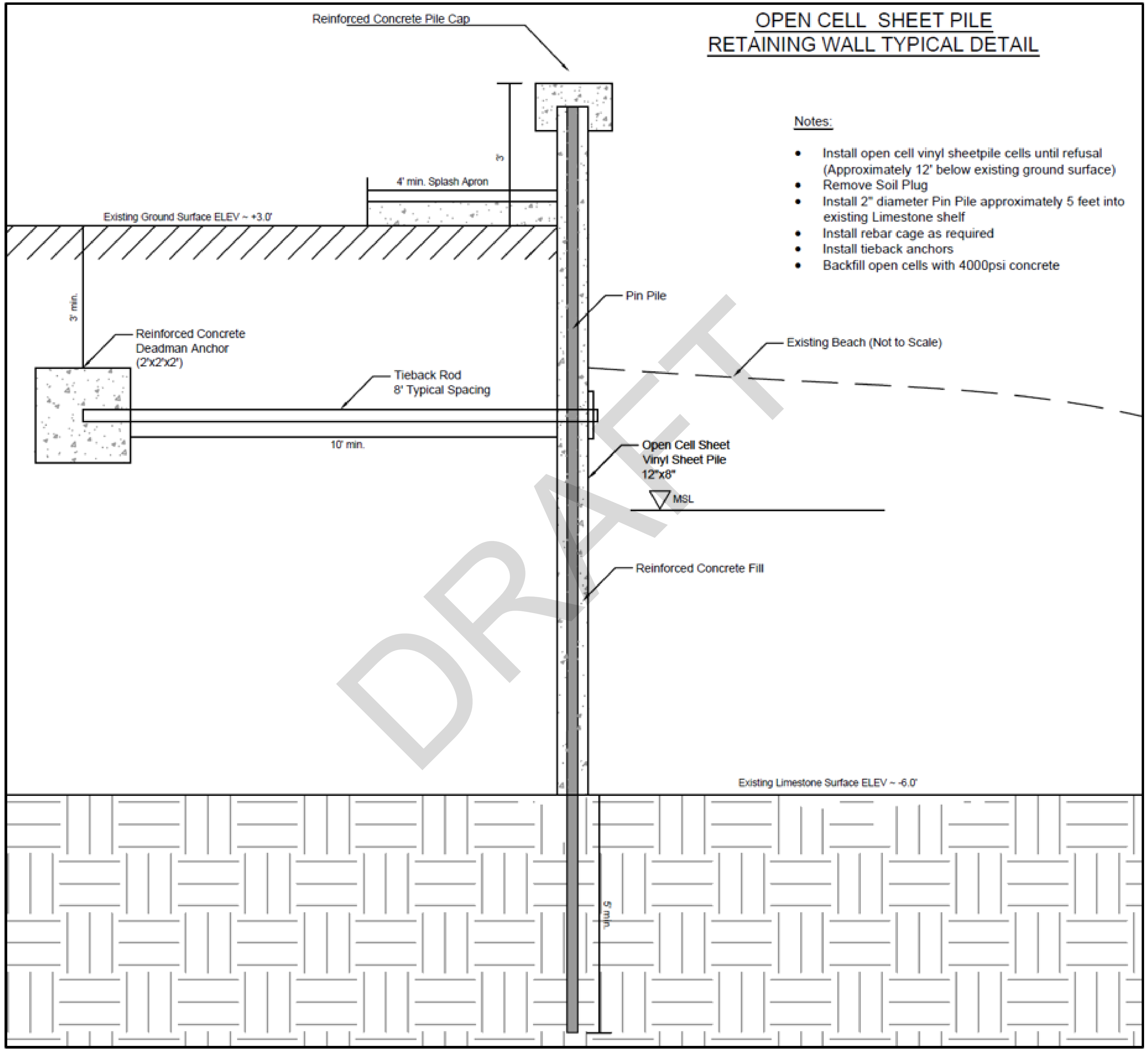

Figure 5: Open Cell Piling Seawall schematic.

2.2 Proposed Mitigation (*4. Proposed mitigation, if applicable*)

USACE proposes the following mitigation to conserve EFH. USACE considers and applies a progressive approach to mitigation: avoidance first, followed by minimization and lastly, offset. The following mitigative measures are proposed because they are appropriate, feasible, practicable and commensurate to anticipated adverse effects and will become specifications of any construction contract to be enforceable upon the selected contractor to implement. In accordance with Section 305(b)(4)(a) of the Magnuson-Stevens Act, USACE welcomes any additional CRs NMFS may recommend to conserve EFH.

2.2.1 Programmatic EFH Consultation Conservation Recommendations

USACE has determined the following CRs are applicable and commensurate to the anticipated impacts and expect that adverse effects to EFH would be avoided and or minimized to the greatest extent practicable through implementation of these CRs. The CRs below have been excerpted from the Programmatic Consultation and are appended to the end of this EFHA (Attachment 1).

1. CRs for physical impacts to benthic communities:
   VI.A. 1, 2, 3, 4, 5, 6, 9
2. CRs for increase in sedimentation and/or turbidity:
   VI.B. 1, 2, 3, 4, 5, 6, 8, 9
3. CRs for increase in nutrients, pesticides and herbicides, contaminants, and/or freshwater:
   VI.C. 1, 2, 3, 4,
4. CRs for increase in acoustic impacts:
   VI.D. 1, 2
5. CRs for invasive species:
   VI.E. 1, 2

2.2.2 Project-Specific BMPs

USACE has consulted and coordinated this project with engineering professionals and environmental resource agencies, including USFWS Pacific Islands Fish and Wildlife Office, to develop BMPs that would modify the design in such a manner so as to avoid and/or minimize the impacts to the aquatic and surrounding environment to the greatest extent practicable. Compiled BMPs are provided as Attachment 1 to this assessment. Such BMPs will be implemented by USACE and its contractor and enforceable through contract specifications.

3. Description of the EFH Action Area

The EFH Action Area is the review area within which USACE considered and evaluated direct and indirect impacts of the proposed action on designated EFH and federally managed fishery species. The EFH Action Area for the proposed action is defined as the project footprint extending approximately 320 ft along the seaward edge of the Agat

Mayor's Complex, and the rest of the Action Area that includes the land, shoreline intertidal, and reef flat habitat zones (Figure 6) located seaward and northeast of the Agat Mayor's Complex, the properties of the Mayor's Office and Sagan Bisita, and staging areas (Figure 7). The project footprint (yellow and orange polygon on Figure 7) represents the area of expected potential direct impacts of the proposed action, and the Action Area (blue, green, and black polygons on Figure 6) represents the wider area that can experience potentially both direct and indirect impacts.

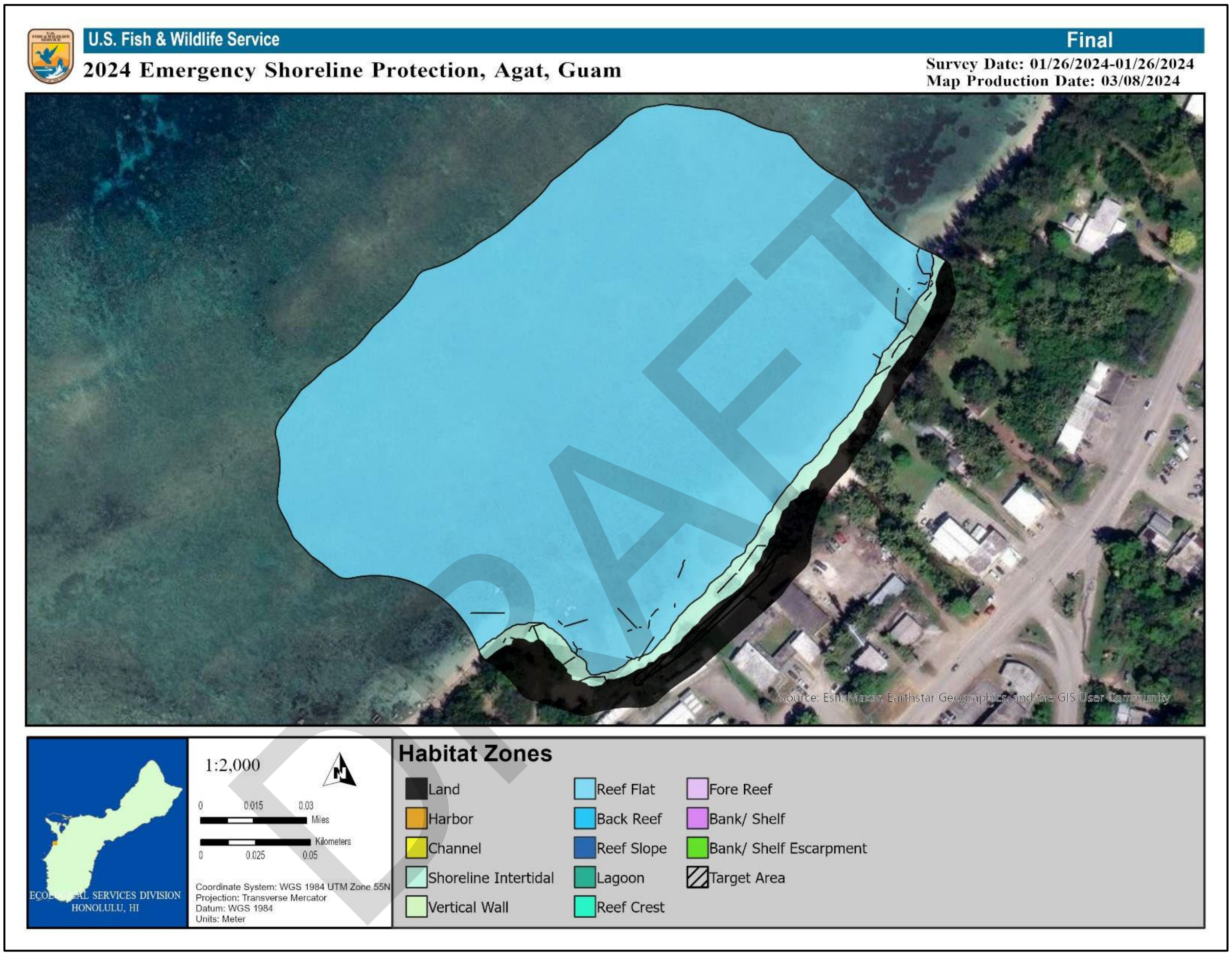

Figure 6: Map of the Agat Mayor's Complex Habitat Zones: land, shoreline intertidal, and reef flat (Raynal & Sukhraj, 2024).

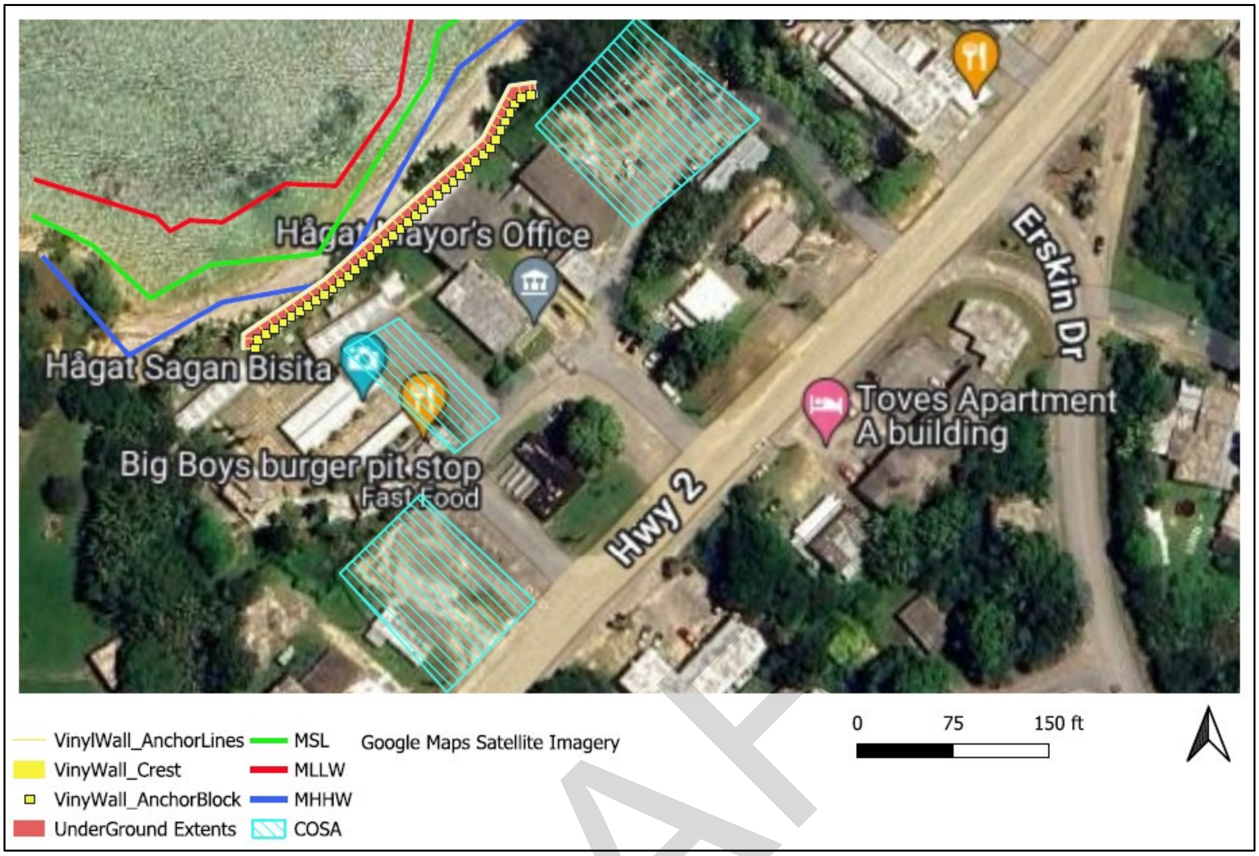

Figure 7: Figure Open cell piling seawall project footprint (yellow and red line). The proposed staging areas are the three open lots (blue hashed squares). The redline indicates mean lower low water (MLLW), green line indicates mean sea level (MSL), blue line indicates mean higher high water (MHHW).

4. Environmental Baseline

4.1 Federally Managed Fisheries and Designated EFH

The proposed action area consists of Essential Fish Habitat (EFH) designated for the federally managed fisheries/species of the Mariana Archipelago and Pelagic Fisheries. EFH is defined in the Magnuson-Stevens Act as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. Textual descriptions of the fisheries, managed species and their designated EFH occurring within the proposed action area are published in the Fishery Ecosystem Plan (FEP) for the Mariana Archipelago and the Fishery Ecosystem Plan for Pacific Pelagic Fisheries of the Western Pacific Region, respectively (WPRFMC 2009 a & b). These place-based FEPs replaced the former Fishery Management Plans.

The Mariana Archipelago Fishery includes the following Management Unit Species (MUS): Mariana Bottomfish MUS listed in Table 1. FEP Amendment 5 (WPFMC 2018) reclassified the Crustacean and Coral Reef MUS to Ecosystem Component Species (ECS).

Table 1: Mariana Bottomfish MUS (50 CFR 665.401)

Local name	Common name	Scientific name
lehi/maroobw	red snapper, silvermouth	*Aphareus rutilans*
tarakitu/etam	giant trevally, jack	*Caranx ignobilis*
tarakiton attelong, orong	black trevally, jack	*Caranx lugubris*
bueli, bwele	lunartail grouper	*Variola louti*
buninas agaga', falaghal moroobw	red snapper	*Etelis carbunculus*
abuninas, taighulupegh	red snapper	*Etelis coruscans*
mafuti, atigh	redgill emperor	*Lethrinus rubrioperculatus*
funai, saas	blueline snapper	*Lutjanus kasmira*
buninas, falaghal-maroobw	yellowtail snapper	*Pristipomoides auricilla*
buninas, pakapaka, falaghal-maroobw,	pink snapper	*Pristipomoides filamentosus*
buninas, falaghal-maroobw	yelloweye snapper	*Pristipomoides flavipinnis*
buninas, falaghal-maroobwmaroobw	pink snapper	*Pristipomoides seiboldii*
buninas rayao amariyu, falaghal-maroobw	flower snapper	*Pristipomoides zonatus*

The marine portion of the proposed action area is inclusive of the EFH action area and encompasses EFH designated for both Mariana Bottomfish and Pelagic MUS. The EFH action area is absent of any Habitat Areas of Particular Concern (HAPC). EFH is designated for each of the above species, however, collectively, the combined EFH for Mariana Bottomfish MUS is the water column from the shoreline to the Exclusive Economic Zone (EEZ, 200 nautical miles from shore), and from the surface to 1,000 meters in depth; and all bottom habitat from the shoreline to a depth of 400 meters. The combined EFH for the Pelagics MUS is the water column down to a depth of 200 meters from the shoreline to the outer limit of the EEZ for egg and larval life stage and the water column down to a depth of 1,000 meters for juvenile and adult pelagic fishery species.

Specific bottom habitats and ecosystems comprising EFH in the Mariana Archipelago are listed in Table 2. There are intertidal habitats, seagrass beds, coral and patch reefs and hard, artificial and soft substrates within the EFH action area. There are no mangrove forests, lagoon, estuarine, surge zone, deep reef slopes, banks and seamounts, deep ocean, or pelagic ecosystems within the EFH action area. These EFH habitats are not discussed or considered further in this analysis.

Table 2: Bottom Habitat and ecosystems comprising EFH designations for the Marianas Bottomfish and Pelagic MUS within the EFH Action Area (WPRFMC 2005 a & b).

Bottom Habitat/Ecosystem	Present in EFH Action Area
Intertidal	Yes
Mangrove forest	No
Seagrass bed	Yes

Coral and Patch Reefs	Yes
Hard, Artificial, and Soft Substrates	Yes
Lagoon	No
Estuarine	No
Surge Zone	No
Deep reef slopes, banks, and seamounts	No
Deep ocean and pelagic ecosystems	No

USFWS biologists surveyed the shoreline intertidal and reef flat habitat zones of the EFH Action Area. The intertidal habitat is directly seaward of the existing CRM seawall, and the sediment present in the intertidal habitat is generally sand and rubble. The biologists noted that this zone is likely periodically saturated by high tides, especially during high surf and extreme weather events (Raynal & Sukhraj, 2024). They also reported that the project footprint was located completely above the low water mark. Live corals, other macroinvertebrates, seagrasses, and fishes were not observed in the intertidal habitat.

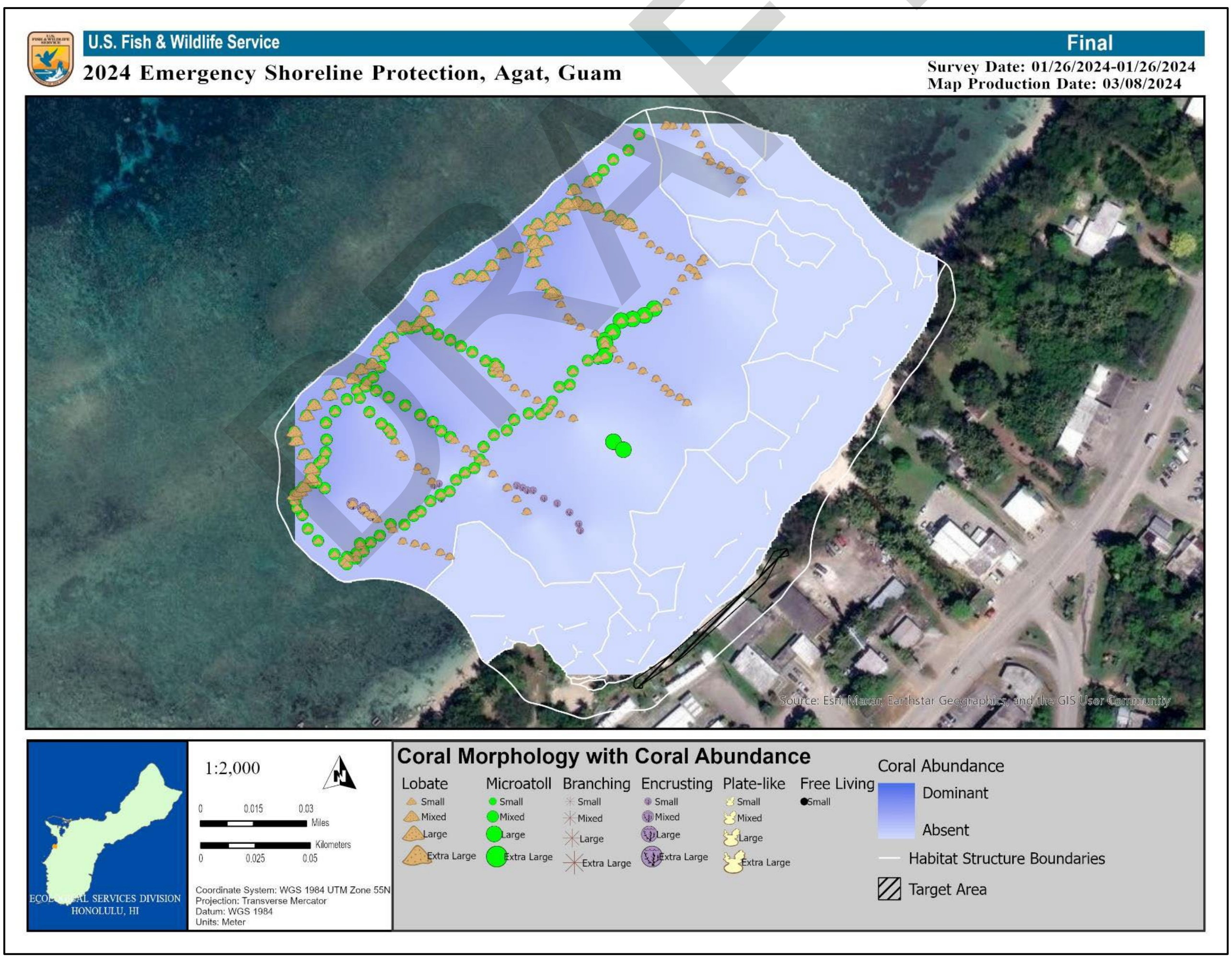

Figure 8: Observed coral in the reef flat habitat zone based on dive tracks (Raynal & Sukhraj, 2024).

The reef flat habitat zone (blue polygon on Figure 6) is directly seaward of the intertidal habitat and project footprint. It is characterized by water depth of approximately 0.1–1.5 m over primarily hard bottom pavement with smaller areas of unconsolidated sediment (mud, sand, and rubble) and mixed habitat structure consisting of scattered coral rock in unconsolidated sediment. USFWS biologists reported that the habitat complexity for the reef flat was low (ranked in habitat complexity category 0), and also stated that the physical environment on the reef flat included enough wave energy to suspend fine sediments and create a turbid environment from the beach out to approximately 100 m from shore. Corals were absent to rare until approximately 50 m from the shore where observed coral cover, diversity, and colony size increased slightly. Coral cover was low to moderate, up to a maximum of 10%, only beyond approximately 140 m from the project footprint, where coral species diversity and colony size also increased slightly (Figure 8). Coral species in the genera *Porites* and *Pocillopora* were the most commonly observed (Raynal & Sukhraj, 2024).

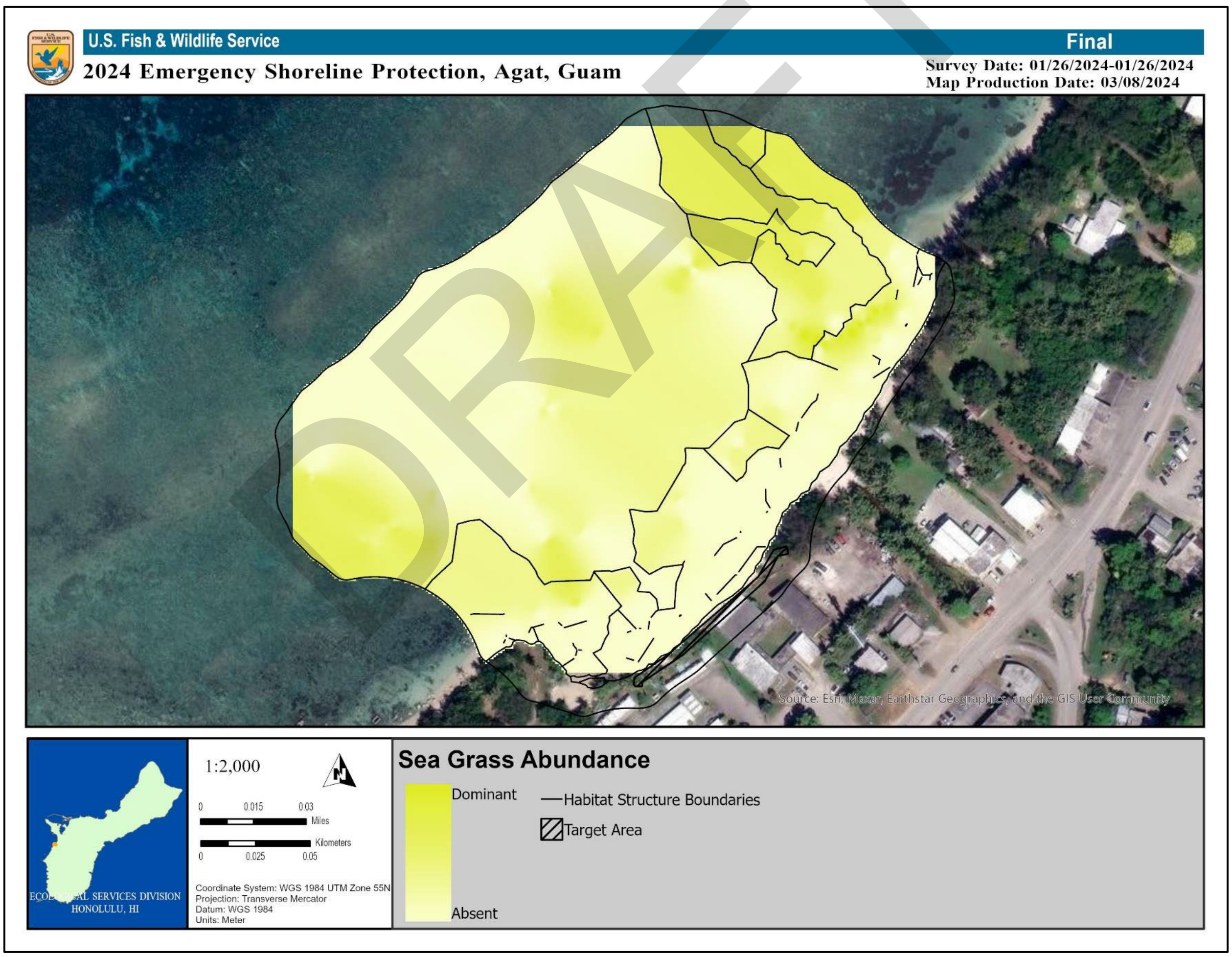

Figure 9: Map of seagrass abundance observed in the intertidal reef flat.

According to the USFWS biologists (Raynal & Sukhraj, 2024), seagrass was common but not dominant in the project area. They observed three species: *Enhalus acoroides*, *Halodule uninervis*, and *Halophila minor*. The nearest recorded seagrass was approximately 35 m from the project footprint and the most abundant seagrass was more than 100 m away (Figure 9).

The USFWS biologists reported that Crustose coralline algae, frondose algae, and turf algae were common but not dominant throughout the reef flat (Raynal & Sukhraj, 2024). Observed frondose algae included species from the genera *Caulerpa*, *Neomeris*, *Halimeda*, *Jania*, *Padina*, *Asparagopsis*, *Galaxaura*, *Sargassum*, *Laurencia*, *Dictyota*, and *Acanthophora*. Filamentous algae and cyanobacteria were uncommon.

USFWS biologists also observed sea cucumber, sea stars, one giant clam (*Tridacna maxima*), and two green sea turtles (*Chelonia mydas*) during surveys in the reef flat zone. Sea cucumber was the nearest recorded species within approximately 60 m and beyond from the project footprint, while the other species were further away from the project footprint.

5. Impact Analysis (*2. Analysis of the potential adverse effects of the action on EFH and the managed species*)

The proposed action described is similar to the following activity categories of the USACE-NMFS Programmatic EFH Consultation: 1. Maintenance, Repairs, Removal, and Replacement of Existing Structures in Waters of the U.S., and 10. Temporary Construction, Access, and Dewatering Activities. In the Programmatic Consultation, USACE and NMFS describe in extensive detail potential for the following impacts to occur from these activities:

A. Physical impacts to benthic communities,

B. Increase in sedimentation and/or turbidity,

C. Increase in nutrients, pesticides and herbicides, contaminants, and/or freshwater,

D. Increase in acoustic impacts, and

E. Increase in invasive species.

USACE incorporates by reference the discussions provided at section V of the USACE-NMFS Programmatic EFH Consultation dated July 29, 2022. The following paragraphs connect the project activities to the relevant section V discussions and the EFH CRs that would minimize or avoid impacts:

- For demolition of the existing CRM seawall with a pneumatic breaker head (that is attached to a landward based backhoe), coring bedrock to later install pin piles, cutting concrete walkways, and removing trees, the discussion in programmatic section V.A analyzes potential physical impacts to benthic communities. The impacts will be avoided by preventing trash and debris from entering the marine environment as recommended in VI.A 3. Additionally, these project activities may be applicable to the discussion in section V.B, which analyzes impacts from the increase of sedimentation and turbidity. Minimization can be achieved with stopping work during large tidal events, storms, and high surf conditions as recommended in VI.B.3.

- Pile driving the vinyl forms will use a vibratory mandrel hammer and the pile driving will occur on land. The discussion in programmatic section V.D analyzes impacts from this kind of sound generating activity. The effects will be inaudible in the water due to work on land and use of a vibratory hammer as recommended in VI.D.1.
- A water jetting system will remove sand from within the vinyl forms and the collected sand will be placed on the beach. The discussion in programmatic section V.C analyzes impacts from the increase in contaminants. Impacts to the water will be avoided by preventing discharges to the water as recommended in VI.C.2.
- Concrete will be used to fill the vinyl forms, create a cap, add a splash apron, replace walkways, and install access stairs. The discussion in programmatic section V.C analyzes impacts from the increase in contaminants. Impacts to the water will be avoided by preventing discharges to the water as recommended in VI.C.2.
- Revegetation will occur after the seawall is complete. The discussion in programmatic section V.E analyzes impacts from the increase in invasive species. The impacts of invasive species will be minimized by replanting with appropriate native species as recommended in VI.E.2.
- Installing pin piles, digging for anchors, creating weep holes, and backfilling with excavated native soils are not considered for programmatic impact analysis as these project activities can be accomplished with minimal effort using hand tools.

Subsections 5.1 through 5.3 below describe project-specific impacts relative to EFH within the Action Area. BMPs described at Section 2.2 and Attachment 1 are intended to avoid and/or minimize the following impacts.

5.1 Direct Impacts

The open cell piling seawall will replace the current damaged CRM seawall. The new seawall will have approximately the same length as the CRM seawall, and it will have a wider 6 ft footprint due to the concrete cap and a splash apron at its top. Staging of equipment necessary for demolition, excavation, and installation of the replacement seawall are expected to occur from the land without the need to stage equipment in the water. Positioning and operation of heavy machinery will take place from the land side of the seawall project footprint to stay off the intertidal habitat zone. Water jetting of the vinyl form will be done in a manner that ensures sediment is trapped, dewatered, and later placed back on the beach appropriately. No in-water work is anticipated as the demolition, excavation, and installation of the seawalls will occur between the land habitat and intertidal habitat zones, which establishes a distance of approximately 13 ft away from the water at the meeting of intertidal habitat and reef flat habitat zones during calm weather.

There are no expected direct impacts to designated water column and substrate EFH. As previously reported, coral colonies are generally rare within 50 m of the project footprint and uncommon within 140 m, which does not indicate that coral reef habitats are likely to be directly impacted by the proposed action (Raynal & Sukhraj, 2024).

Long-term sedimentation changes associated with altered currents and erosion patterns around the new seawall may occur. The resulting impacts may have little effect on the most sensitive marine habitat features, such as coral colonies, seagrasses, and algae, due to a distance buffer. While significant direct impacts of the proposed structure on sensitive habitats remains possible, it currently appears unlikely that turbidity, erosion, or sedimentation will deteriorate protected marine habitats (Raynal & Sukhraj, 2024). Thus, USACE anticipates federally managed fishery species and their prey to remain present or return soon after seawall construction is complete, as there would be no permanent change to EFH that would permanently affect use of this habitat by these fish.

USACE acknowledges that replacement of the existing seawall is necessary to prevent further and future erosion of terrigenous sediments, i.e., pollutants into the marine environment.

5.2 Indirect Impacts

Indirect impacts of the proposed action to the coral colonies, seagrasses, algae, sea cucumber, sea stars, giant clam, and green sea turtles in the Action Area can likely be minimized with adherence to the identified CRs and project specific BMPs.

Changes in sedimentation and turbidity during the construction phase are possible. Given that the waters at the beach are commonly relatively turbid and marine habitat features are uncommon within approximately 35 m or more of the project footprint, losses due to sedimentation caused by construction appear to be relatively unlikely as long as sediment associated with trenching, driving structures into the earth, and washing structures and equipment is trapped and dewatered appropriately (Raynal & Sukhraj, 2024).

As previously stated in the Direct Impacts section, long-term sedimentation changes associated with altered currents and erosion patterns around the new seawall may occur. The resulting impacts may have little effect on the most sensitive marine habitat features due to a distance buffer. Indirect impacts of the proposed structure on sensitive habitats remains possible, but it currently appears unlikely that turbidity, erosion, or sedimentation will deteriorate protected marine habitats (Raynal & Sukhraj, 2024).

5.3 Cumulative Effects

Use of PVC (plastic) for the open cell piling seawall may result in indirect and cumulative impacts. PVC will increase the stability and longevity of the proposed seawall, but high exposure to ultraviolet (UV) radiation, seawater, and impacts from debris may potentially cause the PVC to degrade over time. Generally, many plastics exposed to the same stressors do crumble into increasingly smaller fragments, then eventually break down into microplastics. Dispersal of microplastics is a growing global concern and has a range of negative impacts on marine ecosystems, including bioaccumulation of microplastics in wildlife tissue (Raynal & Sukhraj, 2024)

The manufacturer of the open cell piling seawall (Truline) provided USACE the report on their PVC material prepared by an independent material scientist. Below is a summary of the expected outcomes for the PVC (Rabinovitch, 2018):

- PVC has high resistance to salt water and is not affected by it.
- Degradation of the outer surface of exterior grade rigid PVC, such as the outer surface of Truline product is expected to be limited to less than 150µm depth in its first 50 years life.
- The outer surface will not degrade to the point of complete disintegration, but cracks may occur due to reduced ductility, accidental impact abuse or overstressing the product due to less than optimum design exceeding material strength.
- Typically, there are no loose PVC particles of the degraded outer surface, rather it is mainly saturated with titanium dioxide (TiO_2) and calcium carbonate ($CaCO_3$). The oxidation products of PVC degradation are typically washed out by rain.

Within 50 years, the PVC may have cracks due to overstressing. The PVC is anticipated to have a thin and exterior layer degraded, rather than broken down into fragments, and TiO_2 and $CaCO_3$ are the chemical components resulting from the degradation. Thus, the release of TiO_2 and $CaCO_3$ into the marine ecosystem is likely. Adverse effects from $CaCO_3$ are not expected.

Use of TiO_2 in PVC provides UV protection for the material, and when in the marine ecosystem, TiO_2 may negatively impact marine microbial species based on the nanoparticle (TiO_2 NPs) size, concentration, and release duration (A. Hendrix, USFWS, personal communication, April 9, 2024). Previous experiments have revealed a negative toxic impact of TiO_2 NPs upon marine phytoplankton growth and decline of cyanobacterial populations with higher TiO_2 NPs concentrations; however, these studies are typically carried out at concentrations in the mg L^{-1} range (i.e. 1-30 mg L^{-1}), far exceeding those measured and predicted to occur in the environment currently (0.021-40 µg L^{-1}) (Dedman et al., 2021).

One study that reported on negligible risk from environmentally relevant concentrations of TiO_2 NPs discovered that *Prochlorococcus* cultures recovered from exposure over time when in natural oligotrophic seawater, possibly due to reduced TiO_2 NPs toxicity and availability from their aggregation and sedimentation within 72 hours (Dedman et al., 2021). In an additional experiment from the same study, the diversity and structure of natural marine microbial communities showed negligible variations when exposed to environmentally relevant TiO_2 NPs concentrations (i.e. 25 µg L^{-1}); thus, the environmental risk of TiO_2 NPs towards marine microbial species appears low, however scientists noted the potential still exists for adverse effects in hotspots of contamination. TiO_2 NPs has been recorded to interact with other contaminants within the water column (i.e. tributyltin, phenanthrene, polycyclic aromatic hydrocarbons), which can potentially enhance toxicity at lower concentrations and containment uptake in the marine food web. Thus, the release, dispersal, and presence of certain TiO_2 NPs concentrations and other contaminants in the marine ecosystem over time could have cumulative effects, which results in adverse effects to EFH.

The exact nanoparticle size, concentration, and release duration for titanium dioxide from the open cell piling seawall over a 50-year period of analysis remains uncertain based on the current information presented. However, USACE will implement the project specific BMPs and CRs (i.e. develop a maintenance plan to include inspections, replacement prior to breakdown of vinyl components) to minimize effects of titanium dioxide and presence of microplastics. USACE maintains that the proposed action would have minimal impacts to EFH both individually and cumulatively.

6. Conclusion (*3. USACE Conclusions Regarding the Effects of the Action on EFH*)

In accordance with the Magnuson-Stevens Fishery Conservation and Management Act, an effect is adverse if the impact reduces quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH.

USACE has considered the potential for adverse effects resulting from the proposed action and anticipates impacts to be minimal--temporary and limited to the intertidal and reef flat habitat zones. Through implementation of the project-specific BMPs and CRs (Attachment 1), the proposed action would not reduce the quantity of EFH and would minimally affect the quality of EFH. **Accordingly, USACE has determined that the proposed action may adversely affect EFH but does not have the potential to cause substantial adverse effects.**

7. **Literature Cited**

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NMFS Concurrence Letter

Section 404(b)(1) Clean Water Act 40 CFR Part 230
Evaluation of the Effects of Discharge of Dredged or Fill Materials into the Waters of the United States
Agat Mayor's Complex Continuing Authorities Program (CAP) Section 14 Emergency Shoreline Protection
Agat, Guam

I. PROJECT DESCRIPTION

The following is provided in accordance with Section 404(b)(1) of the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500) as amended by the Clean Water Act of 1977 (CWA) (Public Law 95-217, 33 U.S.C. § 1251 et seq.). Its intent is to succinctly state and evaluate information regarding the effects of discharge of dredge or fill material into the waters of the United States (WOTUS). As such, it is not meant to stand-alone and relies heavily upon information provided in the environmental document to which it is attached, the Agat, Guam CAP Section 14 Emergency Shoreline Protection Integrated Feasibility Report and Environmental Assessment (IFR/EA).

The project will provide emergency shoreline protection from coastal erosion to Agat Mayor's Office, Sagan Bisita, and public utilities in the area (collectively referred to as Agat Mayor's Complex). The proposed project area includes 320 feet (ft) of the west central coast of Guam in the village of Agat (Figure 1). Under the Recommended Plan, 320 ft of existing seawall would be replaced with an Open Cell Piling Seawall that is 320 ft long and has a 6 ft wide structure footprint (Figure 2).

Figure 1. Proposed Project Area: The project area includes 320 linear feet of existing sea wall (yellow and red polygon) along Agat Bay and three potential staging areas (teal striped polygons). Sections of the wall are at mean higher high water (MHHW; blue line) and above Mean Sea Level (MSL; green line). None of the project is below mean lower low water (MLLW; red line). Figure by U.S. Army Corps of Engineers (USACE), 2024.

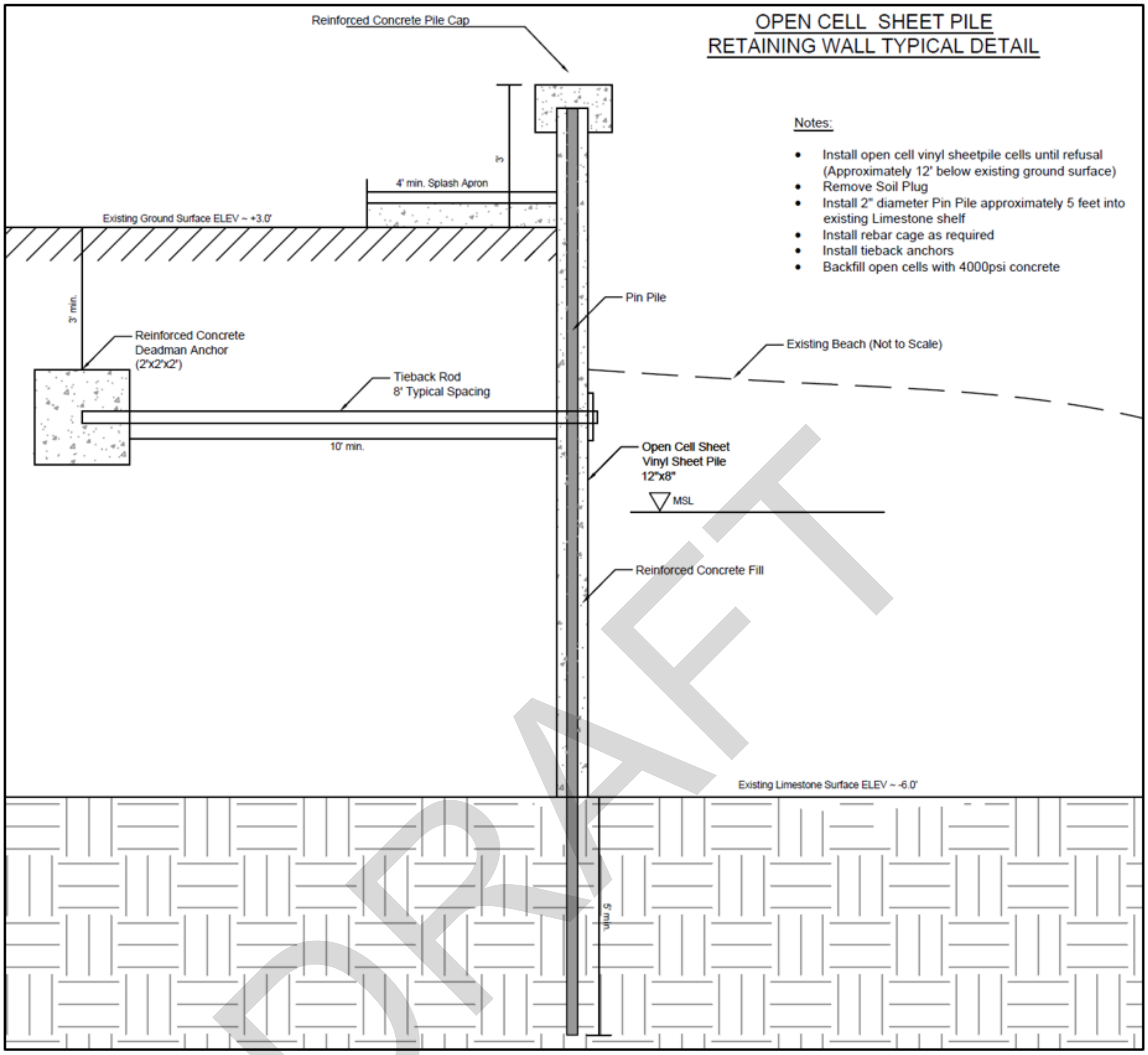

Figure 2. Open Cell Piling Seawall cross section, showing where MSL will potentially intersect with the structure. Figure by USACE, 2024.

The project consists of removal of the existing seawall from the beach side with a maximum excavation width of 4 feet, and the construction of an open cell piling seawall. The open cell piling seawall will be 320 ft long and consist of 1 ft wide vinyl cells filled with reinforced concrete installed to the consolidated limestone shelf. The individual wall panels will be anchored with a 2-inch diameter pin pile installed into the limestone. The seawall will have a 2 ft wide pile cap and a 4 ft wide splash apron, and it will have a top elevation of approximately 6 ft MSL and will extend down to -6 ft MSL. The height of the seawall will be about 12 ft tall from the existing limestone surface with the top of the seawall at approximately 3 ft above the existing grade of the mayor’s complex. The project includes the following components:

- Demolition and removal of the existing seawall
    - Removal of approximately 12 trees

- Up to a 4 ft wide excavation would be made on the seaward side of the wall to remove the toe
- 142 cubic yards (cy) of block, concrete, and rock rubble taken to a landfill for disposal
- Excavated beach sand replaced to restore the beach profile

- Vibratory mandrel hammer installation of vinyl open cell sheet piling until refusal to bedrock
- Removal of beach sand from the interior of the cells by pumping a jet of water into the annular space and clearing the sand (approximately 284 cy of sand can be added to the beach)
- Core bedrock 5 ft deep to install 2-inch diameter pin piles to anchor the vinyl open cell sheet piles (approximately 118 cy of rock taken to a landfill for disposal)
- Install weep holes to aid in proper drainage backshore, alleviate water pressure on the landward side, allowing for more efficient drainage and reducing the potential for erosion on adjacent properties
- Backfill cells with reinforced concrete fill and top with a 2 ft wide concrete cap
- Dig 6 inch wide by minimum of 3 ft deep trenches every 8 ft for placement of 10 ft long tieback rods that will attach to 40 2 ft by 2 ft reinforced concrete deadman anchors (approximately 356 cy of soil to be stored and backfilled)
    - The excavation required to place the tiebacks could be completed with a shovel
    - At the location of the Mayor's Office building, the 2 x 2 x 2 ft square space required to place the deadman anchors will be hollowed and then re-laid in the concrete porch
    - The excavation required to place the tiebacks could be completed with a shovel, demonstrating the minimal excavation effort required
- Backfill trenches with the excavated native soil
- The individual panels will be tied together at the top with a 2 ft wide reinforced concrete pile cap
- Installation of a 4 ft concrete splash apron behind the crest of the structure
- Installation of concrete stairs for recreational water access
- Excavated beach sand replaced to restore the beach profile
- Replace 12 trees and reseed the upland side of the wall

This Recommended Plan meets USACE's coastal engineering criteria for expected design life and adaptability to sea level change (SLC). Construction of the seawall is expected to begin in 2027 and take approximately 6 months.

A. Authority

This feasibility study 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 USC 701r). Under the CAP, Section 14 authorizes USACE to partner with a non-Federal sponsor (NFS) 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.

This activity is regulated by USACE under Section 404 of the CWA (33 U.S.C § 1344). Section 230.10(a) of the 404(b)(1) guidelines state "an alternative is practicable if it is available and capable of being done after taking into considerations costs, existing technology, and logistics in light of overall project purposes." Pursuant to the Section 404(b)(1) Guidelines (40 CFR 230), the least environmentally damaging practicable alternative (LEDPA) must be practicable in terms of technology, cost, and logistics in light of overall project purpose, and produce the least environmental damage. Impacts to aquatic and terrestrial habitat would be avoided where possible, minimized where avoidance is not possible, and compensated when they occur. The open cell piling seawall is the best practicable alternative that meets design requirements and CAP 14 funding constraints.

B. General Description of Dredged and Fill Material

Construction of the proposed seawall would involve:

- Demolition and removal of the existing seawall (142 cy of block, concrete, and rock rubble taken to a landfill for disposal)
- Remove the material from the interior of the cells by pumping a jet of water into the annular space and clearing the sand (approximately 284 cy of sand will be added to the beach)
- Core bedrock 5 ft deep to install 2-inch diameter pin piles to anchor the vinyl open cell sheet piles (approximately 118 cy of rock taken to a landfill for disposal)
- Installing and removing all mitigation measures

The existing wall is made up of block, concrete, and rock rubble and will be demolished prior to construction. The demolition material will be hauled offsite and disposed at a local waste facility. An estimated 284 cy of sand would be washed from the cells prior to their filling with concrete. The sand would be trapped, dewatered, and later placed back on the beach appropriately. While the open cell piling seawall would be at the footprint of the original wall, that footprint extends below the high tide line for approximately 80 square feet (sq ft) (see Figure 1; USACE is using the Mean Higher High Water (MHHW) vertical datum as a reasonable proxy for the high tide line), and therefore constitutes a discharge to WOTUS under Section 404 of the CWA. The project would temporarily and permanently impact a total of 310 sq ft of the intertidal zone that is below the high tide line.

The concrete used to fill the cells would come from Guam and be the same concrete used for similar applications in Guam.

Excavated rock and native soil that is not used as fill during project construction would be placed at an upland disposal site, as yet to be determined.

C. Description of the Proposed Discharge Site

The floor of Agat Bay in the project area is approximately 6 feet of sand over limestone bedrock. There are varying amounts of sandy beach present between the existing seawall and the ocean (Figure 1). In some locations toward the eastern end of the project extent, there is approximately 15 feet of beach. In other areas, there is no beach at all. The structure footprint of the finished seawall is estimated to be 0.04 acres (ac). The direct in-water footprint will vary along the project length with the existing shoreline (Figure 1).

D. Description of Discharge Methods

Preferably, construction will occur from land at low tide and have little in-water work. Material will be excavated from the shoreline and placed for the open cell piling seawall using an excavator located on the upland. Fill for the open cell piling seawall would be placed by excavator and other construction machinery.

II. FACTUAL DETERMINATION

A. Physical Substrate Determinations

Most of the material discharged at the construction site will originate in the construction site. The open cell piling seawall will have a structure footprint of 0.04 acres.

B. Water Circulation, Fluctuation, and Salinity Determinations

The open cell piling seawall will replace the existing seawall and is not expected to change water circulation along the beach. The open cell piling seawall would protect a portion of the shoreline along Agat Bay from further erosion. The mouth of an unnamed stream on National Park Service (NPS) property is just outside the project area to the west, but no noticeable effects on salinity are anticipated.

C. Suspended Particulate/Turbidity Determinations

The U.S. Fish and Wildlife Service (USFWS) reported visibility to be low in Agat Bay during their dives in 2024. Excavation is expected to be performed with an excavator operated from the upland area. Construction activities will be confined mainly to the shoreline area with little in-water work. Excavation of materials seaward of the existing seawall will be conducted so as to minimize turbidity. If practicable and feasible, necessary excavations in the intertidal zone will be conducted during low tide conditions to minimize turbidity effects. Construction materials will be relatively free of silt or other fine particulate material. There may be some localized, transient increases in turbidity created by excavation and setting of stones under all structural improvements. No significant long-term effects on water quality are anticipated with the Recommended Plan. Project construction is not expected to have any significant impacts on the marine environment. Any turbidity effects generated by site preparation and placement of stones are expected to be localized and transient: particulates should quickly settle to the bottom or be carried away by wave action and currents. Generation of turbidity will be minimized by avoiding excavation work during periods of high water.

D. Contaminant Determinations

Agat Bay is classified as M2: good marine water quality, supporting whole body contact, recreation, aquatic life, and consumption uses. Water quality adjacent to the Mayor’s Complex was reported as good for 2020, the most recent data available (Agat Bay 2; Category 2). Category 2 waters support some but not all designated uses. The northern portion of Agat Bay is impaired for chlordane, dioxin, and PCBs in fish tissues (Agat Bay 1; Category 5). Category 5 waters have at least one designated use that is not supported and a Total Maximum Daily Load (TMDL) is needed (GEPA 2020; USEPA 2024). World War II era unexploded ordinance are a risk on most accessible shorelines of Guam.

Care will be exercised to ensure that no contamination of the marine environment results from construction activities. Best management practices will be employed to ensure that no debris, petroleum products or other deleterious material is allowed to fall, flow, leach or otherwise enter the water.

The Clean Water Act Section 404(b)(1) guidelines state, "Dredged or filled material is most likely to be free from chemical, biological, or other pollutants where is composed primarily of sand, gravel, or other naturally occurring inert material. Dredged material so composed is generally found in areas of high current or wave energy…" (40 CFR 230.60). As described in previous sections, the material to be excavated consists of native soils. USACE determines that the material to be excavated meets the above description from 40 CFR 230.60 and is highly unlikely to have received and retained contaminants.

E. Aquatic Ecosystem and Organism Determinations

As described above in Section 1C, the habitat that would be directly impacted by the proposed project is a narrow, highly variable intertidal strand of sand, coral rubble, gravel, and rock, supporting no obvious aquatic communities (Figure 3). The benthic habitat within several hundred meters of shore consists of uncolonized sand, or sand sparsely colonized by seagrasses (Figure 4). The nearest areas of coral were found well offshore (Figure 5) (USFWS 2024).

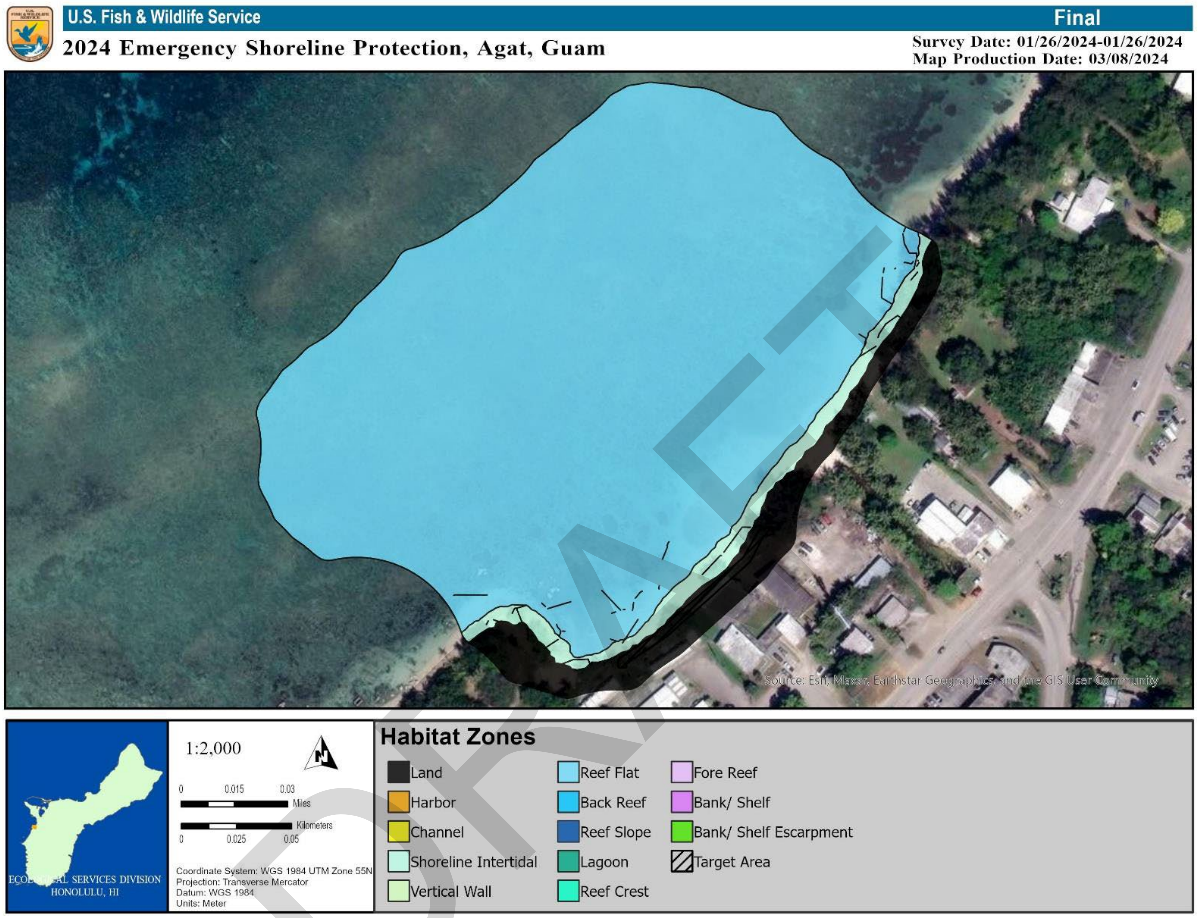

Figure 3: Habitat Zones of and near the proposed project area. Figure by USFWS, 2024.

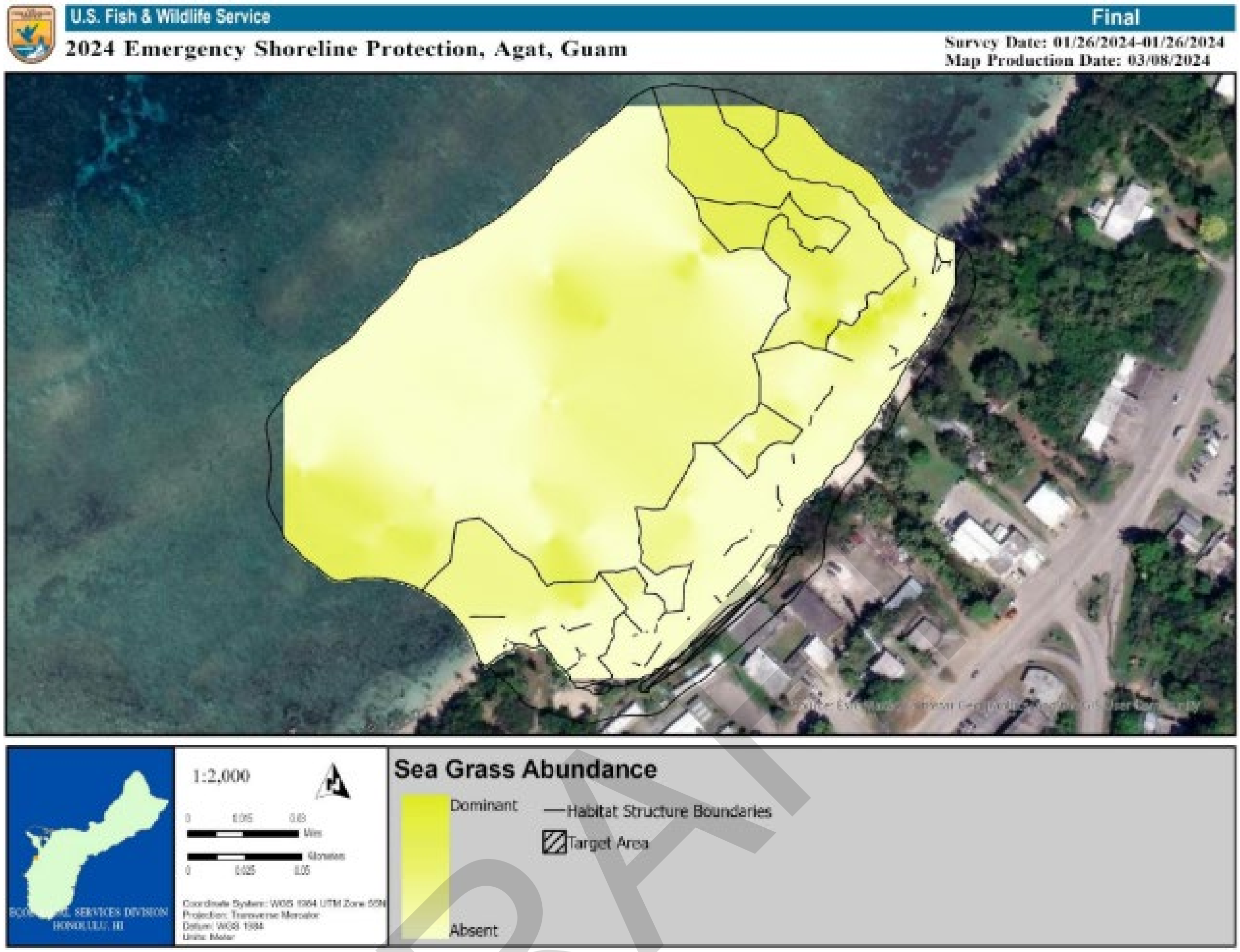

Figure 4: Observed seagrass abundance in the proposed project area. Figure by USFWS, 2024.

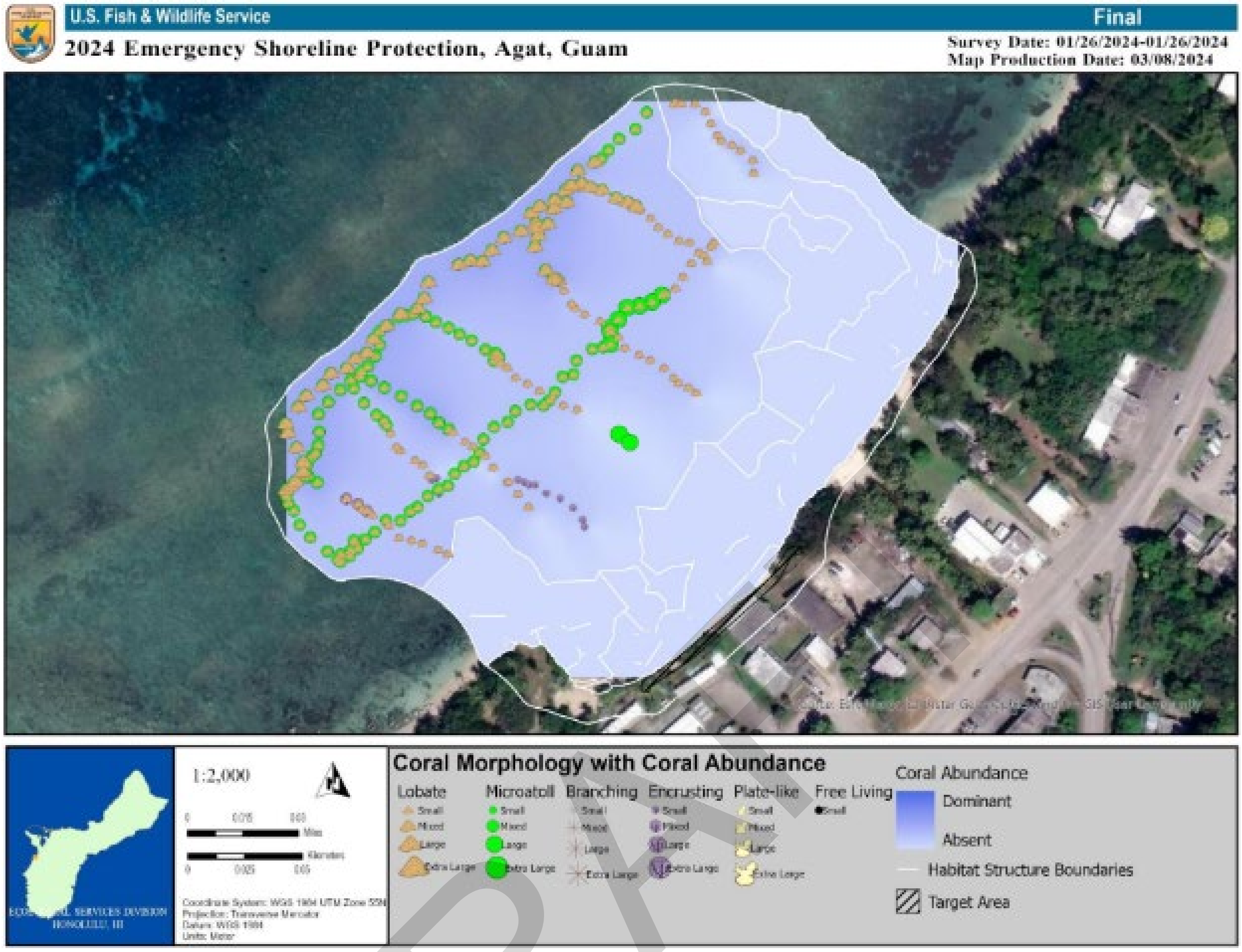

Figure 5: Observed coral morphology and coral abundance in the proposed project area. Figure by USFWS, 2024.

The USFWS surveyed the project area in January 2024.The intertidal region extends 40 feet from the existing seawall and was unconsolidated sediment. The intertidal and submerged substrates were dominated by sand with scattered patches of seagrass and coral more than 150 feet offshore. Species that are listed as management units (Magnuson-Stevens Fishery Conservation and Management Act, MSA 16 U.S Code § 1801 et seq.) or as threatened or endangered (United States Endangered Species Act, ESA 16 U.S Code § 1531 et seq.) were not observed.

F. Proposed Discharge Site Determinations

Construction of the open cell piling seawall would occupy approximately 0.04 acres where the existing seawall currently stands. All excavated material used would be placed behind the wall and not in the marine environment.

G. Determination of Cumulative Effects on the Aquatic Ecosystem

The construction of the open cell piling seawall should not have any different effect on the local ecosystem in the long-term when compared to the current seawall, other than to provide better protection of the shoreline from erosion.

III. FINDINGS OF COMPLIANCE OR NON-COMPLIANCE WITH THE RESTRICTIONS ON DISCHARGE

A. Adaptation of the Section 404(b)(l) Guidelines to this Evaluation

The proposed project complies with the requirements outlined in the Environmental Protection Agency's Guidelines for Specification of Disposal Sites for Dredged or Fill Material.

B. Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site Which Would Have Less Adverse Impact on the Aquatic Resources

If the excavated material is suitable for the purpose, some of it may be used in project construction. All other material will be disposed of in a yet to be determined upland site.

C. Compliance with Applicable State Water Quality Standards

The proposed project will not lead to exceedances of applicable Guam water quality standards.

D. Compliance with Applicable Toxic Effluent Standard or Prohibition Under Section 307 Of the Clean Water Act

No toxic effluents that would affect water quality parameters are associated with the proposed project. Therefore, the project complies with toxic effluent standards of Section 307 of the Clean Water Act.

E. Compliance with Endangered Species Act of 1973

USACE has been in informal consultation with the National Marine Fisheries Service (NMFS) and USFWS, under Section 7 of the Endangered Species Act (ESA). The ESA-listed species that have been considered under this study are summarized in Table 1. The USACE has determined that no listed species will be adversely affected by this project (see Appendix 3, Attachment 2f). USFWS and NMFS have/have not concurred.

Table 1. ESA-Listed Species Potentially Affected by the Proposed Action

Name	Status	Critical Habitat	Jurisdiction	Observed	Effects
Scalloped hammerhead shark *Sphyrna lewini*	Threatened	No	NMFS	No	No Effect
Green sea turtle, *Chelonia mydas*	Endangered	Proposed Not in Action Area	NMFS in ocean. USFWS on land	Yes	NLAA
Hawksbill sea turtle Eretmochelys imbricata	Endangered	Not in Action Area	NMFS in ocean. USFWS on land	No	No Effect
Slevin's Skink *Emoia slevini*	Endangered	No	USFWS	No	No Effect
Mariana Fruit Bat *Pteropus mariannus mariannus*	Endangered	Not in Action Area	USFWS	No	NLAA
Guam Kingfisher *Todiramphus cinnamominus*	Endangered	Not in Action Area	USFWS	No	No Effect
Guam Rail *Gallirallus owstoni*	Endangered	No	USFWS	No	No Effect
Mariana Swiftlet *Aerodramus bartschi*	Endangered	No	USFWS	No	NLAA
Short-tailed Albatross *Phoebastria (Diomedea)*	Endangered	No	USFWS	No	No Effect

Name	Status	Critical Habitat	Jurisdiction	Observed	Effects
albatrus					
small-polyp stony coral *Acropora globiceps*	Threatened	Proposed Not in Action Area	NMFS	No	No Effect
Giant Clam *Tridacna derasa* *T. gigas* *Hippopus hippopus*	Endangered Threatened	No	NMFS	No	No Effect
Fragile Tree Snail *Samoana fragilis*	Endangered	No	USFWS	No	No Effect
Guam Tree Snail *Partula radiolata*	Endangered	No	USFWS	No	No Effect
Humped Tree Snail *Partula gibba*	Endangered	No	USFWS	No	No Effect
Cebello Halumtano *Bulbophyllum guamense*	Threatened	No	USFWS	No	No Effect
Dendrobium guamense	Threatened	No	USFWS	No	No Effect
Tuberolabium guamense	Threatened	No	USFWS	No	No Effect
Ufa-halomtano *Heritiera longipetiolata*	Endangered	No	USFWS	No	No Effect
Fadang *Cycas micronesica*	Threatened	No	USFWS	No	No Effect

F. Evaluation of Extent of Degradation of the Waters of the United States

There are no municipal or private water supplies in the area that could be negatively affected by the proposed project. Commercial interests would benefit from shoreline stabilization. There would be no significant adverse impacts on plankton, fish, shellfish, wildlife, or special aquatic sites.

G. Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem

Shoreline work will be done during low tide and equipment will be operated from the upland area to minimize in-water work. Construction will cease under unusual conditions such as large tidal events and high surf conditions, except for efforts to avoid or minimize resource damage.

Construction will be scheduled for time periods which minimize conflicts with the peak coral spawning season (12 July to 9 August 2027), if practicable.

Sensitive resource areas, such as corals, coral reefs and seagrass beds known to occur within a project area will be identified on project figures. Project staff will be instructed to avoid the sensitive resource areas to the greatest extent practicable, including avoiding anchoring in these areas, flagging the areas if appropriate, and securing all in-water equipment in a manner that will prevent the equipment from being dragged across the substrate.

Construction will incorporate best management practices described in the Guam 2017 Erosion and Sediment Control Field Guide. Silt curtains or other effective containment devices to help contain silt and other suspended particles placed in the water column as a result of excavation and construction activities will be used and properly installed to avoid degradation of adjacent coral reefs, and aquatic vegetation. All deliberately exposed soil or subsoil materials used in the project near water would be protected from erosion and stabilized as soon as possible with geotextile filter fabric or native or non-invasive vegetation matting, hydro-seeding, etc. All disturbed areas must be immediately stabilized following cessation of activities for any break in work longer than 4 days.

All project-related materials and equipment placed in the water will be free of pollutants. Debris and other wastes will be prevented from entering or remaining in the marine environment during the project. Excavation will be restricted to uncontaminated areas.

The maximum amount of material placed shall not exceed the minimum needed for erosion protection. All material will be placed in a manner that will avoid erosion by normal or expected high flows.

Before any equipment or material enters the water, a site manager shall verify that no ESA-listed marine animals are in the area where the equipment or materials are expected to contact the substrate.

Temporary fills will be removed in their entirety. All areas impacted by construction will be stabilized and revegetated with native species as appropriate. All removed trees will be replaced with appropriate native species for the particular location. Large trees, greater than 2-inch diameter at breast height, will be used as much as possible based on nursery availability. Clearing would be confined to the minimal area necessary to facilitate construction activities, while all bare areas would be reseeded and maintained until grass/vegetative cover is established. All areas will be cleaned of any trash and debris and returned, as close as possible, to the condition prior to initiation of project activities.

H. On the Basis of the Guidelines, the Proposed Disposal Site(s) for the Discharge of Dredged or Fill Material is Specified as Complying with the Requirements of these Guidelines.

IV. FINDING OF COMPLIANCE

No significant adaptations of the 404(b)(1) guidelines were made relative to this evaluation. The proposed project would not cause or contribute to significant degradation of waters of the U.S., including adverse effects on human health; life stages of organisms dependent on the aquatic ecosystem; ecosystem diversity; productivity and stability; and recreational, aesthetic, and economic values.

A review of the proposed project indicates that:

1. The discharge represents the least environmentally damaging practicable alternative, and if in a special aquatic site, the activity associated with the discharge must have direct access or proximity to, or be located in the aquatic ecosystem.

____X____ Yes ___________No

2. The activity does not appear to (1) violate applicable state water quality standards or effluent standards prohibited under the CWA, or (2) jeopardize the existence of federally listed endangered or threatened species or designated marine sanctuary.

____X____ Yes ___________No

3. The activity will not cause or contribute to significant degradation of waters of the U.S., including adverse effects on human health; life stages of organisms dependent on the aquatic ecosystem; ecosystem diversity; productivity and stability; and recreational, aesthetic, and economic values.

_____X_____ Yes ___________No

4. Appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem.

_____X______ Yes __________No

Note: A negative response indicates that the proposed project does not comply with the guidelines.7. On the basis of the guidelines the proposed disposal site for the discharge of dredged material is specified as complying with the inclusion of appropriate and practical conditions to minimize pollution or adverse effects to the aquatic ecosystem.

V. REFERENCES

Guam Environmental Protection Agency (GEPA). 2020. Integrated Report.

USACE. 2024. Draft Integrated Feasibility Report and Environmental Assessment, Agat Emergency Shoreline Protection Agat, Guam.

USEPA. 2024. Clean Water Act Section 303(d): Impaired Waters and Total Maximum Daily Loads (TMDLs). https://www.epa.gov/tmdl .

USFWS. 2024. Final Report, Fish and Wildlife Coordination Act Report, Phase 1 Marine Habitat Characterization, Emergency Shoreline Protection, Agat Mayor's Complex, Agat, Guam. April 2024.

Civil and Public Works Branch
Programs and Project Management Division

Ms. Michelle C.R. Lastimoza
Administrator
Guam Environmental Protection Agency
17-3304 Mariner Avenue
Tiyan Barrigada, Guam 96913

Reference: AGAT MAYOR'S COMPLEX SHORELINE PROJECT FEASIBILITY STUDY

Dear Ms. Lastimoza:

The Honolulu District, U.S. Army Corps of Engineers (Corps) has initiated a feasibility study to evaluate measures to protect the Agat Bay shoreline bordering Agat Mayor's Complex, Agat, Guam. The study is authorized under Section 14 of the Flood Control Act of 1946, authorizing the Corps to plan and construct emergency streambank and shoreline protection projects to protect endangered highways, highway bridge approaches, public facilities such as water and sewer lines, churches, public and private nonprofit schools and hospitals, and other nonprofit public facilities. The Government of Guam, represented by the Guam Department of Public Works, is the non-Federal sponsor for this study.

The Corps hosted an interagency coordination meeting on July 17, 2023, that your agency attended, to present the project details and share information regarding resource impacts and concerns in preparation for a National Environmental Policy Act Environmental Assessment. In accordance with Section 401 of the Clean Water Act (33 USC § 1341), USACE acknowledges the requirement to obtain certification from the Guam Environmental Protection Agency (EPA) that any proposed discharges associated with the shoreline protection project will comply with the applicable provisions of the Clean Water Act. However, the details of the feasibility level of conceptual design are inadequate to identify and describe all proposed discharges with sufficient detail to apply for and obtain a Section 401 Water Quality Certification. To account for the lack of information presently available, we are proposing to apply for and obtain a water quality certification from your agency when sufficient detail is available, during the environmental permitting process of the Pre-Construction Engineering and Design Phase that follows this Feasibility Phase. USACE seeks written confirmation acknowledging USACE's coordination of this project with your agency, your agency's potential preliminary findings, if available, and acknowledgement of USACE's plans to obtain a water quality certification at a later date, prior to implementation of the project.

We request your written confirmation within 30 days of the date of this letter. As this study progresses, we will continue to keep your agency apprised of any changes, as appropriate. Should you have any questions or comments, please contact the study project manager, Mr. Michael Terlaje of my Civil and Public Works Branch, at (671) 727-2491 or via email at Michael.J.Terlaje@usace.army.mil. Thank you for your cooperation.

Sincerely,

Digitally signed by
ROUSE.MICHAEL.BARRY
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Date: 2024.09.24
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Michael B. Rouse
Chief, Environmental Resources
Section, Honolulu and Alaska Regional
Planning Team

Civil and Public Works Branch
Programs and Project Management Division

Edwin Reyes
Administrator, Guam Coastal Management Program
Government of Guam, Bureau of Statistics and Plans
P.O. Box 2950
Hagatna, Guam 96932

RE: Coastal Zone Management Act (CZMA) Federal Consistency Review for
U. S. Army Corps of Engineers' Consistency Determination for its proposed Emergency shoreline protection of Agat Mayor's Complex at Agat Bay

Dear Administrator Reyes,

The Honolulu District, United States Army Corps of Engineers (USACE) is investigating the feasibility of emergency shoreline protection of the Municipal Government Headquarters, Agat, Guam pursuant to Section 14 of the Continuing Authorities Program. In accordance with Section 307(c) of the Coastal Zone Management Act of 1972 (16 USC § 1456), USACE understands that the proposed development project that may affect coastal uses and/or resources is subject to review by your office, to ensure consistency with the Guam Coastal Zone Management (CZM) Program.

Currently, the Municipal Government Headquarters of Agat, commonly referred to as the "mayor's office," is located directly on the coastline and under threat of coastal erosion. The furthest oceanward building in the mayor's office complex is just a few feet from a concrete rock masonry (CRM) seawall that protects it from the eroding shoreline. Adjacent to the mayor's office is another community facility, Agat Sagan Bisita, with pavilions along the shoreline and an adjoining section of CRM seawall. This CRM seawall is deteriorating and is also at risk of overtopping during high wave events. The recommended TSP for this project is an open cell piling seawall, as described in the attached Integrated Feasibility Report and Environmental Assessment. This alternative will replace the existing CRM seawall at its current footprint. At this time, construction of project features will be predominately upland of the seawall with limited and temporary work occurring in the intertidal zone for site preparation.

USACE has reviewed the enforceable policies of the Guam Coastal Management Program and determined that based on the described activities have a range of coastal effects, some of which may include reasonably foreseeable effects on coastal uses or resources or direct or indirect environmental benefits and determined that the proposed federal action is consistent, to the maximum extent practicable, with the Guam CZM Program. USACE seeks your concurrence on this determination. Transmitted with this letter is the Guam CZM Program Assessment and Supplemental Information Form (Enclosure 1) for your review and the draft Integrated Feasibility Report and NEPA Document (Enclosure 2) for your reference.

Should you have any questions or comments, please reference the Agat Emergency Shoreline Protection Project, and contact either our Environmental Planner, Ms. Connie Chan-Le at (808) 289-5746 or via email at connie.g.chanle@usace.army.mil or the Project Manager, Mr. Mike Terlaje at (671) 727-2491 or via email at michael.j.terlaje@usace.army.mil. Thank you for your cooperation.

Sincerely,

Digitally signed by ROUSE.MICHAEL.BARRY .1155134743
Date: 2024.09.24 16:10:27 -08'00'

Michael B. Rouse
Chief, Environmental Resources Section, Hawaii and Alaska Regional Planning Team Enclosures

Enclosures

The GCMP Assessment Format and Supplemental Information Form may be reproduced and submitted along with other required information to the BSP.

GUAM COASTAL MANAGEMENT PROGRAM ASSESSMENT

DATE OF APPLICATION:_24 September 2024_____________________

NAME OF APPLICANT:__U.S. Army Corps of Engineers (USACE), Honolulu District_______

ADDRESS: 230 Otake Street, Fort Shafter, HI 96858-5440__________________

TELEPHONE NO.__808-835-4018__ Fax No. __N/A_____ Cell No: 808-289-5746__

E-MAIL ADDRESS: connie.g.chanle@usace.army.mil_____________________

TITLE OF PROPOSED PROJECT: Agat Mayors Complex CAP 14 Emergency Shoreline Protection

COMPLETE FOLLOWING PAGES

FOR BUREAU OF STATISTICS AND PLANS ONLY:

DATE APPLICATION RECEIVED:____

OCRM NOTIFIED: ________________ LIC. AGENCY NOTIFIED:_______________________

APPLICANT NOTIFIED: ___________ PUBLIC NOTICE GIVEN:________________________

OTHER AGENCY REVIEW REQUESTED:____

____

____

DETERMINATION:

( ) CONSISTENT ( ) NON-CONSISTENT ( ) FURTHER INFORMATION REQUESTED

OCRM NOTIFIED: ______________LIC. AGENCY NOTIFIED:__________________________

APPLICANT NOTIFIED: ____

ACTION LOG:

1.____

2.____

3.____

4.____

5.____

6.____

DATE REVIEW COMPLETED: ____

FEDERAL CONSISTENCY SUPPLEMENTAL INFORMATION FORM

Date: __24 September 2024__

Project/Activity Title or Description: __Agat Mayors Complex CAP 14 Emergency Shoreline Protection__

The Recommended Plan is the construction of an open cell piling seawall with a structure footprint length and width of 320 ft long by 6 ft wide where an existing CRM seawall currently stands (Figures 1 and 2) anchored 5 feet into bedrock with 2 inch diameter pin piles. The cells of the vinyl sheet piles will be backfilled with reinforced concrete and the wall anchored with 10 foot tieback rods every 8 feet for the length of the seawall. The finished seawall will have a top elevation of 6 ft above Mean Sea Level (MSL), depth elevation of -6 ft MSL, and width of 6 ft. The top crest elevation needed for the design to meet the USACE 50-year design requirement for sea level change (SLC) and be adaptable to 100-year SLC under the intermediate scenario is 6ft above MSL, approximately the same height as the existing seawall. The Open Cell Piling Seawall will be approximately 6 ft wide, constructed parallel to the shoreline and extending seaward. The footprint provided for the seawall in Figure 1 shows the maximum extent that could be needed for construction, excavation 6 inches landward of the existing seawall. The footprint of the finished open cell piling seawall is estimated to be 1760 square feet. Excavation, grading, structure demolition, tree and foliage removal, staging, and upland buffer areas are expected to increase the total project footprint to 2.38 ac.

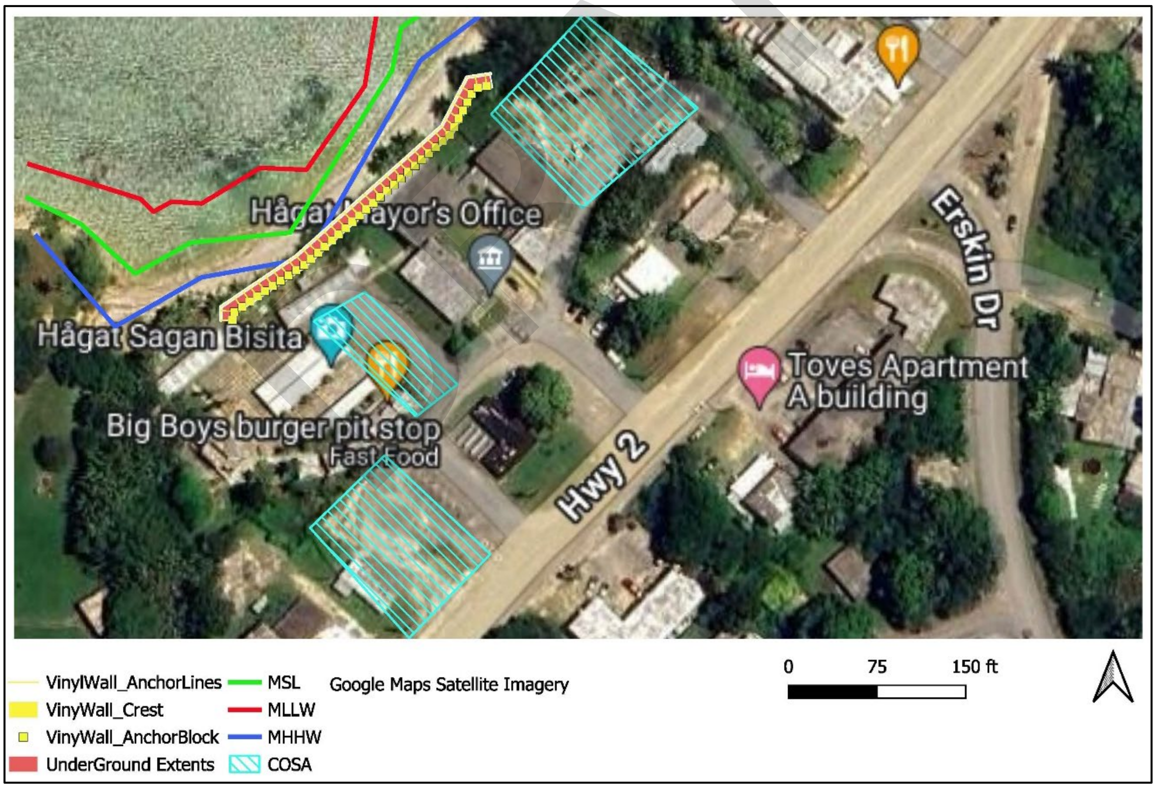

Figure 1: Proposed Project Area: The proposed active construction (yellow and red polygon) and staging areas (COSAs; blue striped polygons) along Agat shoreline. Redline indicates mean lower low water (MLLW), green line indicates mean sea level (MSL), blue line indicates mean higher high water (MHHW). USACE, 2024.

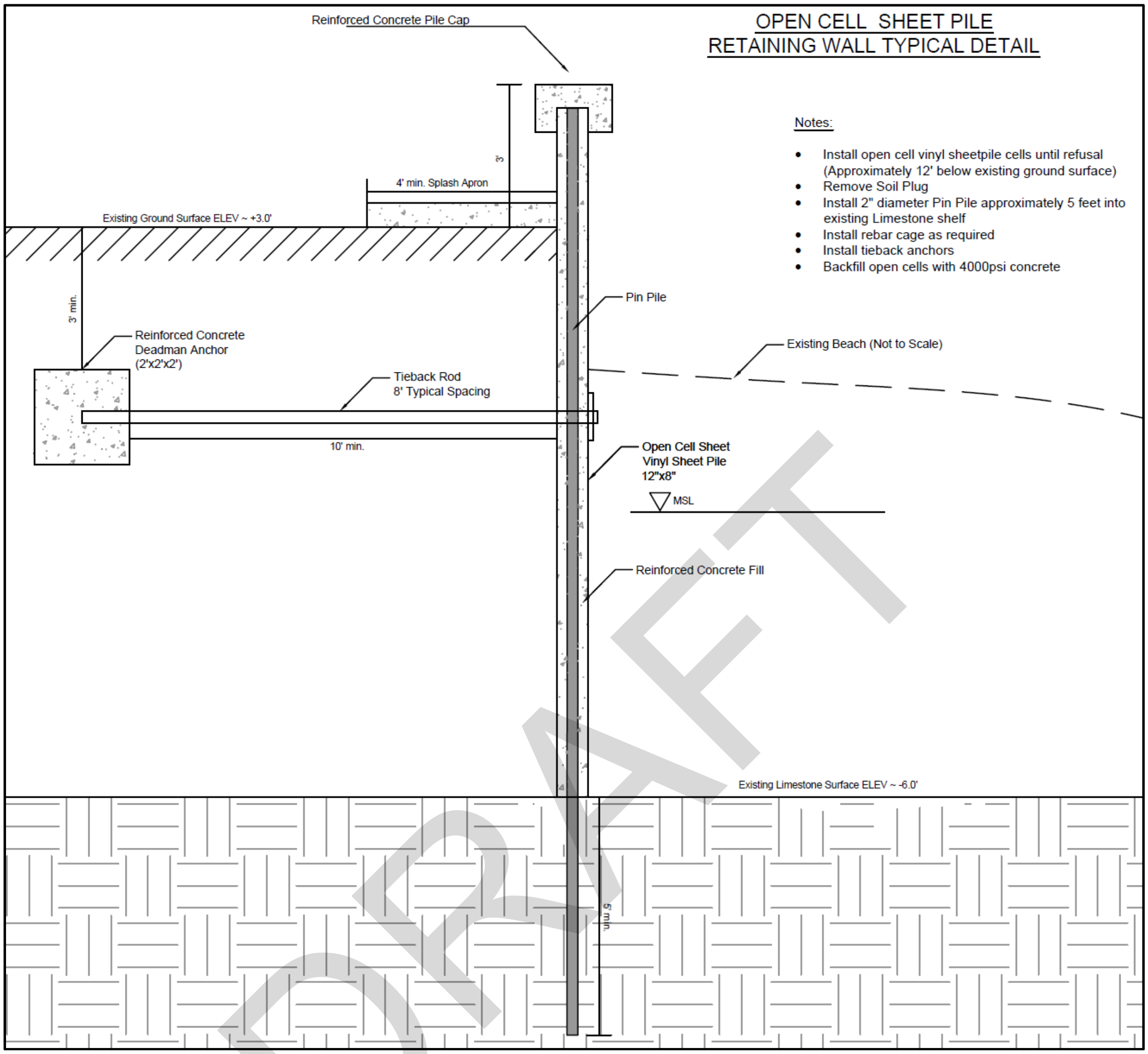

Figure 2: Open Cell Piling Seawall cross section, showing where MSL will potentially intersect with the structure. USACE, 2024.

The open cell piling seawall will be 320 ft long and consist of 1 ft wide vinyl cells filled with reinforced concrete installed to the consolidated limestone shelf. The individual wall panels will be anchored with a 2-inch diameter pin pile installed into the limestone. The seawall will have a 2 ft wide pile cap and a 4 ft wide splash apron, and it will have a top elevation of approximately 6 ft MSL and will extend down to -6 ft MSL. The height of the seawall will be about 12 ft above the limestone, 4 to 6 feet above the beach sand, with the top of the seawall will be approximately 3 ft above the existing grade of the mayor’s complex.

Location: 320 linear feet of existing sea wall along the shoreline of Agat Mayor’s Complex and Sagan Bisita

Other applicable area(s) affected, if appropriate:

____

Est. Start Date: _2027________________ Est. Duration:________6 months_____________

APPLICANT

Name & Title__Connie Chan-Le, Environmental Planner_____________________________

Agency/Organization: __U. S. Army Corps of Engineers, Honolulu District______________

Address ____230 Otake Street, _______________________________________

______Fort Shafter, HI_________________ Zip Code_ 96858-5440_

Telephone No. during business hours:

C: 808-289-5746

Fax (____) ____________________

E-mail Address: ___connie.g.chanle@usace.army.mil______

AGENT

Name & Title ______________________________________

Agency/Organization Address______________________________ Zip Code______________

Telephone No. during business hours:

A/C (___) ____________________

A/C (___) ____________________

Fax (___) ____________________

E-mail Address: _____________________________

CATEGORY OF APPLICATION (check one only)

(X) I - Federal Agency Activity

( ) II - Federal Permit or License

( ) III - Federal Grants & Assistance

TYPE OF STATEMENT (check one only)

(X) Consistency

( ) General Consistency (Category I only)

( ) Negative Determination (Category I only)

( ) Non-Consistency (Category I only)

APPROVING FEDERAL AGENCY (Categories II & III only)

Agency ____

Contact Person ____

Telephone No. during business hours:

Area Code ( )______________________________

Area Code ( )______________________________

FEDERAL AUTHORITY FOR ACTIVITY

Title of Law_____The 1946 Flood Control Act, as amended (33 USC 701r) for Emergency Shoreline Protection under the Continuing Authorities Program ____________________

Section ________Section 14____

OTHER GUAM APPROVALS REQUIRED:

Date of	**Agency**	**Type of Approval**	**Application Status**
2026	Guam EPA	Clean Water Act Section 401 Water Quality Certification	To be submitted after Preconstruction Engineering & Design in 2026 and before start of construction in 2027

DEVELOPMENT POLICIES (DP):

DP 1. Shore Area Development

Intent: To ensure environmental and aesthetic compatibility of shore area land uses.

Policy: Only those uses shall be located within the Seashore Reserve which:

- enhance, are compatible with or do not generally detract from the surrounding coastal area's aesthetic and environmental quality and beach accessibility; or
- can demonstrate dependence on such a location and the lack of feasible alternative sites.

Discussion: Consistent. The proposed project is located within the Seashore Reserve and is necessary to reduce beach erosion and coastal storm risk along the Agat Bay shoreline. An existing seawall, protecting Agat Mayor’s Complex and Sagan Bisita, is in need of repair. The Recommended Plan proposes to replace the damaged seawall to restore protection to the existing development ensures the environmental and aesthetic compatibility of shore area land uses. The Recommended Plan must occur within the Seashore Reserve because that is the location of the current seawall and relocating Agat Mayor’s Complex and Sagan Bisita is not possible within funding and authorization constraints. The Recommended Plan replaces 70% of the existing seawall and therefore ensures environmental and aesthetic compatibility of the existing shore area land uses.

See Section 2 of the Agat Mayor’s Complex Emergency Shoreline Protection IFR/EA for more information about the existing shoreline and Section 4 for more information on the potential project effects on the shoreline.

DP 2. Urban Development

Intent: To cluster high impact uses such that coherent community design, function, infrastructure support and environmental compatibility are assured.

Policy: Commercial, multi-family, industrial and resort-hotel zone uses and uses requiring high levels of support facilities shall be concentrated within appropriate zone as outlined on the Guam Zoning Code.

Discussion: Consistent. The project occurs in the already developed urban area of Agat. A seawall already exists in the Shore Area as protection for the Agat Mayor’s Complex and Sagan Bisita, and associated infrastructure. This project is a replacement of the existing damaged seawall to provide increased protection to the existing development.

See section 2.4.2 of the Agat Mayor’s Complex Emergency Shoreline Protection IFR/EA for more information about the existing land use and section 4.3.2 for more information on the potential project effects on land use.

DP 3. Rural Development

Intent: To provide a development pattern compatible with environmental and infrastructure support suitability and which can permit traditional lifestyle patterns to continue to the extent practicable.

Policy: Rural districts shall be designated in which only low density residential and agricultural uses will be acceptable. Minimum lot size for these uses should be one-half acre until adequate infrastructure including functional sewering is provided.

Discussion: Not Applicable. The project occurs in the already developed urban area of Agat Mayor's Complex. The project area does not have rural land use designation.

See section 2.4.2 of the Agat Mayor's Complex Emergency Shoreline Protection IFR/EA for more information about the existing land use and section 4.3.2 for more information on the potential project effects on land use.

DP 4. Major Facility Siting

Intent: To include the national interest in analyzing the siting proposals for major utilities, fuel and transport facilities.

Policy: In evaluating the consistency of proposed major facilities with the goals, policies, and standards of the Comprehensive Development and Coastal Management Plans, Guam shall recognize the national interest in the siting of such facilities, including those associated with electric power production and transmission, petroleum refining and transmission, port and air installations, solid waste disposal, sewage treatment, and major reservoir sites.

Discussion: Not Applicable. The project is a seawall replacement and does not meet the definition of a major facility.

DP 5. Hazardous Areas

Intent: Development in hazardous areas will be governed by the degree of hazard and the land use regulations.

Policy: Identified hazardous lands, including flood plains, erosion-prone areas, air installations' crash and sound zones and major fault lines shall be developed only to the extent that such development does not pose unreasonable risks to the health, safety or welfare of the people of Guam, and complies with the land use regulations.

Discussion: Consistent. The project area is identified as a coastal high hazard flood zone (Zone VE - 1% Annual Chance Flood Hazard) in the FEMA Flood Insurance Rate Maps. The proposed project is water dependent and in order to reduce beach erosion and coastal storm risk, the locale in direct proximity to the waterline is necessary. Project activities within the flood zone would comply with all applicable laws and regulations. The project is not located in geologically unstable zones, such as cliff lines or severe slopes. The construction of the proposed project would reduce the risk to human life and safety and facilitate floodplain management.

See section 2.2 of the Agat Mayor's Complex Emergency Shoreline Protection IFR/EA for more information about the existing physical environment and section 4.1 for more information on the potential project effects on the physical environment.

DP 6. Housing

Intent: To promote efficient community design placed where the resources can support it.

Policy: The government shall encourage efficient design of residential areas, restrict such development in areas highly susceptible to natural and manmade hazards, and recognize the limitations of the island's resources to support historical patterns of residential development.

Discussion: Not Applicable. The project is a seawall replacement and does not include housing.

DP 7. Transportation

Intent: To provide transportation systems while protecting potentially impacted resources.

Policy: Guam shall develop an efficient and safe transportation system, while limiting adverse environmental impacts on primary aquifers, beaches, estuaries, coral reefs and other coastal resources.

Discussion: Consistent. The project protects potentially impacted transportation resources. The project is the replacement of an existing seawall providing protection to Agat Mayor's Complex and Sagan Bisita and other existing infrastructure. While construction of the rock open cell piling seawall will have temporary effects on the nearshore marine environment during construction, best management practices will be used to minimize temporary effects to the maximum extent practicable and to ensure no lasting effects to coastal resources of Agat Bay.

See section 2 of the Agat Mayor's Complex Emergency Shoreline Protection IFR/EA for more information about the existing coastal resources and section 4 for more information on the potential project effects on the coastal environment.

DP 8. Erosion and Siltation

Intent: To control development where erosion and siltation damage is likely to occur.

Policy: Development shall be limited in areas of 15% or greater slope by requiring strict compliance with erosion, sedimentation, and land use regulations, as well as other related land use guidelines for such areas.

Discussion: Consistent. The proposed project is water dependent and in order to reduce beach erosion and coastal storm risk, the locale in direct proximity to the waterline is necessary. The project is replacement of an existing seawall providing protection to Agat Mayor's Complex and Sagan Bisita and other existing infrastructure. While construction of the open cell piling seawall will have temporary minimal effects on the nearshore marine environment during construction, best management practices will be used to minimize temporary effects such as elevated turbidity to the maximum extent practicable and to ensure no lasting effects to Agat Bay.

See section 2.1 of the Agat Mayor's Complex Emergency Shoreline Protection IFR/EA for more information about the existing physical environment, section 4.1 for more information on the potential project effects on the physical habitat, and Attachment 6 of Appendix 3 for best management practices to be used to minimize effects.

RESOURCES POLICIES (RP):

RP 1. Air Quality

Intent: To control activities to ensure good air quality.

Policy: All activities and uses shall comply with all local air pollution regulations and all appropriate Federal air quality standards in order to ensure the maintenance of Guam's relatively high air quality.

Discussion: Consistent. The proposed project would comply with all air and water quality laws, including the implementation of BMPs. Construction vehicles would be operated in accordance with the provisions of the Clean Air Act. The proposed action would not include the disposal of any hazardous substances into the air or other media.

See section 4.1.2 of the Agat Mayor's Complex Emergency Shoreline Protection IFR/EA for more information on the potential project effects on air quality, section 4.1.4 for potential effects on water quality, Attachment 8 of Appendix 3 for best management practices to be used to minimize effects and Section 3.3 of Appendix 3 for discussion of project compliance with the Clean Water Act and Clean Air Act.

RP 2. Water Quality

Intent: To control activities that may degrade Guam's drinking, recreational, and ecologically sensitive waters.

Policy: Safe drinking water shall be assured and aquatic recreation sites shall be protected through the regulation of uses and discharges that pose a pollution threat to Guam's waters, particularly in estuaries, reef and aquifer areas.

Discussion: The proposed project is water dependent and in order to reduce beach erosion and coastal storm risk, the locale in direct proximity to the waterline is necessary. Construction would strictly comply with erosion, sedimentation, and related land and water use districting guidelines, as well other related land and water use policies. USACE would operate in accordance with the provisions of the Clean Water Act and all other local and Federal policies governing water pollution. The proposed action would not include the disposal of any hazardous substances into the water or other media. BMPs would be in place to minimize the accidental release of materials into the waterways. A Clean Water Act (CWA) 404(b)(1) analysis can be found in Appendix 3, Attachment 4a of the IFR/EA. The open cell piling seawall would temporarily impact approximately 80 square feet below the MHHW line, which represents the jurisdictional boundary of the CWA. Avoidance, minimization, and conservation measures established by the Permit and IFR/EA would be implemented to reduce effects to water quality (see Attachment 8 of Appendix 3 for detailed mitigation strategies). Since the total disturbance would be greater than one acre, the contactor would be required to obtain a Construction General Permit (Section 402 of the CWA, 33 U.S.C. § 1342; 40 C.F.R. § 122.26), implement stormwater controls, and prepare a Stormwater Pollution Prevention Plan (SWPPP) to minimize the amount of sediment and other pollutants associated with construction sites from being discharged in stormwater runoff. Temporary erosion control BMPs would be used, such as straw wattles, silt curtains, or erosion matting to prevent sediment runoff into the bay. The proposed project would comply with all air and water quality laws, including the implementation of BMPs. Construction vehicles would be operated in accordance with the provisions of the Clean Air Act. The proposed action would not include the disposal of any hazardous substances into the air or other media. The project would comply with all appropriate Federal and local policies to ensure that subsurface work would have no impact on groundwater. The proposed project does not include the drilling or operation of wells.

See section 2.2.4 of the Agat Mayor's Complex Emergency Shoreline Protection IFR/EA for more information about the existing water quality, section 4.1.4 for more information on potential project impacts on water quality; sections 2.2.3 for hydrology, hydraulics, and geomorphology of the area; section 2.2.2 for air quality; Attachment 8 of Appendix 3 for avoidance and minimization mitigation implementation, and Section 3 of Appendix 3 for discussion of project compliance with the Clean Water Act and Clean Air Act.

RP 3. Fragile Area

Intent: To protect significant cultural areas, and natural marine and terrestrial wildlife and plant habitats.

Policy: Development in the following types of fragile areas including Guam's Marine Protected Areas (MPA) shall be regulated to protect their unique character.

- historical and archeological sites
- wildlife habitats
- pristine marine and terrestrial communities
- limestone forests
- mangrove stands and other wetlands
- coral reefs

Discussion: Consistent. The proposed project does not occur in an MPA, pristine marine and terrestrial communities, limestone forests, mangrove stands, other wetlands or coral reefs.

No known historic properties have formally been reported within the Area of Potential Effect (APE) at this time; however, consultation has identified at least one burial within the APE and there is a likelihood that subsurface cultural resources and/or other burials exist that could be impacted by construction along the shoreline. Consultation with the Guam State Archaeologist identified additional cultural resources and burial locations that have not yet been formally reported (J. M. Joseph, pers. comm. 2022). USACE has therefore proposed to conduct a phased identification and evaluation effort pursuant to 36 CFR § 800.4(b)(2) and to develop a Memorandum of Agreement (MOA) in accordance with 36 CFR § 800.6 that will identify actions to minimize or mitigate significant impacts as required. The project will be developed in compliance with Section 106, NHPA. See section 4.5 of the Agat Mayor's Complex Emergency Shoreline Protection IFR/EA for more information on potential project impacts to cultural, historic, and archeological resources.

The project is water dependent and in order to reduce beach erosion and coastal storm risk, the locale in direct proximity to the waterline is necessary. Since the coral reef lies approximately 100 yards offshore, the proposed activities would not take place within or near reefs. There would be no direct negative effect on living marine resources. There would be no change to water flow, nutrient levels, or other natural processes that would in turn impact the reefs. Standard best management practices (BMPs) would be used during construction to prevent siltation in the lagoon. Standard BMPs would be used as necessary during construction to minimize effects.

The project area is on public land with no residential dwellings. The proposed project would be built on a sandy shoreline next to a pre- existing structure (a pedestrian walkway). Standard avoidance, minimization, and conservation measures such as a pre-construction surveys would be used to avoid any significant impact to wildlife. This proposed project is designed to prevent shoreline erosion.

See section 4 of the Agat Mayor's Complex Emergency Shoreline Protection IFR/EA for more information on potential project impacts affecting the hydrology, hydraulics, and geomorphology of the area, including potential effects to the island shoreline. For more information on potential effects to coral reefs, refer to section 4.2 in the Agat Mayor's Complex Emergency Shoreline Protection IFR/EA.

RP 4. Living Marine Resources

Intent: To protect marine resources in Guam's waters.

Policy: All living resources within the waters of Guam, particularly fish, shall be protected from over harvesting and, in the case of corals, sea turtles and marine mammals, from any taking whatsoever.

Discussion: Consistent. The proposed project would take place in accordance with the requirements of the Endangered Species Act, the Fish and Wildlife Coordination Act, Clean Water Act, National Environmental Policy Act and the Essential Fish Habitat Provisions of the Magnuson Stevens Act. The proposed project would not result in the degradation of wildlife habitat or harm the function or integrity of the reefs or seagrass beds in Agat Bay. The Agat Mayor's Complex Emergency Shoreline Protection IFR/EA further discusses potential effects to federally protected natural resources, as well as avoidance and minimization measures to reduce these effects. No part of the project would involve the take or collection of fish, marine mammals, or Guam listed species for any purpose. No part of the proposed project would be perceptible to fish, marine mammals, or species on the Guam endangered species list, or otherwise significantly affect their behavior or the quality of their habitat.

See section 4.2 of the Agat Mayor's Complex Emergency Shoreline Protection IFR/EA for more information on potential project impacts to marine habitat and species, and special-status species. See Attachment 8 of Appendix 3 for discussion of mitigation measures that would minimize many adverse environmental impacts.

RP 5. Visual Quality

Intent: To protect the quality of Guam's natural scenic beauty

Policy: Preservation and enhancement of, and respect for the island's scenic resources shall be encouraged through increased enforcement of and compliance with sign, litter, zoning, subdivision, building and related land-use laws. Visually objectionable uses shall be located to the maximum extent practicable so as not to degrade significant views from scenic overlooks, highways and trails.

Discussion: Consistent. The proposed project would preserve the scenic resources of the Commonwealth, and would be in compliance with sign, litter, zoning, building codes, and related land use laws. The proposed seawall would raise the height of the existing seawall by 0 to 3 feet depending on location (the current wall ranges in height from 3 to 6 feet) to ensure adequate structural integrity and in consideration of climate change. The minor change in elevation would not obstruct or degrade scenic views.

See section 4.7 of the Agat Mayor's Complex Emergency Shoreline Protection IFR/EA for more information on potential project effects to aesthetics and visual resources.

RP6. Recreation Areas

Intent: To encourage environmentally compatible recreational development.

Policy: The Government of Guam shall encourage development of varied types of recreational facilities located and maintained so as to be compatible with the surrounding environment and land uses, adequately serve community centers and urban areas and protect beaches and such passive recreational areas as wildlife, marine conservation and marine protected areas, scenic overlooks, parks, and historical sites.

Developments, activities and uses shall comply with the Guam Recreational Water Use Management Plan (RWUMP).

Discussion: Consistent. The proposed activities would allow recreational and subsistence usage and includes the incorporation of maintaining existing access to the beach. The open cell piling seawall would reduce the risk of shoreline erosion from harming the Bay and reefs. There would be no significant effects to the Bay or reefs from either alternative. The sea grass beds off the shore would be preserved and the quality and value of the beds would not be degraded. Standard best management practices (BMPs) would be used during construction to prevent siltation in the bay. There would be no effect on areas of historical and cultural significance.

The proposed project would not preclude or inhibit the development or enhancement of recreational facilities compatible with the surrounding environment. The project would protect the recreational infrastructure along Agat Mayor’s Complex and Sagan Bisita.

See section 4.2 of the Agat Mayor’s Complex Emergency Shoreline Protection IFR/EA for more information on effects to marine resources.

RP 7. Public Access

Intent: To ensure the right of public access.

Policy: The public's right of unrestricted access shall be ensured to all non-federally owned beach areas and all Guam recreation areas, parks, scenic overlooks, designated conservation areas and their public lands. Agreements shall be encouraged with the owners of private and federal property for the provision of releasable access to and use of resources of public nature located on such land.

Discussion: Consistent. Means of Public Access to the shoreline are part of the Project Design and neither proposed alternative would disrupt existing public access. Public Access may be temporarily impacted during construction but would not be permanently interrupted or otherwise affected by the proposed federal action. The proposed wall is designed at a slope to allow walking along its surface.

See section 4.3 of the Agat Mayor’s Complex Emergency Shoreline Protection IFR/EA for more information on potential project impacts on public access.

RP 8. Agricultural Lands

Intent: To stop urban types of development on agricultural land.

Policy: Critical agricultural land shall be preserved and maintained for agricultural use.

Discussion: Not applicable. The proposed action would not take place on or near commercial or private agricultural lands, including grazing lands. The project area is urban and has no neighboring agricultural activities or landuse designations.

References

Bureau of Statistics and Plans – Guam Coastal Management Program (BSP-GCMP). 2020. 2021-2025 Section 309 Assessment and Strategy Report. https://bsp.guam.gov/wp-bsp-content/uploads/2021/05/GCMP_Section309_2020_FINAL_er-2.12.2021.pdf

BSP-GCMP. 2011. Procedures Guide for Achieving Federal Consistency with the Guam Coastal Management Program.

Burdick, D.R. 2005. Guam Coastal Atlas. 149 pages. https://www.uog.edu/_resources/files/ml/technical_reports/114Burdick_2005_UOGMLTechReport114.pdf.

Project Development Team (PDT). 2022. Trip Report.

USACE. 2024. Agat Mayor's Complex Emergency Shoreline Protection Draft Integrated Feasibility Report ad NEPA Document.

Conclusion

Based upon the above information, data and analysis USACE finds that the proposed federal action is consistent to the maximum extent practicable with the enforceable policies of the Guam Coastal Zone Management Program. Pursuant to 15 CFR § 930.41, the Guam Coastal Management Program has 60 days from the receipt of this letter in which to concur with or object to this Consistency Determination, or to request an extension under 15 CFR §930.41(b). The State's concurrence will be presumed if the State's response is not received by the USACE on the 60th day from receipt of this determination.

We request that the Guam CZM Program response, or any questions or concerns regarding the proposed activities, be sent to Connie Chan-Le at connie.g.chanle@usace.army.mil.

CZMA Federal Consistency Certification

August 29, 2023

CEPOA-PMC-E

Joseph Quinata
Chief Program Officer
Guam Preservation Trust
P.O. Box 3036
Hagatna, GU 96932

Dear Mr. Quinata:

The U.S. Army Corps of Engineers (USACE), Honolulu District, is conducting a study to determine the feasibility of shoreline protection in Agat (Hågat), Guam. The feasibility study is being conducted in partnership with the Government of Guam. In compliance with Section 106 of the National Historic Preservation Act of 1966, as amended, the purpose of this letter is to notify you of a Federal undertaking [36 CFR § 800.3(f)].

You are receiving this letter because we believe that the Guam Preservation Trust may have an interest in cultural resources in the general project area. A letter addressed to the Guam State Historic Preservation Officer, which provides more information about the project area and anticipated timeline, is enclosed. We invite you to bring any relevant cultural resources concerns or information to our attention.

If you have any questions or concerns about this study, please contact me by phone at 907-753-2640 or by email at Tyler.J.Teese@usace.army.mil.

Sincerely,

Tyler. J. Teese
Archaeologist
Environmental Resources Section
Alaska District

August 29, 2023

CEPOA-PMC-E

Melvin Won Pat-Borja
President
Guam Department of Chamorro Affairs
P.O. Box 2950
Hagatna, GU 96932

Dear President Won Pat-Borja:

The U.S. Army Corps of Engineers (USACE), Honolulu District, is conducting a study to determine the feasibility of shoreline protection in Agat (Hågat), Guam. The feasibility study is being conducted in partnership with the Government of Guam. In compliance with Section 106 of the National Historic Preservation Act of 1966, as amended, the purpose of this letter is to notify you of a Federal undertaking [36 CFR § 800.3(f)].

You are receiving this letter because we believe that the Department of Chamorro Affairs may have an interest in cultural resources in the general project area. A letter addressed to the Guam State Historic Preservation Officer, which provides more information about the project area and anticipated timeline, is enclosed. We invite you to bring any relevant cultural resources concerns or information to our attention.

If you have any questions or concerns about this study, please contact me by phone at 907-753-2640 or by email at Tyler.J.Teese@usace.army.mil

Sincerely,

Tyler J. Teese
Archaeologist
Environmental Resources Section
Alaska District

DEPARTMENT OF THE ARMY
ALASKA DISTRICT, U.S. ARMY CORPS OF ENGINEERS
P.O. BOX 6898
JBER, AK 99506-0898

August 28, 2023

CEPOA-PMC-E

Mr. Patrick Lujan
State Historic Preservation Officer
Guam Historic Resources Division
Department of Parks and Recreation
490 Chalan Palasyo
Agana Heights, GU 96910

Dear Mr. Lujan:

The U.S. Army Corps of Engineers (USACE), Honolulu District, is conducting a study to determine the feasibility of shoreline protection in Agat (Hågat), Guam. More specifically, the project will focus on approximately 450 feet of the beach along the west side of the Agat Mayor's Office and Sagan Biseta (Figure 1). In compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (54 USC § 306108), the purpose of this letter is to notify you of a Federal undertaking [36 CFR § 800.3(c)(3)].

Authority

USACE is conducting this study under the Continuing Authorities Program (CAP), as authorized by Section 14 of the 1946 Flood Control Act, as amended (33 USC § 701r). The Federal Interest Determination for this project was approved by the USACE Pacific Ocean Division on February 14, 2022 The study timeline is meant to comply with USACE Engineering Pamphlet 1105-2-58.

Study Timeline

On January 11, 2022, USACE conducted a Site Visit at the proposed project area to delineate the extent of shoreline erosion and further clarify study boundaries. Personnel from the Guam Historic Resources Division were able to attend the virtual Charette for this project that was held July 18–19, 2023. We submitted our most recent Request for Assistance to your office on July 27, 2023, requesting clarification on cultural resources near the Agat Mayor's Office. Over the next few months, USACE and its Non-Federal Sponsor, the Government of Guam, will develop an array of alternatives based upon those developed at the Charette that can address the shoreline erosion.

Figure 1. Agat project area, Guam (red line is approximate erosion study area).

We anticipate that these potential alternatives will be narrowed down to a Tentatively Selected Plan (TSP) in December 2023. At that time, USACE will assess the potential effect of the proposed TSP on historic properties within the Area of Potential Effect and seek your consultation and concurrence on our assessment. A Public Comment Period on the Draft Feasibility Study & Integrated Environmental Assessment is anticipated to begin in February 2024. If you have any questions or concerns about this study, please contact me by phone at 907-753-2640 or by email at Tyler.J.Teese@usace.army.mil.

Sincerely,

Tyler J. Teese
Archaeologist
Environmental Resources Section
Alaska District

cc:
Mr. John Mark Joseph, State Archaeologist, Guam Historic Resources Division
Mr. Joseph Quinata, Chief Program Officer, Guam Preservation Trust
Mr. Melvin Won Pat-Borja, President, Guam Department of Chamorro Affairs

March 20, 2024

CEPOA-PMC-E

Mr. Patrick Lujan
State Historic Preservation Officer
Guam Historic Resources Division
Department of Parks and Recreation
490 Chalan Palasyo
Agana Heights, GU 96910

Dear Mr. Lujan:

The U.S. Army Corps of Engineers (USACE), Honolulu District, is conducting a study to determine the feasibility of shoreline protection along the beach in front of the municipal government headquarters (Agat Mayor's Compound) in Hågat on the island of Guam. The tentatively selected plan, an open cell piling seawall, would be placed along approximately 320 feet (ft) of the beach bordering the Agat Mayor's Compound (Figure 1). The proposed open cell piling seawall constitutes an undertaking pursuant to 36 CFR § 800.3(a) and therefore requires consultation under Section 106 of the National Historic Preservation Act (54 USC § 306108). In compliance with the implementing regulations of Section 106 of the NHPA, the purpose of this letter is to seek your concurrence on an assessment of effect (36 CFR § 800.5[b]).

Study Authority

USACE is conducting this study in coordination with its Non-Federal Sponsor, the Government of Guam, under the Continuing Authorities Program (CAP) authorized by Section 14 of the 1946 Flood Control Act, as amended (33 USC § 701r). The Federal Interest Determination for this project was approved by the USACE Pacific Ocean Division on July 2022. The Government of Guam and USACE Honolulu District executed a Federal Cost Share Agreement for this study on February 24, 2023. For the purposes of compliance with Section 106 of the NHPA, USACE is the lead agency.

Project Description

The existing seawall along the Agat shoreline which protects the Agat Mayor's Compound has been severely compromised by erosion and is largely ineffective during storm events (Figures 2 and 3). This seawall was constructed in the 2000s (Mayor Kevin J.T. Susuico, personal communication 2022). To address this erosion, USACE and the Government of Guam propose to replace approximately 320 linear ft of the existing seawall with an open cell piling seawall (Figure 4).

Figure 1. Agat Shoreline Protection study area in Hågat, Guam.

Figure 2. Existing seawall along the Agat shoreline; damaged rock and brickwork visible.

Figure 3. Existing seawall at the Agat shoreline facing the War in the Pacific National Park at Ga’an Point.

The proposed undertaking consists of 320-ft long open cell piling seawall with tie-back anchors. The ends of the seawall will curve back (inland) to protect against wave attack. The total height of the seawall will be approximately 20 ft, although only about 3 ft of the seawall will be visible above ground level. The crest of the seawall will be approximately 2 ft wide, with a sloped, 4-ft wide splash apron running along the back (inland) side of the seawall. The splash apron will sit atop gravel fill. After the existing seawall is removed, the new open cell piling seawall will be installed by driving plastic open cell (modified diaphragm) columns into the ground with a vibratory or impact hammer until they hit refusal at what is anticipated to be limestone bedrock. The soil within each column will then be removed with pressurized water, and a 3-inch diameter drill will bore approximately 5 ft further into the bedrock. A 2-inch diameter steel pin-pile will then be inserted into bedrock and extend the entire length of the column. The column will then be backfilled with concrete reinforced with rebar.

The tie-back anchors will comprise 2 ft by 2 ft blocks of reinforced concrete (“deadmen”), buried 3 ft below ground surface and set 10 ft back (inland) from the seawall. The deadmen will be connected to the seawall with tie-back rods buried approximately 2.5 ft below ground surface. The anchors will be spaced every 8 ft along the project length, for a total of 40 tie-back anchors.

Prior to installation of the open cell piling seawall, geotechnical investigations will take place to determine bedrock material and sediment type. These investigations will involve drilling a 6-inch diameter borehole approximately every 50 ft along the centerline of the proposed seawall. Seven on-shore borings are anticipated to be collected.

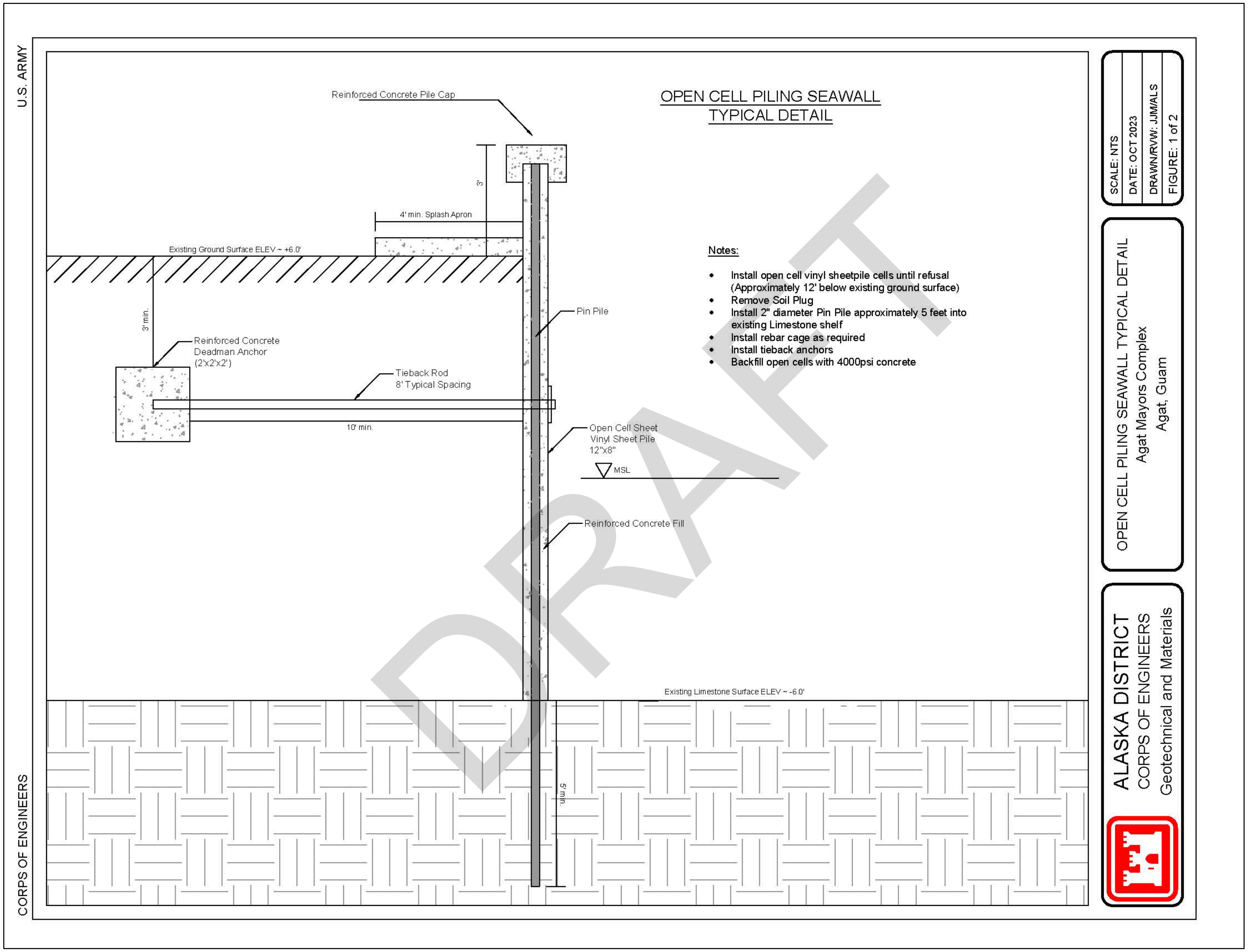

Figure 4. Cross-section of proposed open cell piling seawall.

Area of Potential Effect

The proposed open cell piling seawall approved for funding and construction by USACE constitutes an undertaking pursuant to 36 CFR § 800.3(a), requiring compliance with Section 106 of the NHPA. The proposed undertaking will impact approximately 320 feet of the Agat shoreline, in front of the Agat Mayor's Compound and the Sagan Biseta. Although the ground disturbance anticipated during removal of the current seawall and construction of the open cell piling seawall will not extend much further inland than the existing seawall, with the exception of the ends which will extend 12 ft inland, materials and equipment are expected to be staged in existing public parking lots or storage yards at the Agat Mayor's Compound.

In accordance with 36 CFR § 800.4(a), USACE has identified the proposed undertaking's area of potential effects (APE) to include both the open cell piling seawall footprint and potential staging areas (Figure 5). The APE encompasses approximately 0.80 hectares (2.0 acres).

Figure 5. Area of Potential Effect (APE) and components of the proposed undertaking.

Background

The island of Guam was first occupied more than 3,500 years ago by seafaring peoples from Southeast Asia, ancestors of the CHamoru people. The history of Guam is broadly divided into six periods: Pre-Latte, Latte, Spanish, First American, Japanese

Occupation, and Second American (Guam Historic Resources Division 2022). The Spanish first arrived on Guam in the 1660s. Although the Spanish missionaries were initially welcomed by the CHamoru and given land to build their church, the good relationship did not last. The island's first foreign military installation, thought to have been constructed near Hagåtña, was completed in 1683 (Walth et al. 2016).

During the Spanish Period, between 1680–1684, the Spanish Governor Don Jose Quiroga constructed multiple centralized settlements. The Spanish proceeded to destroy smaller scattered villages and moved the inhabitants to the new settlements. In 1684, the Spanish completed the construction of Agat. Many of the new inhabitants at Agat came from the village of Fena (USACE 1981).

During World War II (WWII), Japanese forces invaded Guam on December 10, 1941. Approximately 33 months later, U.S. forces began pre-invasion bombardments along the western side of Guam (Dixon et al. 2013). The village of Agat received the most intense focus of the bombardments, leveling the village in preparation of the joint amphibious landing of U.S. Marines and U.S. Army units. Agat Beach was one of two American invasion points. Ga'an Point located in modern day Agat, was a heavily fortified Japanese defensive point that also received naval bombardments. After U.S. forces recaptured Guam, the U.S. military rebuilt the village of Agat (now known as "Hågat") 1 to 2 miles south of the original Spanish settlement (Thompson 1985).

Previous Archaeological Investigations

Most archaeological investigations in the Agat area have been undertaken in association with cultural resource management of various construction projects. These previous projects include road work and utilities (Moore et al. 1994; Moore et al. 1995; DeFant et al. 2011; DeFant et al. 2018) and harbors (USACE 1981; Price & Craib 1978). USACE has previously conducted limited archaeological investigations in association with feasibility studies in the general area (e.g., Price & Craib 1978). Additional archaeological investigations have been conducted by the National Park Service during their Cultural Landscapes surveys (NPS 2003, 2013; Thompson 1985). More recent archaeological investigations, for which reports have not yet been finalized, include sewer line installations and cell phone tower installations; burials were identified at two locations (J. M. Joseph, pers. comm. 2022).

Identification of Historic Properties

In January 2022, USACE archaeologist Kelly Eldridge conducted a non-invasive pedestrian survey of the APE. Shovel testing was not conducted out of concern that digging holes along seaward side of the existing seawall would further destabilize and damage the structure. Shovel testing along the landward side was not possible due to existing buildings and structures. No surficial cultural resources were identified. A review of the published literature, as well as grey literature and other documentation provided to USACE by the Guam Historic Resources Division in response to Requests for Assistance, identified 11 known cultural resources in the general vicinity of the APE (Table 1). Nine are historic properties in accordance with 36 CFR § 800.16(l).

Table 1. Known cultural resources in the vicinity of the study area (GHRD 2024; NPS 2024).

GHPI Number	Site Name	Cultural Period	NRHP Status
66-02-1054	Agat Invasion Beach	Second American	Listed
66-02-1313	Fena Massacre Site	Latte, Spanish	Unknown
66-02-1048	Hill 40	Second American	Listed
66-02-1049	Mt. Ailfan Battle Site	Second American	Unknown
66-02-1072	Taelayaq Spanish Bridge	Spanish	Listed
66-02-1071	Taleyfac Spanish Bridge	Spanish	Listed
66-02-1868	Umang Dam	Spanish	Listed
N/A	Agat World War II Amtrac	Second American	Listed
66-03-1043	Cable Station Ruins	First American Japanese Occupation Second American	Listed
66-03-1066	Orote Field	First American, Japanese Occupation Second American	Listed
66-03-1041	Sumay Cemetery	First American Japanese Occupation Second American	Listed

GHPI = Guam Historic Properties Inventory
NRHP = National Register of Historic Places

The pedestrian survey did not identify any cultural resources in the project area. The review of published and available grey literature identified the Agat Invasion Beach as the only known cultural resources within the APE. There are no records that any subsurface cultural materials were uncovered during construction of the existing seawall during the 2000s. Additionally, when questioned during the January site visit and at subsequent meetings, City of Hågat and Government of Guam representatives were not aware of any cultural resources that were identified during the construction of the Agat Mayor's Compound.

Assessment of Effect

The modern City of Hågat was built following W-day (Liberation Day) 21 July 1944, after U.S. forces destroyed the former village site that had been constructed by the Spanish 1 to 2 miles to the north. Intense fighting occurred in the project area during WWII; the APE is within the Agat Invasion Beach (66-02-1054) which is listed in the National Register of Historic Places (NRHP) due to its association with WWII. Subsurface cultural materials or burials have been recovered to the north and southeast of the APE approximately 0.5 to 2 miles away in Agat, respectively; however, no cultural materials or burials have been identified within the APE.

The proposed undertaking will replace the existing seawall along the beach in front of the Agat Mayor's Compound with one similar in size and height above ground surface. Following 36 CFR 800.5(a), USACE has applied the criteria of adverse effect to the Agat Invasion Beach and found that the construction of the open cell piling seawall will not alter, directly or indirectly, any characteristics that qualify the Agat Invasion Beach for inclusion in the NRHP in a manner that would diminish the integrity of the historic property. USACE has considered those characteristics identified in the original National Register nomination, as well as those subsequently identified (e.g., viewshed).

Although there are no known subsurface cultural materials in the project area, and no subsurface cultural materials were identified during the construction of the existing seawall or the Agat Mayor's Compound, due to the potential for an inadvertent discovery, USACE will have an on-site archaeologist who meets the *Secretary of the Interior's Historic Preservation Professional Qualification Standards* (36 CFR § 61; 62 FR 33708) to monitor all ground-disturbing construction activities within the APE. If human remains are discovered during construction of the proposed undertaking, USACE will follow the Guam Department of Parks and Recreation's General Guidelines for Archaeological Burials, including the Section IV Reburial Guidelines Amendment of 2010. USACE has made a reasonable and good faith effort to identify historic properties per 36 CFR § 800.4(b)(1).

Conclusion

USACE and its Non-Federal Sponsor, the Government of Guam, plan to replace an existing damaged seawall with an open cell piling seawall along the beach in front of the Agat Mayor's Compound in Hågat, Guam to address shoreline erosion. The proposed undertaking will not adversely affect any known historic properties or cultural resources. Following 36 CFR § 800.5(b), USACE seeks your concurrence on the determination that the proposed undertaking will result in **no adverse effect on historic properties,** conditional upon archaeological monitoring by an SOI-qualified archaeologist. If you have any questions about this project, please contact Tyler Teese by phone at 907-753-2640, or by email at Tyler.J.Teese@usace.army.mil

Sincerely,

Tyler Teese
Archaeologist
Environmental Resources Section
Alaska District

cc:
Mr. Joseph Quinata, Chief Program Officer, Guam Preservation Trust
Mr. Melvin Won Pat-Borja, President, Guam Department of Chamorro Affairs
Mr. Tim Clark, Cultural Resources, National Park Service

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2016. Final Report: Archaeological Investigations for the Agana Bridge #1 and Route 1/Route 8 Intersection Improvements Project (GU-NH-0001 (14)), Hagåtña, Guam. Vol. I. SWCA Environmental Consultants.

GUAM PRESERVATION TRUST
INANGOKKON INADAHI GUÅHAN
P.O. Box 3036, Hagåtña, Guam 96932 • Tel: 671-472-9439/40 • Fax: 671-477-2047 • guampreservationtrust.org

September 22nd, 2023
Tyler J. Teese
Archaeologist
Environmental Resource Division
Department of the Army
Alaska District, U.S. Army Corps of Engineers
P.O. Box 6898
JBER, AK 99506-0898

Dear Mr. Teese,

The Guam Preservation Trust received your notice of the feasibility study on shoreline protection in Hågat, Guam conducted by the USACE along a 450 ft. segment of the coastline at the Agat Mayor's office and Sagan Bisita. We have conducted our own site visit and have confirmed that there are no potential adverse effects to historic properties within the study area.

In the immediate vicinity of the study area there is a War in the Pacific National Historical Park site that is listed on the national registry, Agat Invasion Beach (#66-02-1054); the pillbox at Ga'an point and the two concrete emplacements just north of Ga'an point are worth consideration in further development planning and reports about the study area.

Additional considerations for the study area include the viewshed from just above/inland from the current retaining wall that meets the Mayor's office and Sagan Biseta with the beach head, obstruction of this viewshed should be avoided. Accessibility to the beach from the Mayor's office and Sagan Bisita is another consideration for development planning as the disruption of beach access from those locations should be avoided. A Dropbox link with pictures of the project area and its vicinity has been sent in an email to your address from our program officer, Kyle Riordan.

Please keep us advised if further consultation or questioning is required by any other interested parties.

Sincerely,

JOE QUINATA
Chief Program officer

Department of Parks and Recreation
Dipattamenton Plaset yan Dibuetsion
Government of Guam
Director's Office, Parks and Recreation Divisions:
#1 Paseo de Susana, Hagåtña, Guam 96910
P.O. Box 2950, Hagåtña, Guam 96932
(671) 475-6288; Facsimile (671) 477-0997
Guam Historic Resources Division:
490 Chalan Palasyo, Agana Heights, Guam 96910
(671) 475-6294/6355; Facsimile (671) 477-2822

Lourdes A. Leon Guerrero
Governor
Joshua F. Tenorio
Lt. Governor

Angel R. Sablan
Acting Director
Warren Pelletier
Deputy Director

March 29, 2024

In reply refer to:
RC 2024-0223

Tyler Teese
Department of the Army
Alaska District, U.S. Army Corps of Engineers
P.O. Box 6898
Jber, AK 99506-0898

Subject: USACE study to determine Feasibility of Shoreline Protection along Beach Front of Municipal Government Headquarters

Hafa Adai Mr. Tyler Teese:

Thank for the Notice of an Undertaking and Determination of Effect of replacing a seawall in front of the Agat Mayor's Office, Agat, Guam. We concur with the determination of "No Affect on Historic Properties" as the proposed activity will not alter any of the characteristics of the Agat Invasion Beach within which the present sea wall was constructed.

Thank you for providing a copy of the study and Determination of Effect on the only historic property noted in the APE for the project. Please provide 2 copies of the study for our library along with an electronic copy and digital shapefile of the APE for the project on cd.

Generally, our office requests a survey plan in advance of conducting archaeological projects in Guam, with all of the pertinent project, locational data, methodology, and notice of an undertaking. In our response we can then identify any concerns and provide recommendations for the actual survey. We can also provide more detailed information on prior sites and surveys. A Request for Assistance form can be found on our website to brief our office on the upcoming project and to identify data needs. Thank you for your compliance with this protocol.

Should you have any questions, please contact Mr. Logan Myers, Archaeologist, at (671) 475-6340 or by email: logan.myers@dpr.guam.gov.

Sincerely,

Patrick Q. Lujan
State Historic Preservation Officer

From: Clark, Timothy B
To: Teese, Tyler J CIV USARMY CEPOA (USA)
Cc: Eldridge, Kelly A CIV USARMY CEPOA (USA); Stelson, Laura F CIV USARMY CEPOA (USA); Alberti, Barbara N
Subject: [Non-DoD Source] Re: [EXTERNAL] Agat Mayor"s Compound - Emergency Shoreline Protection Project
Date: Sunday, March 31, 2024 5:30:02 PM

Hi Tyler,

I've discussed the project with our Superintendent and we are happy with the current design. No need for a meeting this week. Thanks for all the information about the project.

Sincerely,

Tim

From: Teese, Tyler J CIV USARMY CEPOA (USA) <Tyler.J.Teese@usace.army.mil>
Sent: Sunday, March 31, 2024 8:32 AM
To: Clark, Timothy B <timothy_clark@nps.gov>
Cc: Eldridge, Kelly A CIV USARMY CEPOA (USA) <Kelly.A.Eldridge@usace.army.mil>; Stelson, Laura F CIV USARMY CEPOA (USA) <Laura.F.Stelson@usace.army.mil>; Alberti, Barbara N <Barbara_Alberti@nps.gov>
Subject: RE: [EXTERNAL] Agat Mayor's Compound - Emergency Shoreline Protection Project

HI Tim,

Unfortunately, we wont be able to make Monday morning. We have a meeting with representatives from SHPO at our field site at 9am. Are you available to meet Wednesday afternoon at 3pm?

Very Respectfully,

Tyler Teese
Archaeologist, Alaska District
U.S. Army Corps of Engineers
Email: Tyler.J.Teese@usace.army.mil
Phone: (907) 753-2640

From: Teese, Tyler J CIV USARMY CEPOA (USA)
Sent: Saturday, March 30, 2024 6:43 AM
To: Clark, Timothy B <timothy_clark@nps.gov>
Cc: Eldridge, Kelly A CIV USARMY CEPOA (USA) <Kelly.A.Eldridge@usace.army.mil>; Stelson, Laura F CIV USARMY CEPOA (USA) <Laura.F.Stelson@usace.army.mil>; Alberti, Barbara N <Barbara_Alberti@nps.gov>
Subject: RE: [EXTERNAL] Agat Mayor's Compound - Emergency Shoreline Protection Project

Hi Tim,

It was great to quickly meet you as well! I will discuss the field schedule with my colleagues today and send you a confirmation email this evening. Attached is the PDF for the Agat finding of effect letter as requested.

I set up a temporary phone while on island and can be reached at 671-201-2273.

Very Respectfully,

Tyler Teese
Archaeologist, Alaska District
U.S. Army Corps of Engineers
Email: Tyler.J.Teese@usace.army.mil
Phone: (907) 753-2640

From: Clark, Timothy B <timothy_clark@nps.gov>
Sent: Friday, March 29, 2024 4:15 PM
To: Teese, Tyler J CIV USARMY CEPOA (USA) <Tyler.J.Teese@usace.army.mil>
Cc: Eldridge, Kelly A CIV USARMY CEPOA (USA) <Kelly.A.Eldridge@usace.army.mil>; Stelson, Laura F CIV USARMY CEPOA (USA) <Laura.F.Stelson@usace.army.mil>; Alberti, Barbara N <Barbara_Alberti@nps.gov>
Subject: [Non-DoD Source] Re: [EXTERNAL] Agat Mayor's Compound - Emergency Shoreline Protection Project

Hi Tyler,

It was great to quickly meet you the other day. We are interested in hearing more about the Agat seawall project. Can you all meet with us Monday at 8 am? Also, would it be possible to get an electronic copy of the finding of effects letter?

If you can't make Monday at 8, is there a better time? Our calendars are fairly free Monday. The rest of the week is busy in the mornings but free after about 13:00.

Thanks,

Tim

From: Teese, Tyler J CIV USARMY CEPOA (USA) <Tyler.J.Teese@usace.army.mil>
Sent: Tuesday, March 19, 2024 4:56 AM
To: Clark, Timothy B <timothy_clark@nps.gov>
Cc: Eldridge, Kelly A CIV USARMY CEPOA (USA) <Kelly.A.Eldridge@usace.army.mil>; Stelson, Laura F CIV USARMY CEPOA (USA) <Laura.F.Stelson@usace.army.mil>
Subject: [EXTERNAL] Agat Mayor's Compound - Emergency Shoreline Protection Project

This email has been received from outside of DOI - Use caution before clicking on links,

opening attachments, or responding.

Good Morning,

I will be on island with Kelly Eldridge and Laura Stelson next week. All three of us are archaeologist out of the USACE Alaska District. I am hoping to set up a meeting with you to discuss any additional concerns with the Agat Mayor's Compound project while we are in the area. Do you have any availability to meet between March 28 to April 3?

Also, I will be sending out a finding of effect letter this week and would like to know if you want it emailed or would like a hard copy? If you want a hard copy please let me know what address you want the letter sent to.

Very Respectfully,

Tyler Teese
Archaeologist, Alaska District
U.S. Army Corps of Engineers
Email: Tyler.J.Teese@usace.army.mil
Phone: (907) 753-2640

From:	Wang, Olivia
To:	Dean, Marian E CIV USARMY CEPOH (USA); Flores, Jacqueline B; Kim, Jiny
Cc:	Czachura, Kevin K; Pe"a, Ryan; Gombar, Laura P
Subject:	[Non-DoD Source] RE: [EXTERNAL] Migratory Bird Protections in Guam
Date:	Thursday, August 31, 2023 8:02:34 AM
Attachments:	image001.png image002.png MigratoryBirdInformation_25Aug2023.docx

Hi Marian,

Attached is the updated MBTA information sheet. The main update is that as of December 2021, incidental take is again prohibited under MBTA and therefore you'll need a permit if any activities have detrimental effects to birds or their nests. I also updated the document with links to general management and mitigation methods for birds.

Looking through the document, some more specific recommendations: seems like since there are no MBTA listed species nesting in the vicinity of the work site, effect on birds would be minimal. If the work can be done outside of peak shorebird migration periods (August – May) that would be ideal to minimize potential impact. If any work is done at night/if any outdoor lighting is used, I would be aware of potential issues with seabird attraction and fallout, but if all work is being done during daylight hours then not an issue.

Let me know if you have any further questions or things to clarify!

Olivia

From: Dean, Marian E CIV USARMY CEPOH (USA) <Marian.E.Dean@usace.army.mil>
Sent: Friday, August 25, 2023 10:16 AM
To: Wang, Olivia <olivia_wang@fws.gov>; Flores, Jacqueline B <jacqueline_flores@fws.gov>; Kim, Jiny <jiny_kim@fws.gov>
Cc: Czachura, Kevin K <kevin_czachura@fws.gov>; Pe'a, Ryan <ryan_pea@fws.gov>; Gombar, Laura P <lauraalexandria_gombar@fws.gov>
Subject: RE: [EXTERNAL] Migratory Bird Protections in Guam

Olivia,
Very good to meet you!
Thank you for your assistance on this.

Marian

Marian Dean
Environmental Planner
Civil & Public Works Branch

230 Otake St.
Ft. Shafter, HI 96858-5440
marian.dean@usace.army.mil
808-379-8223

From: Wang, Olivia <olivia_wang@fws.gov>
Sent: Friday, August 25, 2023 7:02 AM
To: Flores, Jacqueline B <jacqueline_flores@fws.gov>; Dean, Marian E CIV USARMY CEPOH (USA) <Marian.E.Dean@usace.army.mil>; Kim, Jiny <jiny_kim@fws.gov>
Cc: Czachura, Kevin K <kevin_czachura@fws.gov>; Pe'a, Ryan <ryan_pea@fws.gov>; Gombar, Laura P <lauraalexandria_gombar@fws.gov>
Subject: [Non-DoD Source] RE: [EXTERNAL] Migratory Bird Protections in Guam

Hi Marian,

The attached MBTA document is outdated; I will work on getting some updated general guidance to you soon. I'm also happy to meet and discuss MBTA related aspects of the feasibility report if you want more specific input on project planning. Let me know.

Also as Jackie said, I am the new MBTA person for the Pacific Region, so please contact me if you have other MBTA related concerns going forward!

Thanks,
Olivia

From: Flores, Jacqueline B <jacqueline_flores@fws.gov>
Sent: Thursday, August 24, 2023 6:54 PM
To: Dean, Marian E CIV USARMY CEPOH (USA) <Marian.E.Dean@usace.army.mil>; Kim, Jiny <jiny_kim@fws.gov>
Cc: Czachura, Kevin K <kevin_czachura@fws.gov>; Pe'a, Ryan <ryan_pea@fws.gov>; Gombar, Laura P <lauraalexandria_gombar@fws.gov>; Wang, Olivia <olivia_wang@fws.gov>
Subject: RE: [EXTERNAL] Migratory Bird Protections in Guam

Hafa Adai Marian,
We would normally include the attached for MBTA information since it's not our authority. The attached was what was provided by MBTA Regional Office at the time. Olivia Wang is now the MBTA person for the Pacific Region. I would defer to her if the information needs to be updated.

Thanks
Jackie

From: Dean, Marian E CIV USARMY CEPOH (USA) <Marian.E.Dean@usace.army.mil>
Sent: Friday, August 25, 2023 11:45 AM
To: Flores, Jacqueline B <jacqueline_flores@fws.gov>; Kim, Jiny <jiny_kim@fws.gov>
Cc: Czachura, Kevin K <kevin_czachura@fws.gov>; Pe'a, Ryan <ryan_pea@fws.gov>; Gombar, Laura P <lauraalexandria_gombar@fws.gov>
Subject: Re: [EXTERNAL] Migratory Bird Protections in Guam

Yes, we did in March 2022.
Project development was paused for several months, but we're finally wrapping up the feasibility report and environmental assessment: https://www.poh.usace.army.mil/Missions/Civil-Works/Civil-Works-Projects/East-Hagatna/
The ESA Biological Evaluation is currently under internal review, and we plan to send it to the agencies for concurrence soon.

Guam Division of Aquatic and Wildlife Resources reports migratory birds including the White Tern (*Gygis alba*), Pacific Reef Heron (*Egretta sacra*), Eurasian Tree Sparrow (*Passer montanus*), Philippine Turtle Dove (*Streptopelia dusumier*), Yellow Bittern (*Ixobrychus sinensis*), and Common Sandpiper (*Actitis hypoleucos*) flying through our project area, but not nesting or foraging.

Are there "**standard migratory bird protection measures required under the Migratory Bird Treaty Act and/or Migratory Bird Conservation Act"** that I could incorporate into our project planning?

Thank you,
Marian

From: Flores, Jacqueline B <jacqueline_flores@fws.gov>
Sent: Thursday, August 24, 2023 12:55 PM
To: Kim, Jiny <jiny_kim@fws.gov>; Dean, Marian E CIV USARMY CEPOH (USA) <Marian.E.Dean@usace.army.mil>
Cc: Czachura, Kevin K <kevin_czachura@fws.gov>; Pe'a, Ryan <ryan_pea@fws.gov>; Gombar, Laura P <lauraalexandria_gombar@fws.gov>
Subject: [Non-DoD Source] Re: [EXTERNAL] Migratory Bird Protections in Guam

Hafa Adai Marian,
This project sounds familiar. Did you reach out to our office for ESA information?

Thanks
Jackie

From: Kim, Jiny <jiny_kim@fws.gov>
Sent: Friday, August 25, 2023 8:00 AM
To: Marian.Dean@usace.army.mil <Marian.Dean@usace.army.mil>
Cc: Czachura, Kevin K <kevin_czachura@fws.gov>; Pe'a, Ryan <ryan_pea@fws.gov>; Flores, Jacqueline B <jacqueline_flores@fws.gov>
Subject: Fw: [EXTERNAL] Migratory Bird Protections in Guam

Hi Marian,

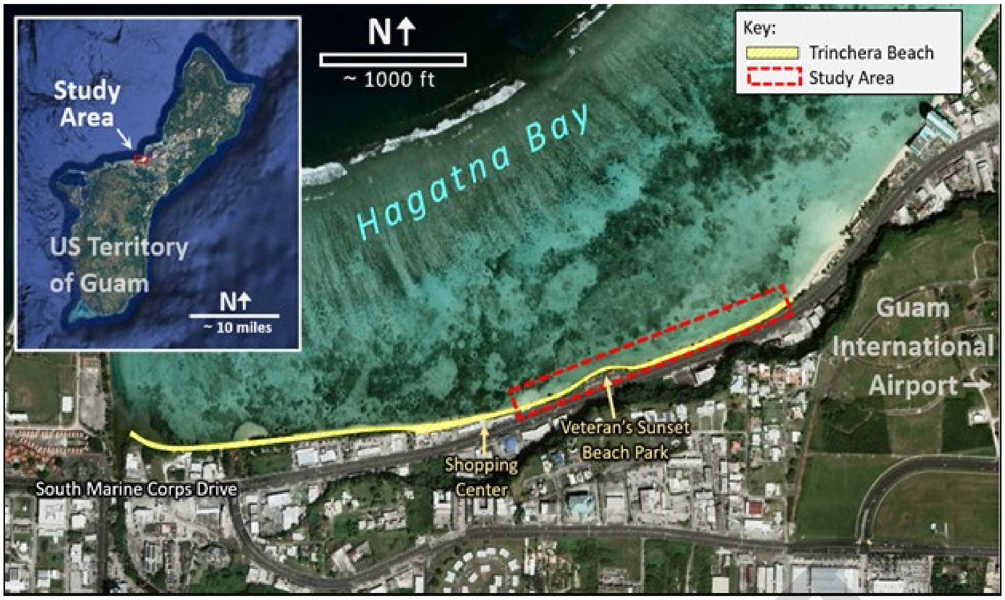
I am copying Jackie (the Island Team manager in which your work is occurring), and Ryan and Kevin (who work on DoD projects within our office). They will be the best people to address your question.

Thank you,
Jiny

From: Dean, Marian E CIV USARMY CEPOH (USA) <Marian.E.Dean@usace.army.mil>
Sent: Thursday, August 24, 2023 11:53 AM
To: Kim, Jiny <jiny_kim@fws.gov>
Cc: Nadig, Aaron <aaron_nadig@fws.gov>
Subject: RE: [EXTERNAL] Migratory Bird Protections in Guam

I have an entire website to share: https://www.poh.usace.army.mil/Missions/Civil-Works/Civil-Works-Projects/East-Hagatna/

We propose to replace 2100 feet of an existing seawall with a rock (or tribar if not enough rock is available) revetment along South Marine Corps Drive (within the red box below):



The construction staging area would be in the parking lot of Veteran's Sunset Beach Park. All construction would occur from the landward side at low tide and therefore out of the water as much as practicable.

Thank you,
Marian

Marian Dean
Environmental Planner
Civil & Public Works Branch

230 Otake St.
Ft. Shafter, HI 96858-5440
marian.dean@usace.army.mil
808-379-8223

From: Kim, Jiny <jiny_kim@fws.gov>
Sent: Thursday, August 24, 2023 11:01 AM
To: Dean, Marian E CIV USARMY CEPOH (USA) <Marian.E.Dean@usace.army.mil>
Cc: Nadig, Aaron <aaron_nadig@fws.gov>
Subject: [Non-DoD Source] Re: [EXTERNAL] Migratory Bird Protections in Guam

Hi Marian,

Thanks for your email. I will either find you a contact or provide some recommendations for your project. Do you happen to have a project description I can share?

Mahalo,
Jiny

From: Dean, Marian E CIV USARMY CEPOH (USA) <Marian.E.Dean@usace.army.mil>
Sent: Thursday, August 24, 2023 9:36 AM
To: Nadig, Aaron <aaron_nadig@fws.gov>; Kim, Jiny <jiny_kim@fws.gov>
Subject: [EXTERNAL] Migratory Bird Protections in Guam

Aaron and Jiny,
Hope you are well.

As you may be aware, we have a project on the East Hagatna waterfront in Guam. Guam Division of Aquatic and Wildlife Resources reports migratory birds flying through our project area, but not nesting or foraging.

Are there "**standard migratory bird protection measures required under the Migratory Bird Treaty Act and/or Migratory Bird Conservation Act"** that I could incorporate into our project planning?

I couldn't find anything applicable on the USFWS website, but I may not be looking in the correct place.

Thank you for any assistance you can provide,
Marian

Marian Dean
Environmental Planner
Civil & Public Works Branch

Dear Project Proponent:

Thank you for your inquiry and for your interest in protecting Migratory Birds. There are several resources available to you in order to generate a Migratory Bird Species List for your project and to understand how to reduce impact on migratory birds.

1) Migratory Bird Species List:
   A list of the migratory bird species covered by the Migratory Bird Treaty Act, is available at this link.

2) IPaC:
   The Information for Planning and Conservation tool, is an online tool through which users may use to generate a list of Threatened and Endangered Species (https://ecos.fws.gov/ipac/). Information in IPaC is incomplete for migratory birds, particularly for birds on Pacific islands.

3) Site-specific Bird Species Lists:
   The best way to create a site-specific bird species list is for a biologist to visit the site and record bird occurrence throughout the year. If this is not possible, project proponents can generate a bird occurrence list in eBird which can inform your creation of a site-specific list of Migratory Birds.

   Once you arrive at the eBird website, click "Explore," and enter your state, county, province or country into the "Explore Regions" search bar. From there you can zoom into your specific project area, or select a hot spot that is closer to your project area.

3) Conservation Measures to reduce project effects on birds:

   The Migratory Bird Treaty Act prohibits the take (killing, capturing, selling, trading, and transport) of migratory birds (and their nests, eggs, and parts) without prior authorization by U.S. Fish and Wildlife, even if that take occurs incidentally (i.e. unintentionally) to the purpose of otherwise legal activities (This rule was temporarily changed by Dept. of Justice solicitors in December 2017, but that change has since been revoked as of December 3rd 2021). Nests that are inactive can be removed without a permit, but cannot be kept or retained without a permit (More restrictive rules apply to eagles). If incidental take of migratory birds is likely at any point during the project, please contact your regional Migratory Bird Permit Office for further information.

   Conservation measures geared toward specific activities may reduce your project's impacts on birds. Several fact sheets are available through the USFWS "Avoiding and Minimizing Incidental Take of Migratory Birds" site, as well as the Avian Knowledge Network "Beneficial Practices" site. Common stressors of migratory birds to keep in mind during project planning include vegetation alteration or removal, ground disturbance, water disturbance, structures, noise, light, chemicals, and human presence.

   Information on birds and their nesting seasons can be found by searching for species name at Wikipedia, and Cornell's All About Birds web site.

Attachment 8: Environmental Commitments

Climate

The resource is unaffected by the action; therefore, no environmental commitments are required.

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.

Geology

The resource benefits from the action, therefore no environmental commitments are required.

Hydrology

The resource benefits from the action, therefore no environmental commitments are required.

Surface Water Quality

- **EC-WQ-1 Construction Stormwater Pollution Prevention Plan (SWPPP)**. A SWPPP shall be developed for the project by the construction contractor and filed with GEPA and Department of Public Works prior to construction. The SWPPP shall be stored at the construction site for reference or inspection review. Implementation of the SWPPP would help stabilize graded areas and waterways and reduce erosion and sedimentation. The SWPPP would define areas where hazardous materials would be stored, where trash would be placed, where rolling equipment would be parked, fueled, and serviced, and where construction materials such as reinforcing bars and structural steel members 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. Construction contractors shall implement BMPs to prevent erosion and sedimentation to avoid potential release of contaminants into surface waters and groundwater according to the guidelines in the Guam Erosion and Sediment Control Field Guide (2017). These shall be incorporated into a SWPPP.
    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.
    6. The plan would designate BMPs that would be adhered to during construction activities:
        - Erosion minimizing efforts such as straw wattles, water bars, covers, silt fences, and sensitive area access restrictions (for example, flagging) would be installed before clearing and grading begins. Mulching, seeding, or other suitable stabilization measures would be used to protect exposed areas during construction activities. During construction activities, measures would be in place to ensure that contaminates are not discharged from the

    construction sites. Proper installation and maintenance of equipment diapers, or drip pans.
  - A contingency plan to control and clean spilled petroleum products, hydraulic leaks, and other toxic materials.
  - Appropriate materials to contain and clean potential spills will be stored at the work site and be readily available.
  - All project-related materials and equipment placed in the water will be free of pollutants including silt.
  - Daily pre-work inspections of heavy equipment and vessels for cleanliness and leaks, with all heavy equipment operations and vessel use postponed or halted until leaks are repaired and equipment is cleaned.
  - Fueling of land-based vehicles and equipment shall take place at least 50 ft (15 meters) away from the water, preferably over an impervious surface.
  - All construction discharge water (e.g., concrete washout, pumping for work area isolation, vehicle wash water, drilling fluids) must be treated before discharge.
  - Debris and other wastes will be prevented from entering or remaining in the marine environment during the project.
- **EC-WQ-2 Hazardous Materials Management Plan and Emergency Response Plan**. The construction contractor shall prepare a project- specific hazardous materials management and hazardous waste management plan would be developed 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-WQ-3** 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-WQ-4 Conditional Notifications and Reports of 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 Guam Environmental Protection Agency (GEPA) staff.
- **EC-WQ-5** Fueling, lubrication, maintenance, storage, and staging of vehicles and equipment will not result in a discharge to any waters of the state and will be located outside of waters of the United States in areas where accidental spills will not enter or affect such waters. All fueling of equipment will be done more than 50 ft from open water. All construction equipment will be properly tuned and maintained prior to and for the duration of onsite operations. The equipment will be checked by a certified mechanic and determine to be running in proper condition before it is operated. If construction related materials reach surface waters, appropriate spill response procedures would be initiated as soon as the incident is discovered. In addition, the GEPA will be notified via email and telephone within twenty-four (24) hours of occurrence.
- **EC-WQ-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 working days. The Contracting Office will then notify the GEPA staff member overseeing the Project. The GEPA 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-WQ-7** Cover, or two ft of free board space will be maintained on haul trucks transporting soil, sand, or other loose material on the site. Any haul trucks that will be traveling along freeways or major roadways should be covered.
- **EC-WQ-8** Vehicle speeds on unpaved roads will be limited to 15 miles per hour.
- **EC-WQ-9** Site access will be treated to a distance of 100 ft from the paved road with a 6 to 12-inch layer of wood chips, mulch, or gravel to reduce generation of road dust and road dust carryout onto public roads.
- **EC-WQ10** Idling time will be minimized either by shutting equipment off when not in use or reducing the time of idling to five minutes. Clear signage will be provided that posts this requirement for workers at the entrances to the site.
- **EC-WQ-11** Excavating will be restricted to uncontaminated areas, and any associated waste or spoils must be completely isolated and disposed of in an approved upland disposal location.
- **EC-WQ-12** Construction will incorporate best management practices described in the Guam 2017 Erosion and Sediment Control Field Guide, including a stormwater management plan and an erosion control plan.
- **EC-WQ-13** Appropriate erosion control measures will be incorporated by the construction contractor to prevent sediment from entering waterways and to minimize temporary turbidity impacts. Examples include but are not limited to straw bales/wattles, erosion blankets, silt fencing, silt curtains, mulching, revegetation, and temporary covers. Sediment and erosion control measures will be always maintained by the contractor during construction. Control measures will be inspected periodically by the construction contractor, particularly during and after significant rain events.
- **EC-WQ-14** All deliberately exposed soil or subsoil materials used in the project near water would be protected from erosion and stabilized as soon as possible with geotextile, filter fabric or native or non-invasive vegetation matting, hydro-seeding, etc.
- **EC-WQ-15** Silt curtains or other effective containment devices to help contain silt and other suspended particles placed in the water column because of excavation and construction activities will be used and properly installed to avoid degradation of adjacent coral reefs, and aquatic vegetation.
- **EC-WQ-16** Store all dredge spoil behind maintained berms above the influence of the tides.
- **EC-WQ-17** Temporary access roads and drilling pads must avoid steep slopes, where grade, soil types, or other features suggest a likelihood of excessive erosion or failure; existing access routes must be utilized or improved whenever possible, in lieu of construction of new access routes.
- **EC-WQ-18** The maximum amount of material placed shall not exceed the minimum needed for erosion protection. All material will be placed in a manner that will avoid erosion by normal or expected high flows.
- **EC-WQ-19** Implementation of design and procedural controls will prevent oil, fuel, or other hazardous substances from entering the air or water. All wastes and refuse generated by project construction will be removed and properly disposed. Contractors will implement a spill contingency plan for hazardous, toxic, or petroleum material. Applicable state water quality standards will be met.

HTRW

There are no known HTRW in the study area.

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 Guam. 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 Federal holidays and locally observed holidays on Guam. There shall be no construction permitted on Sunday, Federal holidays, or locally observed holidays unless approval is obtained prior.

Terrestrial & Marine Habitats and Species

- **EC-HS-1** Construction will be staged along the length of the revetment to maintain integrity of the existing wall until fully replaced and timed to avoid operations below tide and during inclement weather.
- **EC-HS-2** Standard migratory bird protection protocols will be incorporated into the project plans and specifications. The contractor will be required to abide by those protocols and all monitoring timeframes as specified by all applicable licenses and permits.
- **EC-HS-3** All tree felling or limbing will be conducted under the supervision of a licensed arborist or forester.
- **EC-HS-4** All disturbed areas will be immediately stabilized following cessation of activities for any break in work longer than 4 days.
- **EC-HS-5** Temporary fills must be removed in their entirety.
- **EC-HS-6** All removed trees will be replaced with appropriate species for the location. Large trees, greater than 2-inch diameter at breast height, will be used as much as possible based nursery on availability. All areas impacted by construction must be stabilized and revegetated with native species as appropriate. Clearing will be confined to the minimal area necessary to facilitate construction activities, while all bare areas will be reseeded and maintained until grass/vegetative cover is established. All areas will be cleaned of any trash and debris and returned, as close as possible, to the condition prior to initiation of project activities.
- **EC-HS-7** Shoreline work will be done during low tide and equipment will be operated from the upland area to minimize in water work. Construction will cease under unusual conditions such as large tidal events and high surf conditions, except for efforts to avoid or minimize resource damage.
- **EC-HS-8** Construction will be scheduled for time periods which minimize conflicts with the recruitment and traditional harvest of culturally-significant reef fishes (manahac), the presence of foraging migratory birds on the inner reef flat, or peak coral spawning season (June 1 to September 30), if practicable.
- **EC-HS-9** Sensitive resource areas, such as corals, coral reefs and seagrass beds known to occur within a project area will be identified on project figures. Project staff will be instructed to avoid the sensitive resource areas to the greatest extent practicable, flagging the areas if appropriate, and securing all in-water equipment in a manner that will prevent the equipment from being dragged across the substrate.

- **EC-HS-10** Holes that might be left open overnight will be sealed each night with plywood, soil or other materials to prevent entrapment of reptiles, amphibians and small mammals.
- **EC-HS-11** Sensitive resource areas, such as corals, coral reefs and seagrass beds known to occur within a project area must be identified on project figures. Project staff must be instructed to avoid the sensitive resource areas to the greatest extent practicable, including avoiding anchoring in these areas, flagging the areas if appropriate, and securing all in-water equipment in a manner that will prevent the equipment from being dragged across the substrate.
- **EC-HS-12** Equipment operators will employ “soft starts” when initiating work each day and after each break of 30 minutes or more that directly impacts the bottom. Buckets and other equipment will be sent to the bottom in a slow and controlled manner for the first several cycles before achieving full operational impact strength or tempo. All objects lowered to the bottom will be lowered in a controlled manner. This can be achieved by the use of buoyancy controls such as lift bags, or the use of cranes, winches, or other equipment that affect positive control over the rate of descent.
- **EC-HS-13** A pollution control plan for the project site and adjacent areas will be prepared and implemented and at a minimum will include:
    - Proper installation and maintenance of equipment diapers, or drip pans.
    - A contingency plan to control and clean spilled petroleum products, hydraulic leaks, and other toxic materials.
    - Appropriate materials to contain and clean potential spills will be stored at the work site and be readily available.
    - All project-related materials and equipment placed in the water will be free of pollutants.
    - Daily pre-work inspections of heavy equipment and vessels for cleanliness and leaks, with all heavy equipment operations and vessel use postponed or halted until leaks are repaired and equipment is cleaned.
    - Fueling of land-based vehicles and equipment shall take place at least 50 feet (15 meters) away from the water, preferably over an impervious surface.
    - All construction discharge water (e.g., concrete washout, pumping for work area isolation, vehicle wash water, drilling fluids) must be treated before discharge.
    - Debris and other wastes will be prevented from entering or remaining in the marine environment during the project.
- **EC-HS-14** Fueling, lubrication, maintenance, storage, and staging of vehicles and equipment will not result in a discharge to any waters of the state, and will be located outside of waters of the United States in areas where accidental spills will not enter or affect such waters. All fueling of equipment will be done more than 50 feet from open water. All construction equipment will be properly tuned and maintained prior to and for the duration of onsite operations. The equipment will be checked by a certified mechanic and determine to be running in proper condition before it is operated. If construction related materials reach surface waters, appropriate spill response procedures would be initiated as soon as the incident is discovered. In addition, the Guam EPA will be notified via email and telephone within twenty-four (24) hours of occurrence.
- **EC-HS-15** Cover or two feet of free board space will be maintained on haul trucks transporting soil, sand, or other loose material on the site. Any haul trucks that will be traveling along freeways or major roadways should be covered.
- **EC-HS-16** Vehicle speeds on unpaved roads will be limited to 15 miles per hour.

- **EC-HS-17** Site access will be treated to a distance of 100 feet from the paved road with a 6 to 12-inch layer of wood chips, mulch, or gravel to reduce generation of road dust and road dust carryout onto public roads.
- **EC-HS-18** Idling time will be minimized either by shutting equipment off when not in use or reducing the time of idling to five minutes. Clear signage will be provided that posts this requirement for workers at the entrances to the site.
- **EC-HS-19** Drilling and dredging will be restricted to uncontaminated areas, and any associated waste or spoils must be completely isolated and disposed of in an approved upland disposal location.
- **EC-HS-20** Construction will incorporate best management practices described in the Guam 2017 Erosion and Sediment Control Field Guide, including a stormwater management plan and an erosion control plan.
- **EC-HS-21** Appropriate erosion control measures will be incorporated by the construction contractor in order to prevent sediment from entering waterways and to minimize temporary turbidity impacts. Examples include but are not limited to: straw bales/wattles, erosion blankets, silt fencing, silt curtains, mulching, revegetation, and temporary covers. Sediment and erosion control measures will be maintained by the contractor during construction at all times. Control measures will be inspected periodically by the construction contractor, particularly during and after significant rain events.
- **EC-HS-22** All deliberately exposed soil or subsoil materials used in the project near water would be protected from erosion and stabilized as soon as possible with geotextile, filter fabric or native or non-invasive vegetation matting, hydro-seeding, etc.
- **EC-HS-23** Silt curtains or other effective containment devices to help contain silt and other suspended particles placed in the water column as a result of excavation and construction activities will be used and properly installed to avoid degradation of adjacent coral reefs, and aquatic vegetation.
- **EC-HS-24** Store all dredge spoil behind maintained berms above the influence of the tides.
- **EC-HS-25** Temporary access roads and drilling pads must avoid steep slopes, where grade, soil types, or other features suggest a likelihood of excessive erosion or failure; existing access routes must be utilized or improved whenever possible, in lieu of construction of new access routes.
- **EC-HS-26** The maximum amount of material placed shall not exceed the minimum needed for erosion protection. All material will be placed in a manner that will avoid erosion by normal or expected high flows.
- **EC-HS-27** Upon completion of all activities, all project materials shall be removed, and all areas temporarily impacted by construction activities shall be fully restored to their pre-construction conditions.
- **EC-HS-28** If anchoring on the seafloor is necessary, then anchors must be placed exclusively in soft sediments. Anchors and anchor components must cause no direct physical impact to corals. Anchor and anchorline footprints of all in-water equipment must be designed to occupy the smallest footprint necessary to achieve safe and effective anchorage.
- **EC-HS-29** The construction work plan and all other environmental-compliance related plans i.e., stormwater management, pollution control, must include a contingency planning that details progressive, action-specific, risk-informed responses to faulty equipment, spills, and inadvertent discharges.
- **EC-HS-30** If in-water work is required, in-water sediment containment devices must be used to contain project generated turbidity and prevent spread beyond the active work area. Sediment containment devices must be inspected with adequate frequency to

minimize potential failure and ensure proper use and installation throughout construction. If a turbid plume is emitted from the enclosure, work must stop until the source is identified and corrected.

- **EC-HS-31** Construction activities will be kept under surveillance, management, and control to minimize interference with, disturbance of, and damage to fish and wildlife. Prior to the start of construction, the contractor will submit their Environmental Protection Plan (EPP) that will describe how all relevant fish and wildlife specifications in the contract will be implemented include protective measures for species that require specific attention:
    - limit the placement and use of people and equipment in submerged areas,
    - avoid direct interactions with vegetative habitats and corals,
    - excavation and backfill will be scheduled to avoid coral spawning and recruitment periods, and sea turtle nesting and hatching periods

Threatened / Endangered Species / Critical Habitat

USACE will include recommendations from the USACE 2021 PacSLOPES (Pacific Standard Local Operating Procedures for Endangered Species) in the project's plans and specifications. Adverse effects to T&E species will be avoided and/or minimized. T&E species protection criteria will be included in the Contractor's EPP. See Attachment 2 Appendix A-3 for the ESA Evaluation.

EC-TE-01 Constant vigilance will be kept for the presence of ESA-listed marine species (sea turtles, marine mammals, sharks, rays) during all aspects of the proposed action. Competent trained observers will be designated to survey the areas adjacent to the action area for ESA-listed marine species. The competent observer will not be simultaneously engaged in any other activity.

EC-TE-02 Surveys shall be made prior to the start of work each day, and prior to resumption of work following any break of more than one half hour. Additional periodic surveys throughout the work day are strongly recommended.

EC-TE-03 All work shall be postponed or halted when ESA-listed marine species are within 50 meters (54.7 yards, 164 feet) of the proposed work, and will only begin/resume after the animals have voluntarily departed the area.

EC-TE-04 If ESA-listed marine species are noticed within 50 meters (54.7 yards, 164 feet) after work has already begun, that work may continue only if, in the best judgement of a biologist, the activity will not adversely affect (i.e. disturb or harm) the animal(s).

EC-TE-05 Project-related personnel shall NOT conduct activities resulting in a take of an ESA-listed species, a species proposed for listing, or listed or proposed critical habitat. "Take" as defined under the ESA means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct". Activities that would qualify as take include attempting to disturb, touch, ride, feed, or otherwise intentionally interact with any protected species.

EC-TE-06 Sensitive resource areas, such as corals, coral reefs and seagrass beds known to occur within a project area must be identified on project figures. Project staff must be instructed to avoid the sensitive resource areas to the greatest extent practicable, including avoiding

anchoring in these areas, flagging the areas if appropriate, and securing all in-water equipment in a manner that will prevent the equipment from being dragged across the substrate.
EC-TE-07 Before any equipment or material enters the water, a site manager will verify that no ESA-listed marine animals are in the area where the equipment or materials are expected to contact the substrate.
EC-TE-08 Equipment operators will employ “soft starts” when initiating work each day and after each break of 30 minutes or more that directly impacts the bottom. Buckets and other equipment will be sent to the bottom in a slow and controlled manner for the first several cycles before achieving full operational impact strength or tempo. All objects lowered to the bottom will be lowered in a controlled manner. This can be achieved by the use of buoyancy controls such as lift bags, or the use of cranes, winches, or other equipment that affect positive control over the rate of descent.
EC-TE-09 In-water excavation and movement of large armor stones will not be undertaken if any ESA-listed marine animals are within 50 meters (54.7 yards, 164 feet) of the authorized work, and those operations will immediately shut-down if an ESA-listed marine animal enters within 50 meters (54.7 yards, 164 feet) of the authorized work. This condition is intended to ensure that no ESA-listed marine animals are exposed to sound levels anywhere near the TTS threshold isopleths.
EC-TE-10 The site of excavation or discharge will contain no known forage or resting habitat for ESA-listed marine species.
EC-TE-11 Observer logs. All non-take interactions with listed species (e.g. a species entering the shut-down zone and work is shut down correctly) must be documented and reported to the USACE and NMFS in monitoring logs (Table 2 in Appendix B of PacSLOPES 2022). Monitoring logs shall be completed daily. If no ESA-listed species are observed, the observer will record “0” in the daily report. All monitoring logs must be submitted to the NMFS within 90 calendar days of the completion of the project. The USACE will provide final reports to NMFS as part of the annual report. The monitoring logs will be submitted in a digital and queryable database to the NMFS reporting contact, and include:

1. total hours and dates of monitoring
2. identification of which ESA species were observed and in what location and circumstances, including date, numbers of individuals of species observed, the outcome of the species observance relative to the authorized project, and any factors which may have affected visibility,
3. if applicable, observed ESA species behaviors and movement types relative to the project activity at time of observation

EC-TE-12 If an ESA-listed species is adversely affected as a result of the project, all work must stop until coordination with the USACE and NMFS has been completed. If observers become aware of any injured, sick, or dead marine mammal or turtle (whether or not it may be related to the proposed action), they will immediately call the NOAA Statewide Hawaii Marine Wildlife Hotline at 888-256-9840. As described in Pac-SLOPES 2022.

Special Aquatic Resources

ECs for fish and wildlife and endangered species are protective of other aquatic resources. There are no wetlands in the study area.

Invasive Species

EC IS 1 Source materials to be free of invasive species.
EC IS 2 Clean equipment to avoid moving species between locations.

Cultural, Historic, and Archaeological Resources

USACE will provide for an archaeological monitor who meets the Secretary of the Interior's Historic Preservation Professional Qualification Standards (62 FR 33708) to monitor all ground-disturbing construction activities to minimize potential impacts on inadvertent discoveries. Any inadvertent discoveries will follow the Human Remains Recovery Plan in accordance with Guam Territorial Executive Order No. 89-24; the Recovery Plan will adhere to the Guam Department of Parks and Recreation's 2010 Section IV Reburial Guidelines Amendment.

Attachment 9: Air Quality and Greenhouse Gas Emissions

TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF FIGURES

ABBREVIATIONS AND ACRONYMS

CEQ	Council of Environmental Quality
CH_4	Methane
CO_2	Carbon dioxide
CO_{2eq}	Carbon dioxide equivalents
GHG	Greenhouse Gas
IWGSC	Interagency Working Group on Social Cost of Greenhouse Gases
N_20	Nitrous Oxide
NEAT	Net Emissions Analysis Tool
NEPA	National Environmental Policy Act
SC	social cost
SC-CH_4	social cost of methane
SC-CO_2	social cost of carbon dioxide
SC-GHG	social cost of greenhouse gas emissions
SC-N_2O	social cost of nitrous oxide
US	United States
USACE	U.S. Army Corps of Engineers

1 Background

The Council of Environmental Quality (CEQ) introduced the interim guidance on Greenhouse Gas (GHG) for computation of GHG and the social cost of projects on January 9, 2023. The June 2023 Consideration of Greenhouse Emissions and the Effects of Climate Change in Army National Environmental Policy Act (NEPA) Reviews Memorandum established Army NEPA policy for consideration of Greenhouse Gas (GHG) emissions and the effects of climate change in Army NEPA reviews. In assessing GHG emissions and the climate change effects resulting from proposed Army actions, Army NEPA proponents will consider guidance provided in CEQ's Interim Guidance.

U.S. Army Corps of Engineers (USACE) developed a methodology to analyze the components for GHG and incorporate them within NEPA documents. The components that are analyzed within GHG are Carbon dioxide (CO_2), Methane (CH_4), and Nitrous Oxide (N_2O). For GHG, CO_2 is the primary contributor to GHG and climate change, followed by CH_4 and N_2O (Overview of Greenhouse, 2023).

Within this evaluation, four (4) alternatives for the Agat Mayor's Complex Shoreline Protection were considered for GHG emission:

1. No Action
2. Concrete Armor Revetment
3. Open Cell Piling Seawall
4. Secant Pile Seawall

GHG emissions were quantified for the no action alternative based on annual repair of the existing concrete rubble masonry wall throughout the other alternatives construction period and 50 year project life. Emissions associated with the eventual loss of the facility and increased travel time to the nearest replacement location were not calculated for this analysis. The alternatives' GHG emissions were quantified based on construction vehicle and equipment requirements for 1 year of construction (NEAT does not calculate portions of a year), and O&M vehicle and equipment requirements for O&M every 20 years over a 50 year project lifespan.

The GHG emissions were calculated using the type, quantity, horsepower, total hours, and associated emission factors of the equipment in the USACE NEAT model (USACE 2024; Tables 10-1 through 10-9). Estimates of the number and type of construction vehicles, fuel type used, and hours for each are very rough and not considered to represent actual final construction circumstances but are comparable across the alternatives. Emissions factors were not available for lead, nitrous oxide or CO_2 equivalents in the Hawaii database used. Wetland and aquatic habitat GHG fluctuations were not considered because while there would be loss of intertidal habitat with the revetment construction, and a change in the location and quality of intertidal habitat with the No Action alternative, the OCONUS wetland and aquatic habitat emissions are not currently included in the NEATv.1.1 model (USACE 2024). The type of concrete available for use in the project is not known at this time, therefore embodied carbon from cement was not calculated.

Table 10-1: Daily Construction Emissions by Equipment for Alternative 1: No Action

Emission Source Data							Emission Factors for Construction Equipment								Daily Emissions from Construction Activities (lbs/day)							
Construction Activity Equipment Type	Power Rating (Hp)	Load Factor	# Active	Hourly Hp-Hrs	Hrs per Day [1]	Miles Per Day	ROG	CO	NOx	SOx	PM10	PM2.5	CO2	CH4	ROG	CO	NOx	SOx	PM10	PM2.5	CO2	CH4
Worker vehicles	1	1	5	1	2	N/A	0.001	0.006	0.001	0.000	0.000	0.000	**1.111**	**0.000**	0.007	0.061	0.006	0.000	0.001	0.001	11.111	0.000
Loader, (4 CY Bucket, 4x4)	211	0.37	1	78.07	8	N/A	0.081	0.344	0.443	0.002	0.015	0.013	66.798	0.003	0.241	1.020	1.311	0.006	0.045	0.040	197.721	0.010
Dump Trucks (10 CY)	400	0.38	2	304	16	10	0.001	0.006	0.014	0.000	0.001	0.001	7.624	0.001	0.009	0.043	0.106	0.000	0.005	0.004	57.945	0.006
Peak Daily Emissions															**0.26**	**1.12**	**1.42**	**0.01**	**0.05**	**0.04**	**266.78**	**0.02**
SCAQMD Daily Significance Thresholds															**75**	**550**	**100**	**150**	**150**	**55**	**56**	**57**
Annual Project Emissions (grams)															**29,030.726**	**127,299.262**	**161,056.174**	**694.581**	**5,771.318**	**5,056.272**	**30,212,491.593**	**1,817.364**
SCAQMD Yearly Significance Thresholds															**100**	**100**	**100**	**100**	**100**	**100**	**101**	**102**
SCAQMD Yearly Significance Thresholds															**100**	**100**	**100**	**100**	**100**	**100**	**101**	**102**

Table 10-2: Daily Construction Emissions by Equipment for Alternative 2: Concrete Armor Revetment

Emission Source Data							Emission Factors for Construction Equipment								Daily Emissions from Construction Activities (lbs/day)							
Construction Activity/Equipment Type	Power Rating (Hp)	Load Factor	# Active	Hourly Hp-Hrs	Hrs per Day [1]	Miles Per Day	ROG	CO	NOx	SOx	PM10	PM2.5	CO2	CH4	ROG	CO	NOx	SOx	PM10	PM2.5	CO2	CH4
Worker vehicles	1	1	10	1	4	N/A	0.001	0.006	0.001	0.000	0.000	0.000	**1.111**	**0.000**	0.027	0.246	0.024	0.000	0.004	0.002	44.442	0.000
Quarry delivery trucks	1	1	12	1	10	1	0.002	0.012	0.013	0.000	0.001	0.000	**4.193**	**0.000**	0.209	1.403	1.542	0.003	0.060	0.050	503.220	0.000
3/4 Ton Pickup Truck	385	0.38	4	585.2	10	20	0.001	0.009	0.009	0.000	0.000	0.000	**4.193**	**0.000**	0.040	0.261	0.274	0.001	0.011	0.009	127.482	0.001
Crane (40 Ton)	365	0.29	1	105.85	10	1	0.109	0.384	0.705	0.002	0.026	0.023	128.629	0.007	0.315	1.113	2.044	0.005	0.075	0.066	373.025	0.020
Loader, (18.30 CY Bucket, 4x4)	808	0.37	1	298.96	10	1	0.130	0.502	0.803	0.002	0.029	0.026	66.798	0.003	0.482	1.856	2.972	0.009	0.108	0.096	247.151	0.012
Dump Trucks (10 CY)	400	0.38	4	608	10	20	0.001	0.006	0.014	0.000	0.001	0.001	7.624	0.001	0.037	0.172	0.422	0.001	0.021	0.017	231.782	0.025
Backhoe (1.50 CY)	95	0.37	2	70.3	10	1	0.037	0.340	0.247	0.001	0.013	0.011	66.798	0.003	0.271	2.518	1.825	0.004	0.095	0.085	494.302	0.024
Generator	65	0.42	2	54.6	10	1	0.038	0.216	0.220	0.000	0.011	0.009	60.993	0.003	0.319	1.815	1.847	0.003	0.089	0.079	512.339	0.024
Dozer D8	310	0.4	1	124	10	1	0.229	0.928	1.687	0.003	0.067	0.060	239.080	0.017	0.916	3.711	6.747	0.010	0.269	0.240	956.321	0.066
Water Truck (3000 gal)	320	0.38	1	121.6	10	1	0.149	0.545	0.748	0.003	0.027	0.024	**4.193**	**0.000**	0.566	2.070	2.843	0.010	0.104	0.092	15.935	0.000
Grader	200	0.41	1	82	10	1	0.100	0.368	0.670	0.002	0.023	0.020	132.743	0.007	0.410	1.510	2.747	0.008	0.094	0.084	544.246	0.028
Peak Daily Emissions															**3.59**	**16.67**	**23.29**	**0.06**	**0.93**	**0.82**	**4050.25**	**0.20**
SCAQMD Daily Significance Thresholds															**75**	**550**	**100**	**150**	**150**	**55**	**56**	**57**
Annual Project Emissions (grams)															**406,531.868**	**1,888,280.494**	**2,637,192.159**	**6,320.732**	**105,422.380**	**92,890.918**	**458,690,364.967**	**22,776.667**
SCAQMD Yearly Significance Thresholds															**100**	**100**	**100**	**100**	**100**	**100**	**101**	**102**

Table 10-3: Daily Construction Emissions by Equipment for Alternative 3: Open Cell Piling Seawall

Emission Source Data							Emission Factors for Construction Equipment								Daily Emissions from Construction Activities (lbs/day)							
Construction Activity/Equipment Type	Power Rating (Hp)	Load Factor	# Active	Hourly Hp-Hrs	Hrs per Day (1)	Miles Per Day	ROG	CO	NOx	SOx	PM10	PM2.5	CO2	CH4	ROG	CO	NOx	SOx	PM10	PM2.5	CO2	CH4
Worker vehicles	1	1	12	1	4	1	0.001	0.006	0.001	0.000	0.000	0.000	**1.111**	**0.000**	0.032	0.295	0.029	0.001	0.004	0.003	53.331	0.000
3/4 Ton Pickup Truck	385	0.38	4	585.2	10	20	0.001	0.009	0.009	0.000	0.000	0.000	**4.193**	**0.000**	0.040	0.261	0.274	0.001	0.011	0.009	127.482	0.001
Crane (40 Ton)	365	0.29	1	105.85	10	1	0.109	0.384	0.705	0.002	0.026	0.023	128.629	0.007	0.315	1.113	2.044	0.005	0.075	0.066	373.025	0.020
Loader, (18.30 CY Bucket, 4x4)	808	0.37	2	597.92	10	1	0.130	0.502	0.803	0.002	0.029	0.026	66.798	0.003	0.964	3.712	5.944	0.017	0.215	0.192	494.302	0.024
Loader, (4 CY Bucket, 4x4)	211	0.37	1	78.07	10	1	0.081	0.344	0.443	0.002	0.015	0.013	66.798	0.003	0.301	1.275	1.638	0.007	0.056	0.050	247.151	0.012
Semi Truck (75,000 LB Cap)	400	0.38	1	152	4	40	0.001	0.006	0.014	0.000	0.001	0.001	**4.193**	**0.000**	0.018	0.086	0.211	0.001	0.011	0.009	63.741	0.001
Dump Trucks (10 CY)	400	0.38	8	1216	10	40	0.001	0.006	0.014	0.000	0.001	0.001	7.624	0.001	0.146	0.688	1.689	0.005	0.085	0.068	927.127	0.101
Backhoe (1.50 CY)	95	0.37	2	70.3	10	1	0.037	0.340	0.247	0.001	0.013	0.011	66.798	0.003	0.271	2.518	1.825	0.004	0.095	0.085	494.302	0.024
Concrete Truck (8 cy)	235	0.38	2	178.6	10	20	0.001	0.006	0.014	0.000	0.001	0.001	7.248	0.001	0.018	0.086	0.211	0.001	0.011	0.009	110.172	0.012
Generator	65	0.42	2	54.6	10	1	0.038	0.216	0.220	0.000	0.011	0.009	60.993	0.003	0.319	1.815	1.847	0.003	0.089	0.079	512.339	0.024
Dozer D8	310	0.4	1	124	10	1	0.229	0.928	1.687	0.003	0.067	0.060	239.080	0.017	0.916	3.711	6.747	0.010	0.269	0.240	956.321	0.066
Water Truck (3000 gal)	320	0.38	1	121.6	10	1	0.149	0.545	0.748	0.003	0.027	0.024	**4.193**	**0.000**	0.566	2.070	2.843	0.010	0.104	0.092	15.935	0.000
Grader	200	0.41	1	82	10	1	0.100	0.368	0.670	0.002	0.023	0.020	132.743	0.007	0.410	1.510	2.747	0.008	0.094	0.084	544.246	0.028
Roller Compactor (6 Ton)	85	0.38	1	32.3	10	1	0.058	0.387	0.380	0.001	0.027	0.024	67.035	0.004	0.219	1.472	1.444	0.003	0.103	0.091	254.732	0.016
										Peak Daily Emissions					**4.53**	**20.61**	**29.49**	**0.08**	**1.22**	**1.08**	**5174.21**	**0.33**
										SCAQMD Daily Significance Thresholds					**75**	**550**	**100**	**150**	**150**	**55**	**56**	**57**
										Annual Project Emissions (grams)					**513,464.178**	**2,333,991.293**	**3,339,970.212**	**8,595.437**	**138,491.928**	**121,898.886**	**585,978,992.414**	**37,298.578**
										SCAQMD Yearly Significance Thresholds					**100**	**100**	**100**	**100**	**100**	**100**	**101**	**102**

Table 10-4: Daily Construction Emissions by Equipment for Alternative 4: Secant Pile Seawall

Emission Source Data							Emission Factors for Construction Equipment								Daily Emissions from Construction Activities (lbs/day)							
Construction Activity/Equipment Type	Power Rating (Hp)	Load Factor	# Active	Hourly Hp-Hrs	Hrs per Day (1)	Miles Per Day	ROG	CO	NOx	SOx	PM10	PM2.5	CO2	CH4	ROG	CO	NOx	SOx	PM10	PM2.5	CO2	CH4
Worker vehicles	1	1	12	1	4	1	0.001	0.006	0.001	0.000	0.000	0.000	**1.111**	**0.000**	0.032	0.295	0.029	0.001	0.004	0.003	53.331	0.000
3/4 Ton Pickup Truck	385	0.38	4	585.2	10	20	0.001	0.009	0.009	0.000	0.000	0.000	**4.193**	**0.000**	0.040	0.261	0.274	0.001	0.011	0.009	127.482	0.001
Crane (40 Ton)	365	0.29	1	105.85	10	1	0.109	0.384	0.705	0.002	0.026	0.023	128.629	0.007	0.315	1.113	2.044	0.005	0.075	0.066	373.025	0.020
Loader, (18.30 CY Bucket, 4x4)	808	0.37	2	597.92	10	1	0.130	0.502	0.803	0.002	0.029	0.026	66.798	0.003	0.964	3.712	5.944	0.017	0.215	0.192	494.302	0.024
Loader, (4 CY Bucket, 4x4)	211	0.37	1	78.07	10	1	0.081	0.344	0.443	0.002	0.015	0.013	66.798	0.003	0.301	1.275	1.638	0.007	0.056	0.050	247.151	0.012
Semi Truck (75,000 LB Cap)	400	0.38	1	152	4	40	0.001	0.006	0.014	0.000	0.001	0.001	**4.193**	**0.000**	0.018	0.086	0.211	0.001	0.011	0.009	63.741	0.001
Dump Trucks (10 CY)	400	0.38	8	1216	10	40	0.001	0.006	0.014	0.000	0.001	0.001	7.624	0.001	0.146	0.688	1.689	0.005	0.085	0.068	927.127	0.101
Backhoe (1.50 CY)	95	0.37	2	70.3	10	1	0.037	0.340	0.247	0.001	0.013	0.011	66.798	0.003	0.271	2.518	1.825	0.004	0.095	0.085	494.302	0.024
Concrete Truck (8 cy)	235	0.38	2	178.6	10	20	0.001	0.006	0.014	0.000	0.001	0.001	7.248	0.001	0.018	0.086	0.211	0.001	0.011	0.009	110.172	0.012
Generator	65	0.42	2	54.6	10	1	0.038	0.216	0.220	0.000	0.011	0.009	60.993	0.003	0.319	1.815	1.847	0.003	0.089	0.079	512.339	0.024
Dozer D8	310	0.4	1	124	10	1	0.229	0.928	1.687	0.003	0.067	0.060	239.080	0.017	0.916	3.711	6.747	0.010	0.269	0.240	956.321	0.066
Water Truck (3000 gal)	320	0.38	1	121.6	10	1	0.149	0.545	0.748	0.003	0.027	0.024	**4.193**	**0.000**	0.566	2.070	2.843	0.010	0.104	0.092	15.935	0.000
Grader	200	0.41	1	82	10	1	0.100	0.368	0.670	0.002	0.023	0.020	132.743	0.007	0.410	1.510	2.747	0.008	0.094	0.084	544.246	0.028
Roller Compactor (6 Ton)	85	0.38	1	32.3	10	1	0.058	0.387	0.380	0.001	0.027	0.024	67.035	0.004	0.219	1.472	1.444	0.003	0.103	0.091	254.732	0.016
										Peak Daily Emissions					**4.53**	**20.61**	**29.49**	**0.08**	**1.22**	**1.08**	**5174.21**	**0.33**
										SCAQMD Daily Significance Thresholds					**75**	**550**	**100**	**150**	**150**	**55**	**56**	**57**
										Annual Project Emissions (grams)					**513,464.178**	**2,333,991.293**	**3,339,970.212**	**8,595.437**	**138,491.928**	**121,898.886**	**585,978,992.414**	**37,298.578**
										SCAQMD Yearly Significance Thresholds					**100**	**100**	**100**	**100**	**100**	**100**	**101**	**102**

Table 10-5: O&M Emissions by Equipment for Alternative 1: No Action

Emission Source Data							Emission Factors for Construction Equipment								Daily Emissions from Construction Activities (lbs/day)							
Construction Activity Equipment Type	Power Rating (Hp)	Load Factor	# Active	Hourly Hp-Hrs	Hrs per Day (1)	Miles Per Day	ROG	CO	NOx	SOx	PM10	PM2.5	CO2	CH4	ROG	CO	NOx	SOx	PM10	PM2.5	CO2	CH4
Worker vehicles	1	1	5	1	2	N/A	0.001	0.006	0.001	0.000	0.000	0.000	**1.111**	**0.000**	0.007	0.061	0.006	0.000	0.001	0.001	11.111	0.000
Loader, (4 CY Bucket, 4x4)	211	0.37	1	78.07	8	N/A	0.081	0.344	0.443	0.002	0.015	0.013	66.798	0.003	0.241	1.020	1.311	0.006	0.045	0.040	197.721	0.010
Dump Trucks (10 CY)	400	0.38	2	304	16	10	0.001	0.006	0.014	0.000	0.001	0.001	7.624	0.001	0.009	0.043	0.106	0.000	0.005	0.004	57.945	0.006
														Peak Daily Emissions	**0.26**	**1.12**	**1.42**	**0.01**	**0.05**	**0.04**	**266.78**	**0.02**
														SCAQMD Daily Significance Thresholds	**75**	**550**	**100**	**150**	**150**	**55**	**56**	**57**
														Annual Project Emissions (grams)	**29,030.726**	**127,299.262**	**161,056.174**	**694.581**	**5,771.318**	**5,056.272**	**30,212,491.593**	**1,817.364**
														SCAQMD Yearly Significance Thresholds	**100**	**100**	**100**	**100**	**100**	**100**	**101**	**102**

Table 10-6: O&M Emissions by Equipment for Alternative 2: Revetment

Emission Source Data							Emission Factors for Construction Equipment								Daily Emissions from Construction Activities (lbs/day)							
Construction Activity/Equipment Type	Power Rating (Hp)	Load Factor	# Active	Hourly Hp-Hrs	Hrs per Day (1)	Miles Per Day	ROG	CO	NOx	SOx	PM10	PM2.5	CO2	CH4	ROG	CO	NOx	SOx	PM10	PM2.5	CO2	CH4
Worker vehicles	1	1	5	1	4	N/A	0.001	0.006	0.001	0.000	0.000	0.000	**1.111**	**0.000**	0.013	0.123	0.012	0.000	0.002	0.001	22.221	0.000
Quarry delivery trucks	1	1	1	1	10	1	0.002	0.012	0.013	0.000	0.001	0.000	**4.193**	**0.000**	0.017	0.117	0.129	0.000	0.005	0.004	41.935	0.000
3/4 Ton Pickup Truck	385	0.38	1	146.3	10	20	0.001	0.009	0.009	0.000	0.000	0.000	**4.193**	**0.000**	0.010	0.065	0.068	0.000	0.003	0.002	31.871	0.000
Crane (40 Ton)	365	0.29	1	105.85	10	1	0.109	0.384	0.705	0.002	0.026	0.023	128.629	0.007	0.315	1.113	2.044	0.005	0.075	0.066	373.025	0.020
Loader, (18.30 CY Bucket, 4x4)	808	0.37	1	298.96	10	1	0.130	0.502	0.803	0.002	0.029	0.026	66.798	0.003	0.482	1.856	2.972	0.009	0.108	0.096	247.151	0.012
Backhoe (1.50 CY)	95	0.37	1	35.15	10	1	0.037	0.340	0.247	0.001	0.013	0.011	66.798	0.003	0.135	1.259	0.913	0.002	0.048	0.042	247.151	0.012
Dozer D8	310	0.4	1	124	10	1	0.229	0.928	1.687	0.003	0.067	0.060	239.080	0.017	0.916	3.711	6.747	0.010	0.269	0.240	956.321	0.066
														Peak Daily Emissions	**1.89**	**8.24**	**12.88**	**0.03**	**0.51**	**0.45**	**1919.68**	**0.11**
														SCAQMD Daily Significance Thresholds	**75**	**550**	**100**	**150**	**150**	**55**	**56**	**57**
														Annual Project Emissions (grams)	**214,004.036**	**933,566.952**	**1,459,110.757**	**3,065.903**	**57,640.022**	**51,175.079**	**217,403,233.935**	**12,504.996**
														SCAQMD Yearly Significance Thresholds	**100**	**100**	**100**	**100**	**100**	**100**	**101**	**102**

Table 10-7: O&M Emissions by Equipment for Alternative 3: Open Cell Piling Seawall

Emission Source Data							Emission Factors for Construction Equipment								Daily Emissions from Construction Activities (lbs/day)							
Construction Activity/Equipment Type	Power Rating (Hp)	Load Factor	# Active	Hourly Hp-Hrs	Hrs per Day (1)	Miles Per Day	ROG	CO	NOx	SOx	PM10	PM2.5	CO2	CH4	ROG	CO	NOx	SOx	PM10	PM2.5	CO2	CH4
Worker vehicles	1	1	5	1	4	1	0.001	0.006	0.001	0.000	0.000	0.000	**1.111**	**0.000**	0.013	0.123	0.012	0.000	0.002	0.001	22.221	0.000
3/4 Ton Pickup Truck	385	0.38	1	146.3	10	20	0.001	0.009	0.009	0.000	0.000	0.000	**4.193**	**0.000**	0.010	0.065	0.068	0.000	0.003	0.002	31.871	0.000
Crane (40 Ton)	365	0.29	1	105.85	10	1	0.109	0.384	0.705	0.002	0.026	0.023	128.629	0.007	0.315	1.113	2.044	0.005	0.075	0.066	373.025	0.020
Concrete Truck (8 cy)	235	0.38	1	89.3	10	20	0.001	0.006	0.014	0.000	0.001	0.001	7.248	0.001	0.009	0.043	0.106	0.000	0.005	0.004	55.086	0.006
Dozer D8	310	0.4	1	124	10	1	0.229	0.928	1.687	0.003	0.067	0.060	239.080	0.017	0.916	3.711	6.747	0.010	0.269	0.240	956.321	0.066
														Peak Daily Emissions	**1.26**	**5.05**	**8.98**	**0.02**	**0.35**	**0.31**	**1438.52**	**0.09**
														SCAQMD Daily Significance Thresholds	**75**	**550**	**100**	**150**	**150**	**55**	**56**	**57**
														Annual Project Emissions (grams)	**143,163.139**	**572,451.208**	**1,016,608.605**	**1,840.517**	**40,077.017**	**35,528.692**	**162,912,829.843**	**10,409.811**
														SCAQMD Yearly Significance Thresholds	**100**	**100**	**100**	**100**	**100**	**100**	**101**	**102**

Table 10-8: O&M Emissions by Equipment for Alternative 4: Secant Pile Seawall

Emission Source Data							Emission Factors for Construction Equipment								Daily Emissions from Construction Activities (lbs/day)							
Construction Activity/Equipment Type	Power Rating (Hp)	Load Factor	# Active	Hourly Hp-Hrs	Hrs per Day (1)	Miles Per Day	ROG	CO	NOx	SOx	PM10	PM2.5	CO2	CH4	ROG	CO	NOx	SOx	PM10	PM2.5	CO2	CH4
Worker vehicles	1	1	5	1	4	1	0.001	0.006	0.001	0.000	0.000	0.000	**1.111**	**0.000**	0.013	0.123	0.012	0.000	0.002	0.001	22.221	0.000
3/4 Ton Pickup Truck	385	0.38	1	146.3	10	20	0.001	0.009	0.009	0.000	0.000	0.000	**4.193**	**0.000**	0.010	0.065	0.068	0.000	0.003	0.002	31.871	0.000
Crane (40 Ton)	365	0.29	1	105.85	10	1	0.109	0.384	0.705	0.002	0.026	0.023	128.629	0.007	0.315	1.113	2.044	0.005	0.075	0.066	373.025	0.020
Concrete Truck (8 cy)	235	0.38	1	89.3	10	40	0.001	0.006	0.014	0.000	0.001	0.001	7.248	0.001	0.018	0.086	0.211	0.001	0.011	0.009	110.172	0.012
Dozer D8	310	0.4	1	124	10	1	0.229	0.928	1.687	0.003	0.067	0.060	239.080	0.017	0.916	3.711	6.747	0.010	0.269	0.240	956.321	0.066
										Peak Daily Emissions					**1.27**	**5.10**	**9.08**	**0.02**	**0.36**	**0.32**	**1493.61**	**0.10**
										SCAQMD Daily Significance Thresholds					**75**	**550**	**100**	**150**	**150**	**55**	**56**	**57**
										Annual Project Emissions (grams)					**144,197.999**	**577,317.886**	**1,028,564.700**	**1,875.222**	**40,681.210**	**36,011.416**	**169,151,309.239**	**11,072.253**
										SCAQMD Yearly Significance Thresholds					**100**	**100**	**100**	**100**	**100**	**100**	**101**	**102**

2 Direct Short Term Construction Greenhouse Gas Emissions (GHG)

Direct Emissions are a *direct result of the project* (e.g. construction), and are quantified for carbon dioxide, methane, nitrous oxide, and carbon dioxide equivalents in Table F-1. Carbon dioxide equivalents are calculated from the *global warming* potential of each unique GHG using the equation:

$$CO_2eq = X*CO_2 + Y*N_2O + Z*CH_4$$

Where X = 100 Year Global Warming Potential for Carbon Dioxide = 1

Where Y = 100 Year Global Warming Potential for Nitrous Oxide = 298

Where Z = 100 Year Global Warming Potential for Methane = 25

CFR Title 40 Chapter I Subchapter C Part 98: Table A-1 Global Warming Potentials

Direct emissions for the Agat Shoreline Protection are short term GHG emissions resulting from the use of construction equipment (Table 10-9).

Table 10-9: Short-term Direct GHG Emissions from construction equipment in metric tons for construction year 2027

	Alternative 1 - No Action Alternative Metric Tons	**Alternative 2 - Revetment** Metric Tons	**Alternative 3 - Open Cell Piling Seawall** Metric Tons	**Alternative 4 - Secant Pile Seawall** Metric Tons
Air Quality Pollutant Emissions (Clean Air Act)				
Reactive Organic Gases aka Volatile Organic Compounds (ROG/VOC)	0.00	0.41	0.51	0.51
Carbon Monoxide (CO)	0.00	1.89	2.33	2.33
Sulfur Oxides (SOx)	0.00	0.01	0.01	0.01
Nitrous Oxides (NOx)	0.00	2.64	3.34	3.34
Particulate Matter - 2.5 micron ($PM_{2.5}$)	0.00	0.09	0.12	0.12
Particulate Matter - 10 micron (PM_{10})	0.00	0.11	0.14	0.14
Lead (Pb)	0.00	0.00	0.00	0.00
Greenhouse Gas Emissions (NEPA)				
Carbon Dioxide (CO_2)	0.00	458.69	585.98	585.98
Methane (CH_4)	0.00	0.02	0.04	0.04
Nitrous Oxide (N_2O)	0.00	0.00	0.00	0.00

3 Indirect Long-Term Operations and Maintenance (O&M) Emissions

Operations and Maintenance(O&M) emissions are calculated to cover the standard USACE project lifetime of 50 years. O&M for the No Action Alternative would occur every year. O&M for the shoreline protection alternatives would occur once every 20 years.

Table 10-10: Long Term Indirect Emissions from Operations and Maintenance Activities in metric tons

	Yearly O&M Emissions			Project Lifetime O&M Emissions		
Alternative 1 - No Action Alternative	1			50		
Air Quality Pollutant Emissions (Clean Air Act)	Grams	Pounds	Metric Tons	Grams	Pounds	Metric Tons
Reactive Organic Gases aka Volatile Organic Compounds (ROG/VOC)	29,030.73	64.00	0.03	1,451,536.32	3,200.09	1.45
Carbon Monoxide (CO)	127,299.26	280.65	0.13	6,364,963.10	14,032.35	6.36
Sulfur Oxides (SOx)	694.58	1.53	0.00	34,729.05	76.56	0.03
Nitrous Oxides (NOx)	161,056.17	355.07	0.16	8,052,808.69	17,753.42	8.05
Particulate Matter - 2.5 micron ($PM_{2.5}$)	5,056.27	11.15	0.01	252,813.61	557.36	0.25
Particulate Matter - 10 micron (PM_{10})	5,771.32	12.72	0.01	288,565.91	636.18	0.29
Lead - (Pb)		0.00	0.00	0.00	0.00	0.00
Greenhouse Gas Emissions (NEPA)						
Carbon Dioxide (CO_2)	30,212,491.59	66,607.20	30.21	1,510,624,579.65	3,330,359.84	1,510.63
Methane (CH_4)	1,817.36	4.01	0.00	90,868.18	200.33	0.09
Nitrous Oxide (N_2O)		0.00	0.00	0.00	0.00	0.00
Alternative 2 - Concrete Armor Unit Revetment	1			50		
Air Quality Pollutant Emissions (Clean Air Act)	Grams	Pounds	Metric Tons	Grams	Pounds	Metric Tons
Reactive Organic Gases aka Volatile Organic Compounds (ROG/VOC)	10,700.20	23.59	0.01	535,010.09	1,179.50	0.54
Carbon Monoxide (CO)	46,678.35	102.91	0.05	2,333,917.38	5,145.41	2.33
Sulfur Oxides (SOx)	153.30	0.34	0.00	7,664.76	16.90	0.01
Nitrous Oxides (NOx)	72,955.54	160.84	0.07	3,647,776.89	8,041.98	3.65
Particulate Matter - 2.5 micron ($PM_{2.5}$)	2,558.75	5.64	0.00	127,937.70	282.05	0.13
Particulate Matter - 10 micron (PM_{10})	2,882.00	6.35	0.00	144,100.05	317.69	0.14
Lead - (Pb)		0.00	0.00	0.00	0.00	0.00
Greenhouse Gas Emissions (NEPA)						
Carbon Dioxide (CO_2)	10,870,161.70	23,964.62	10.87	543,508,084.84	1,198,231.20	543.51
Methane (CH_4)	625.25	1.38	0.00	31,262.49	68.92	0.03
Nitrous Oxide (N_2O)		0.00	0.00	0.00	0.00	0.00
Alternative 3 - Open Cell Piling Seawall	1			50		
Air Quality Pollutant Emissions (Clean Air Act)	Grams	Pounds	Metric Tons	Grams	Pounds	Metric Tons

Reactive Organic Gases aka Volatile Organic Compounds (ROG/VOC)	7,158.16	15.78	0.01	357,907.85	789.05	0.36
Carbon Monoxide (CO)	28,622.56	63.10	0.03	1,431,128.02	3,155.10	1.43
Sulfur Oxides (SOx)	92.03	0.20	0.00	4,601.29	10.14	0.00
Nitrous Oxides (NOx)	50,830.43	112.06	0.05	2,541,521.51	5,603.10	2.54
Particulate Matter - 2.5 micron ($PM_{2.5}$)	1,776.43	3.92	0.00	88,821.73	195.82	0.09
Particulate Matter - 10 micron (PM_{10})	2,003.85	4.42	0.00	100,192.54	220.89	0.10
Lead - (Pb)		0.00	0.00	0.00	0.00	0.00
Greenhouse Gas Emissions (NEPA)						
Carbon Dioxide (CO_2)	8,145,641.49	17,958.08	8.15	407,282,074.61	897,904.01	407.28
Methane (CH_4)	520.49	1.15	0.00	26,024.53	57.37	0.03
Nitrous Oxide (N_2O)		0.00	0.00	0.00	0.00	0.00
Alternative 4 - Secant Pile Seawall	1			50		
Air Quality Pollutant Emissions (Clean Air Act)	Grams	Pounds	Metric Tons	Grams	Pounds	Metric Tons
Reactive Organic Gases aka Volatile Organic Compounds (ROG/VOC)	7,209.90	15.90	0.01	360,495.00	794.76	0.36
Carbon Monoxide (CO)	28,865.89	63.64	0.03	1,443,294.71	3,181.92	1.44
Sulfur Oxides (SOx)	93.76	0.21	0.00	4,688.06	10.34	0.00
Nitrous Oxides (NOx)	51,428.24	113.38	0.05	2,571,411.75	5,669.00	2.57
Particulate Matter - 2.5 micron ($PM_{2.5}$)	1,800.57	3.97	0.00	90,028.54	198.48	0.09
Particulate Matter - 10 micron (PM_{10})	2,034.06	4.48	0.00	101,703.03	224.22	0.10
Lead - (Pb)		0.00	0.00	0.00	0.00	0.00
Greenhouse Gas Emissions (NEPA)						
Carbon Dioxide (CO_2)	8,457,565.46	18,645.76	8.46	422,878,273.10	932,287.77	422.88
Methane (CH_4)	553.61	1.22	0.00	27,680.63	61.03	0.03
Nitrous Oxide (N_2O)		0.00	0.00	0.00	0.00	0.00

4 Other Emissions

The proposed action is not anticipated to produce Upstream Emissions necessary for operating project features that would not otherwise be emitted, Downstream Emissions that would not be emitted but for project construction, or Connected Emissions from other projects that would not be emitted but for the project.

5 Social Costs of Greenhouse Gases

The social cost of greenhouse gas emissions (SC-GHG) were calculated for each project alternative by summing the individual emissions from the major greenhouse gas pollutants CO_2, CH_4, and N_2O, and then multiplying by the social cost of each pollutant for the year in which they were generated using the tables from the Interagency Working Group on Social Cost of

Greenhouse Gases (IWGSC) report as established by Executive Order 13990 to provide interim updated social costs values, with a 3% discount rate (IWGSC 2021).Social cost (SC) was estimated using the below formula to translate the climate impact to the proposed metric of dollars.

Social Costs of Greenhouse Gases were quantified in 2020 dollars using the USAC ENEAT model. Which follows the "Interagency Working Group on Social Costs of Greenhouse Gases (IWGSCGHG) Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates" under Executive Order 13990. February 2021.

$$SC - GHG \ = CO * SC - CO_2 + \ CO_2 * SC - CO_2 + CH_4 * SC - CH_4 + N_2O * SC - N_2O$$

Where

SC-GHG = the social cost of GHG in dollars
CO_2 = total carbon dioxide emissions in metric tons
SC-CO_2 = social cost of carbon dioxide
CH_4 = total methane emissions in metric tons
SC-CH_4 = social cost of methane
N_2O = total nitrous oxide emissions in metric tons
SC-N_2O = social cost of nitrous oxide

Alternative 1 Habitat Restoration has the highest gross and net Social Costs (Table F-5), as currently calculated for GHG emissions. Net costs are calculated as the difference between the Action Alternative and the No Action Alternative, where the No Action Alternative is assumed to be the baseline.

Table F-11: Social Costs in 2020 Dollars. Net Total = (With action gross) – (No Action gross)

	Social Costs of Greenhouse Gas Emissions in 2020 Dollars ($)				
Alternative 1 - No Action Alternative	**Construction Costs**	**O&M**	**Wetlands and Aquatic Habitat**	**Embodied Carbon**	**Total Social Costs by GHG**
Carbon Dioxide (CO_2)	$0	$325,329	$0	$0	$325,329
Methane (CH_4)	$0	$346	$0	N/A	$346
Nitrous Oxide (N_2O)	$0	$0	$0	N/A	$0
Total Social Costs By Activity	$0	$325,675	$0	$0	

Alternative 1 - No Action Alternative Gross Total	**$325,675**
Alternative 1 - No Action Alternative Net Total	**$0**

	Social Costs of Greenhouse Gas Emissions in 2020 Dollars ($)				
Alternative 2 - Concrete	**Construction Costs**	**O&M**	**Wetlands and Aquatic Habitat**	**Embodied Carbon**	**Total Social Costs by GHG**

Armor Unit Revetment					
Carbon Dioxide (CO_2)	$62,382	$118,605	$0	$0	$180,987
Methane (CH_4)	$39	$121	$0	N/A	$161
Nitrous Oxide (N_2O)	$0	$0	$0	N/A	$0
Total Social Costs By Activity	$62,421	$118,726	$0	$0	

Alternative 2 - Concrete Armor Unit Revetment Gross Total	**$181,147**
Alternative 2 - Concrete Armor Unit Revetment Net Total	**-$144,527**

	Social Costs of Greenhouse Gas Emissions in 2020 Dollars ($)				
Alternative 3 - Open Cell Piling Seawall	**Construction Costs**	**O&M**	**Wetlands and Aquatic Habitat**	**Embodied Carbon**	**Total Social Costs by GHG**
Carbon Dioxide (CO_2)	$79,693	$88,877	$0	$0	$168,571
Methane (CH_4)	$64	$101	$0	N/A	$165
Nitrous Oxide (N_2O)	$0	$0	$0	N/A	$0
Total Social Costs By Activity	$79,758	$88,978	$0	$0	

Alternative 3 - Open Cell Piling Seawall Gross Total	**$168,736**
Alternative 3 - Open Cell Piling Seawall Net Total	**-$156,939**

	Social Costs of Greenhouse Gas Emissions in 2020 Dollars ($)				
Alternative 4 - Secant Pile Seawall	**Construction Costs**	**O&M**	**Wetlands and Aquatic Habitat**	**Embodied Carbon**	**Total Social Costs by GHG**
Carbon Dioxide (CO_2)	$79,693	$92,281	$0	$0	$171,974
Methane (CH_4)	$64	$107	$0	N/A	$172
Nitrous Oxide (N_2O)	$0	$0	$0	N/A	$0
Total Social Costs By Activity	$79,758	$92,388	$0	$0	

Alternative 4 - Secant Pile Seawall Gross Total	**$172,146**
Alternative 4 - Secant Pile Seawall Net Total	**-$153,529**

6 Effects Determination

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, and/or
- Generation of greenhouse gas emissions that would significantly contribute to climate change. There are currently no Federal thresholds of significance established for greenhouse gas emissions, and so it is the responsibility of the NEPA lead agency to decide how significant effects will be determined. To this end, significance for greenhouse gas emissions was determined by comparing the greenhouse gas emissions produced for each project alternative to governmental greenhouse gas reduction goals, while not formally adopting the greenhouse gas reduction goal per se.

Provide a cogent/concise discussion of project impacts and benefits as it relates to GHG emissions and/or sequestration using the recommended metric for determining significant effects- which compares whether project alternatives would prevent the federal net-zero carbon goal from being met (net zero by 2050).

Gross and Net emissions are reported in net total metric tons (required), pounds (optional), and calculated using the equation:

$$\boldsymbol{E_{Net} = A_E - NA_E}$$

Where:
ENet = net emissions for each action alternative (grams, pounds, metric tons)
AE = total emissions for the action alternative (subtracting sequestered emissions)
NAE = total emissions for the no-action alternative.

$$\boldsymbol{Emissions = LF * D * EF}$$

Where
Emissions = the mass or weight of each GHG
LF = load factor (unitless)
D = operation data (time or distance)
EF = emissions factor (emissions per time or distance)

Table F-12: Gross and Net Total Emissions in metric tons by alternative

	Gross Emissions			Net Emissions		
Alternative 1 - No Action Alternative						
Pollutant Emissions (Clean Air Act)	**Grams**	**Pounds**	**Metric Tons**	**Grams**	**Pounds**	**Metric Tons**
Reactive Organic Gases aka Volatile Organic Compounds (ROG/VOC)	1,451,636	3,200	1	0	0	0
Carbon Monoxide (CO)	6,365,063	14,033	6	0	0	0
Sulfur Oxides (SOx)	34,829	77	0	0	0	0
Nitrous Oxides (NOx)	8,052,909	17,754	8	0	0	0
Particulate Matter - 2.5 micron ($PM_{2.5}$)	252,914	558	0	0	0	0
Particulate Matter - 10 micron (PM_{10})	288,666	636	0	0	0	0
Lead - (Pb)	0	0	0	0	0	0

Greenhouse Gas Emissions (NEPA)						
Carbon Dioxide (CO_2)	1,510,624,681	3,330,360	1,511	0	0	0
Methane (CH_4)	90,970	201	0	0	0	0
Nitrous Oxide (N_2O)	0	0	0	0	0	0
Carbon Dioxide Equivalents (CO_2e)	1,512,898,935	3,335,374	1,513	0	0	0
Alternative 2 - Concrete Armor Unit Revetment						
Pollutant Emissions (Clean Air Act)	**Grams**	**Pounds**	**Metric Tons**	**Grams**	**Pounds**	**Metric Tons**
Reactive Organic Gases aka Volatile Organic Compounds (ROG/VOC)	941,542	2,076	1	-510,094	-1,125	-1
Carbon Monoxide (CO)	4,222,198	9,308	4	-2,142,865	-4,724	-2
Sulfur Oxides (SOx)	13,985	31	0	-20,844	-46	0
Nitrous Oxides (NOx)	6,284,969	13,856	6	-1,767,940	-3,898	-2
Particulate Matter - 2.5 micron ($PM_{2.5}$)	220,829	487	0	-32,085	-71	0
Particulate Matter - 10 micron (PM_{10})	249,522	550	0	-39,143	-86	0
Lead - (Pb)	0	0	0	0	0	0
Greenhouse Gas Emissions (NEPA)						
Carbon Dioxide (CO_2)	1,002,198,450	2,209,471	1,002	-508,426,231	-1,120,889	-508
Methane (CH_4)	54,039	119	0	-36,931	-81	0
Nitrous Oxide (N_2O)	0	0	0	0	0	0
Carbon Dioxide Equivalents (CO_2e)	1,003,549,429	2,212,450	1,004	-509,349,506	-1,122,924	-509
Alternative 3 - Open Cell Piling Seawall						
Pollutant Emissions (Clean Air Act)	**Grams**	**Pounds**	**Metric Tons**	**Grams**	**Pounds**	**Metric Tons**
Reactive Organic Gases aka Volatile Organic Compounds (ROG/VOC)	871,372	1,921	1	-580,264	-1,279	-1
Carbon Monoxide (CO)	3,765,119	8,301	4	-2,599,944	-5,732	-3
Sulfur Oxides (SOx)	13,197	29	0	-21,632	-48	0
Nitrous Oxides (NOx)	5,881,492	12,966	6	-2,171,417	-4,787	-2
Particulate Matter - 2.5 micron ($PM_{2.5}$)	210,721	465	0	-42,193	-93	0
Particulate Matter - 10 micron (PM_{10})	238,684	526	0	-49,981	-110	0
Lead - (Pb)	0	0	0	0	0	0
Greenhouse Gas Emissions (NEPA)						
Carbon Dioxide (CO_2)	993,261,067	2,189,768	993	-517,363,614	-1,140,592	-517
Methane (CH_4)	63,323	140	0	-27,647	-61	0
Nitrous Oxide (N_2O)	0	0	0	0	0	0

Carbon Dioxide Equivalents (CO_2e)	994,844,145	2,193,258	995	-518,054,791	-1,142,116	-518
Alternative 4 - Secant Pile Seawall						
Pollutant Emissions (Clean Air Act)	**Grams**	**Pounds**	**Metric Tons**	**Grams**	**Pounds**	**Metric Tons**
Reactive Organic Gases aka Volatile Organic Compounds (ROG/VOC)	873,959	1,927	1	-577,677	-1,274	-1
Carbon Monoxide (CO)	3,777,286	8,327	4	-2,587,777	-5,705	-3
Sulfur Oxides (SOx)	13,283	29	0	-21,546	-47	0
Nitrous Oxides (NOx)	5,911,382	13,032	6	-2,141,527	-4,721	-2
Particulate Matter - 2.5 micron ($PM_{2.5}$)	211,927	467	0	-40,986	-90	0
Particulate Matter - 10 micron (PM_{10})	240,195	530	0	-48,471	-107	0
Lead - (Pb)	0	0	0	0	0	0
Greenhouse Gas Emissions (NEPA)						
Carbon Dioxide (CO_2)	1,008,857,266	2,224,151	1,009	-501,767,415	-1,106,209	-502
Methane (CH_4)	64,979	143	0	-25,991	-57	0
Nitrous Oxide (N_2O)	0	0	0	0	0	0
Carbon Dioxide Equivalents (CO_2e)	1,010,481,746	2,227,733	1,010	-502,417,189	-1,107,641	-502

6.1 Alternative 2 - No Action:

Under the No Action Alternative there would be no direct emissions from construction activities, but there would be indirect emissions from continued maintenance if the project was not constructed. Over the construction term (2027-2029) and 50-year period of analysis (2030-2080), the no action alternative would result in annual GHG emissions totaling 133 metric tons.

6.2 Alternative 1 - Habitat Restoration

The Action Alternative would result in one direct GHG emission for construction (1065 metric tons), and one indirect GHG emission for maintenance (126 metric tons) within the 50-year design lifespan of the project (Table F-7). There are no anticipated upstream, downstream, or connected emissions from the project. The Action Alternative has the highest net emissions (355 metric tons), minimally increasing emissions above the baseline (No Action).

7 Literature Cited

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DRAFT FINDING OF NO SIGNIFICANT IMPACT

AGAT EMERGENCY SHORELINE PROTECTION
AGAT, GUAM

The U.S. Army Corps of Engineers, Honolulu District and Alaska District (Corps) have conducted an environmental analysis in accordance with the National Environmental Policy Act of 1969, as amended. The Draft Integrated Feasibility Report and Environmental Assessment (IFR/EA) dated 30 September 2024, for the Agat Emergency Shoreline Protection addresses protection of 320 feet of shoreline on Agat Bay fronting the Agat Mayor's Complex in Agat, Guam. The final recommendation is contained in the report of the Chief of Engineers, dated *TBD*.

The Draft IFR/EA, incorporated herein by reference, evaluated four (4) 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 three (3) action alternatives, including the Proposed Action. The Proposed Action (Alternative 3) is the National Economic Development (NED) Plan, least cost and environmentally acceptable plan, and entails replacement of 320 linear feet (ft) of the 450-foot existing seawall with an open cell piling seawall that is 1 ft wide, with a 2 ft wide cap and a 4 ft wide splash apron, 12 ft tall from the existing limestone surface (about 4 to 6 ft above the beach sand), and 3 ft above the existing grade of the mayor's compound property to reduce the threat of coastal erosion to the Mayor's Complex and adjacent utilities. Construction of the seawall requires:

- Demolition and removal of the existing seawall
    - Removal of approximately 12 trees
    - Up to a 4 ft wide excavation would be made on the seaward side of the wall to remove the toe
    - 142 cubic yards (cy) of block, concrete, and rock rubble taken to a landfill for disposal
    - Excavated beach sand replaced to restore the beach profile
- Vibratory mandrel hammer installation of vinyl open cell sheet piling until refusal to bedrock
- Removal of beach sand from the interior of the cells by pumping a jet of water into the annular space and clearing the sand (approximately 284 cy of sand can be added to the beach)
- Core bedrock 5 ft deep to install 2-inch diameter pin piles to anchor the vinyl open cell sheet piles (approximately 118 cy of rock taken to a landfill for disposal)
- Install weep holes to aid in proper drainage backshore, alleviate water pressure on the landward side, allowing for more efficient drainage and reducing the potential for erosion on adjacent properties
- Backfill cells with reinforced concrete fill and top with a 2 ft wide concrete cap
- Dig 6 inch wide by minimum of 3 ft deep trenches every 8 ft for placement of 10 ft long tieback rods that will attach to 40 2 ft by 2 ft reinforced concrete deadman anchors (approximately 356 cy of soil to be stored and backfilled)
    - The excavation required to place the tiebacks could be completed with a shovel

- At the location of the Mayor's office building, the 2 x 2 x 2 ft square space required to place the deadman anchors will be hollowed and then re-laid in the concrete porch
- The excavation required to place the tiebacks could be completed with a shovel, demonstrating the minimal excavation effort required

- Backfill trenches with the excavated native soil
- The individual panels will be tied together at the top with a 2 ft wide reinforced concrete pile cap
- Installation of a 4 ft concrete splash apron behind the crest of the structure
- Installation of concrete stairs for recreational water access
- Excavated beach sand replaced to restore the beach profile
- Replace 12 trees and reseed the upland side of the wall

The finished seawall will have a top elevation of approximately 6 ft above mean sea level (MSL) and will extend down to -6 ft MSL. This meets the USACE 50-year design requirement for sea level change (SLC) and is adaptable to 100-year SLC.

In addition to a “no action” plan, three (3) final array alternatives were evaluated as described in Section 5 of the IFR/EA. The alternatives included:

- Alternative 2: Concrete Armor Unit Revetment
- Alternative 3: Open Cell Piling Seawall
- Alternative 4: Secant Pile Seawall

For all alternatives, the potential effects were evaluated, as appropriate. A summary assessment of the potential effects of the Proposed Action are listed in Table S-1:

Table S-1: Summary of Potential Effects of the Proposed Action.
*****Mitigation in the context of this Table refers to the avoidance and minimization measure (BMPs) outlined in Attachment 8 Environmental Commitments of the IFR/EA Appendix A-3.

	Significant effects	Less than significant effects	No Effect	Beneficial Effect
Climate	☐	☐	☒	☐
Air Quality/ Greenhouse Gas	☐	☐	☐	☒
Geology, Hydrology & Hydraulics	☐	☒	☐	☐
Water Resources and Quality*	☐	☒	☐	☐
Special Aquatic Sites*	☐	☒	☐	☐
Hazardous, Toxic & Radioactive Wastes	☐	☐	☒	☐
Noise*	☐	☒	☐	☐
Terrestrial Habitats and Species*	☐	☒	☐	☐
Marine Habitats and Species*	☐	☒	☐	☐
Threatened, Endangered Species & Critical Habitat*	☐	☒	☐	☐
Essential Fish Habitat*	☐	☒	☐	☐
Invasive Species*	☐	☒	☐	☐
Navigation	☐	☐	☒	☐
Land Use, Public Infrastructure & Utilities	☐	☐	☐	☒
Socio-economics	☐	☐	☐	☒
Environmental Justice	☐	☐	☐	☒

	Significant effects	Less than significant effects	No Effect	Beneficial Effect
Historical and Archaeological Resources	☐	☐	☒	☐
Cultural and Subsistence Activities	☐	☒	☐	☐
Aesthetics	☐	☒	☐	☐

*Effect would cause 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.

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) and environmental commitments (ECs) as detailed in Attachment 2 and 8 of the Environmental Appendix (A-3).

The USACE published a public notice on DATE. Public review of the draft IFR/EA document and FONSI was completed on *Date*. All comments submitted during the public review period were responded to in the Final IFR/EA and FONSI.

ENDANGERED SPECIES ACT
INFORMAL CONSULATION:

Pursuant to Section 7 of the Endangered Species Act of 1973, as amended, the USACE determined that the Proposed Action is not likely to adversely affect the following federally listed species or their designated critical habitat: Green Sea Turtle (*Chelonia mydas*); Hawksbill Sea Turtle (*Eretmochelys imbricate*); the coral *Acropora globiceps,* and Mariana Fruit Bat (*Pteropus mariannus mariannus)* and its designated critical habitat; *U.S. Fish and Wildlife Service (FWS) (did not) concur(red) with USACE determination on TBD. National Marine Fisheries Service (NMFS) (did not) concur(red) with USACE determination on TBD*

NATIONAL HISTORIC PRESERVATION ACT
HISTORIC PROPERTIES NOT ADVERSELY AFFECTED:

Pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended, the U.S. Army Corps of Engineers determined that the recommended plan has no potential to cause adverse effects on historic properties. The Guam Historic Preservation Office (GHPO) concurred with the finding on March 29, 2024 that no historic properties would be affected by the project.

CLEAN WATER ACT SECTION 404(B)(1) COMPLIANCE:

Pursuant to the Clean Water Act of 1972, as amended, the discharge of dredged or fill material associated with the recommended plan has been found to be compliant with section 404(b)(1) Guidelines (40 CFR 230). The Clean Water Act Section 404(b)(1) Guidelines evaluation is found in Attachment 4a of Appendix A-3 of the IFR/EA.

CLEAN WATER ACT SECTION 401 COMPLIANCE:
401 WQC PENDING:

A water quality certification pursuant to section 401 of the Clean Water Act will be obtained from the Guam Environmental Protection Agency (GEPA) prior to construction. USACE has obtained a letter of confirmation from the GEPA dated *TBD* stating that GEPA has no preliminary issues with the USACE moving forward with further designs of this project. All conditions of the water quality certification will be implemented in order to minimize adverse impacts to water quality.

COASTAL ZONE MANAGEMENT ACT
CZMA CONSISTENCY PENDING:

A determination of consistency with the Guam Coastal Zone Management program pursuant to the Coastal Zone Management Act of 1972 was sent to the Guam CZM Program. All conditions of the consistency determination shall be implemented in order to minimize adverse impacts to the coastal zone.

OTHER SIGNIFICANT ENVIRONMENTAL COMPLIANCE:

All applicable environmental laws have been considered and coordination with appropriate agencies and officials has been completed.

USACE has coordinated this project with NMFS pursuant to the requirements of the Marine Mammal Protection act (MMPA) and determined that a MMPA permit is not required due to the determination that the type of activities associated with this project do not have the potential to cause a take of a marine mammal.

Implementing the Recommended Plan would result in minimal adverse effects to Essential Fish Habitat (EFH) with no potential for substantial adverse effect to EFH or Managed Unit Species. In the long-term, there are no expected residual adverse effects to EFH or Managed Unit Species.

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.

Technical criteria used in the formulation of alternative plans were those specified in the Water Resources Council's 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. All applicable laws, executive orders, regulations, and local government plans were considered in evaluation of alternatives. Based on this report, the reviews by other Federal, State and local agencies, Tribes, input of the public, and the review by my staff, it is my determination that the recommended plan would not cause significant adverse effects on the quality of the human environment; therefore, preparation of an Environmental Impact Statement is not required.

Date

Adrian O. Biggerstaff, PhD, PE, PMP
Lieutenant Colonel**,** U.S. Army
District Engineer

AGAT EMERGENCY SHORELINE PROTECTION
CONTINUING AUTHORITIES PROGRAM - SECTION 14
AGAT, GUAM

DRAFT INTEGRATED FEASIBILITY STUDY AND ENVIRONMENTAL ASSESSMENT

APPENDIX A-4
REAL ESTATE

A-4 Real Estate Report

US Army Corps of Engineers ®
Honolulu District

U.S. Army Corps of Engineers
Honolulu District

Appendix A-4

Draft Real Estate Plan

Agat Emergency Shoreline Protection
Continuing Authorities Program (CAP)
Section 14 of the 1946 Flood Control Act, as amended (33 U.S.C. § 701r)

March 2024

Prepared for:
U.S. Army Corps of Engineers, Honolulu District

Prepared by:

Patricia Lemay
Realty Specialist
USACE Alaska District

Date

Reviewed by:

Matthew J. Des Forge
Chief, Real Estate Division
USACE Alaska District

Date

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ATTACHMENTS

1.0 EXECUTIVE SUMMARY

The Agat Emergency Shoreline Protection 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) has been selected based on cost, ecological output, economic benefits, completeness, effectiveness, efficiency, and acceptability. The TSP includes the construction of an Open Cell Piling Seawall of 320 linear feet in length by 12 linear feet totaling 0.09 acres. A 50-foot wide construction area and access route are planned alongside the TSP's project feature totaling 0.37 acres and access to COSA's from the public road totaling 0.15 acres. Additionally, three staging areas totaling 2.25 acres are planned near the project feature. The staging area would be restored upon construction completion. Construction is anticipated for six (6) months.

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 Guam. 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 TSP is a perpetual flood protection levee easement totaling 0.09 acres. The minimum estate required for staging, construction, and site access are temporary work area easements totaling 2.77 acres. The temporary work area easement is required for six (6) months during project construction.

The estimated real estate cost associated with the TSP is approximately $59,216 all recommended lands, easements, rights-of-way, relocations, and disposals (LERRDs), administrative costs to be carried out by the NFS, and U.S. Government costs for LERRDs monitoring and certification. The NFS LERRDs planning and acquisition schedule is estimated at twelve (12) months following Project Partnership Agreement (PPA) execution and design refinement. Changes and refinements to the project footprint during PED may result in an increase in the LERRDs cost and schedule. The NFS will be assessed on its capability to acquire and provide the LERRDs necessary for the proposed project.

2.0 AUTHORITY AND PURPOSE

The Study is authorized under Section 14 of the Flood Control Act of 1946, as amended. This is a Continuing Authorities Program (CAP) project. The authority allows for planning and constructing emergency stream bank and shoreline protection for public facilities in imminent danger of failing.

The U.S. Army Corps of Engineers (USACE), in partnership with the Government of Guam, 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 the implementation of emergency shoreline protection measures along approximately 320 feet of shoreline along the western edge of the Agat Mayor's Compound. The purpose of the proposed project is to provide the Agat Mayor's Compound with shore protection for the preservation of community beachfront structures.

Past studies include the Guam Comprehensive Study (1980), Flood Insurance Study (1983), Agat (Hågat) Bay Regional Shoreline Assessment (2020), and Guam Watershed Plan (2022).

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.

Generally, the Real Estate Plan (REP) is prepared under the supervision of 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).

3.0 PROJECT DESCRIPTION AND LOCATION

The Guam Organic Act of 1950, (48 U.S.C. § 1421 et seq., Pub. L. 81–630, H.R. 7273, 64 Stat. 384, enacted August 1, 1950) is a United States federal law that redesignated the island of Guam as an unincorporated territory of the United States, established executive, legislative, and judicial branches, and transferred federal jurisdiction from the United States Navy to the United States Department of the Interior. An unorganized territory is one for which the Organic Act, establishing a civil government, has not been enacted by the U.S. Congress. Guam is an organized, unincorporated territory of the United States in the Micronesia subregion of the western Pacific Ocean. Guam's capital is Hagåtña, and the most populous village is Dededo. It is the westernmost point and territory of the United States, reckoned from the geographic center of the U.S. In Oceania, Guam is the largest and southernmost of the Mariana Islands and the largest island in Micronesia. The Study area is located on the western coast of Guam (Figure 1). The Agat Mayor's Compound is operated by the Department of Public Works (DPW) of the Government of Guam on property owned by the Government of Guam. The Mayor's Compound is the main community building of the village of Agat. It is the core operation center and emergency shelter for the disadvantaged community.

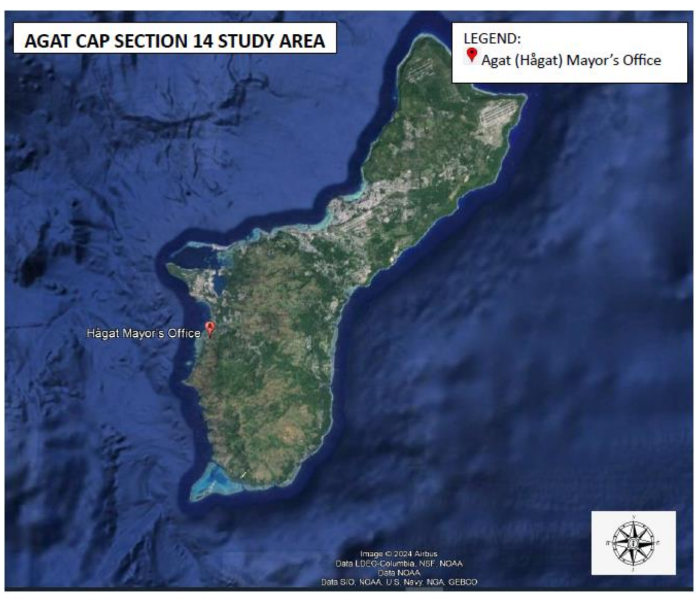

Figure 1. Study Area

Figure 2. Project Vicinity Map

According to past reports, the shoreline along the western shoreline of the Agat Mayor's Compound is progressively eroding with the coastline receding further into the land adjacent to the community buildings.

To combat coastal erosion, a final array of structural alternative plans has been formulated through combinations of screened management measures. Final Study alternatives included:

- Alternative 1: No Action
- Alternative 2: Concrete Armor Unit Revetment
- Alternative 3: Open Cell Piling Seawall
- Alternative 4: Secant Pile Seawall
- Alternative 5: Relocation of the Mayor's Compound

3.1 RECOMMENDED PLAN: Alternative 3: Open Cell Piling Seawall

Alternative 3: was selected as the Recommended Plan. Project features include:

1. TSP: 320 linear feet, 12 linear feet wide (0.09 acres)
2. Construction Area: 320 linear feet, 50 feet wide alongside project feature (0.37 acres) and Road Access to Staging Areas (0.15 acres)
3. Staging Areas: 2.25 acres
    a. COSA 1: 40,000 sf
    b. COSA 2: 18,000 sf
    c. COSA 3: 40,000 sf

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 to last for six (6) months.

Disposal material from the removal of the existing seawall will occur at the Primos Hardfill, a commercial waste site in Yigo, Guam. The landfill is located approximately 26 miles northeast of the project area near Andersen Air Force Base.

Figure 3. Commercial Landfill Location

Material operations and maintenance requirements are expected for the alternative. Periodic inspections of all the features will be required and vegetation clearing and/or repairs may be completed as needed.

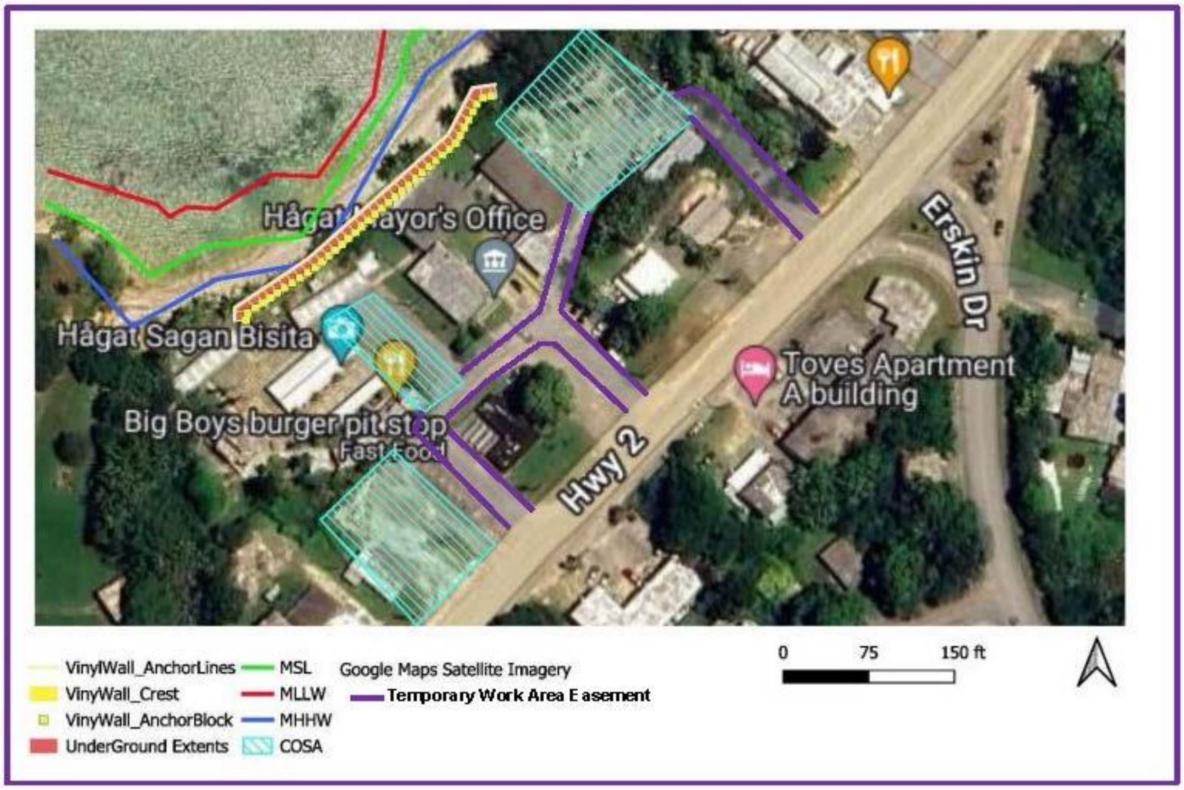

Figure 4. Project Feature Map

3.2 Structures in the Area

Structures and improvements in the Study area include the Agat Mayor's Office, Community Center, Learning Center, and the Agat Sagan Bisita. Project features are not expected to affect these structures.

3.3 Staging and Construction

Three construction laydown areas (COSAs) totaling 2.25 acres have been identified. Staging area 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.

3.4 Site Access

It is anticipated that personnel, equipment, and imported materials would access project construction along public roadways. 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 public roadways would be included in temporary work area easements, as needed, as project features are refined.

3.5 Ownership by Project Feature

Project Feature	Approximate Area (Acres)	Owner	Zoning/Property Class	Interest Required
1. TSP	0.09	Government of Guam	None	Flood protection levee easement (Perpetual)
2. Construction Area/Access	0.52	Government of Guam	None	Temporary work easement (6 months)
3. Staging Areas	0.92	Government of Guam	None	Temporary work easement (6 months)
	0.41	Government of Guam	None	Temporary work easement (6 months)
	0.92	Government of Guam	None	Temporary work easement (6 months)

Table 1. Real Estate Interest Required by Project Feature

4.0 SPONSOR'S REAL ESTATE INTERESTS

Based on a review of Guam's land tenure as well as the jurisdictional water system, it is assumed that the NFS currently owns all interests required for the proposed permanent project feature. The waters adjacent to the Study Area are assumed to be Federally owned and under the jurisdiction of the National Park Service.

5.0 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. TSP: 0.09 acres

The minimum estate required for the TSP is a perpetual flood protection levee easement totaling approximately 0.09 acres.

Flood Protection Levee Easement Standard Estate

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

1. Construction Area/Access: 0.37 acres/0.15 acres
2. Staging/Access: 2.25 acres

The minimum estate required for construction and staging, including access, is a temporary work area easement totaling approximately 2.77 acres. The temporary work area easement is estimated to be required for six (6) months 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.

6.0 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.

7.0 NAVIGATIONAL SERVITUDE

As the Study proposes land features along the shoreline of Guam, navigation servitude is not applicable to this Study. The navigation servitude is the dominant right of the U.S. 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.

8.0 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 Figure 1 and Figure 2. For LERRDs requirements, refer to Figure 3.

9.0 INDUCED FLOODING

It is not anticipated that the proposed project would cause any induced flooding.

10.0 BASELINE COST ESTIMATE FOR REAL ESTATE

The baseline cost estimate for all project LERRDs is estimated at $58,000.00 (rounded), which includes required interests, relocation assistance, incremental real estate contingency, and incidental acquisition costs for both the NFS and U.S. Government.

Real Estate Requirement	Size (Acres)	Cost Estimate
Flood Protection Levee Easements	0.09 Acres	$5,500.00
Temporary Work Area Easements	2.77 Acres	$22,000.00
Improvements		$0
Hazard Removal		$0
Mineral Rights		$0
Damages		$0
Facility/Utility Relocations		$0
Incremental Real Estate Costs		$5,500.00
Incidental Acquisition Costs: NFS		$15,000.00
Incidental Acquisition Costs: Government		$10,000.00
Total		$58,000.00

Table 2. Baseline Cost Estimate for Real Estate

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. 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 U.S. Government costs for staff monitoring and reviewing and approving LERRDs. Incidental acquisition costs assume NFS costs of $15,000. Incidental U.S. Government costs of $10,000 are estimated for NFS monitoring as well as LERRDs certification.

11.0 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.

12.0 MINERALS, TIMER, 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.

13.0 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.

14.0 ZONING

No enactments of zoning ordinances are proposed in lieu of, or to facilitate, acquisition in connection with the proposed project.

15.0 ACQUISITION MILESTONES

The following preliminary schedule estimates twelve (12) months for NFS LERRDs planning and acquisition subject to update once the acquisition schedule has been verified. A final planned timeline below will be mutually agreed upon by USACE Real Estate, Project Management, and the NFS. Given that the current TSP assumes all project features are within the control of the NFS, changes and refinements to the project footprint during PED may result in an increase in the LERRDs acquisition schedule.

The NFS's preliminary acquisition planning is estimated at six (6) months as follows:

Survey/Map/Title 60 Days
Legal Description 30 Days
Appraisal 90 Days

The NFS's LERRDs acquisition is estimated at six (6) months as follows:

Documentation 120 Days
LERRDs Certification 60 Days

Generally, an acquisition schedule of 12-18 months is estimated for projects of comparable scope.

16.0 PUBLIC FACILITY OR UTILITY RELOCATIONS

At this phase of design, a preliminary review of the Civil Engineering Appendix and aerial maps indicate 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 minimum risk of facility/utility relocation is included in the current cost estimate contingency.

17.0 ENVIRONMENTAL IMPACTS

Potential environmental impacts resulting from the proposed project are being considered, including investigation under NEPA, 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. Environmental mitigation is accounted for in the cost estimate as a conservative cost for species survey and potential mitigation. The only species of concern in the study area are three species of tree snail, which the PDT does not anticipate being present because the study area is not ideal habitat. During PED, a tree snail survey will be conducted to identify presence or absence in the study area. If tree snails are present, environmental mitigation costs are already accounted for in our cost estimate, which includes the removal of tree snails from the construction area and relocation to the closest habitat. Currently, there is no anticipated LERRDs requirement.

<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 Guam 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.

18.0 LANDOWNER CONCERNS

No landowner concerns are anticipated at this time. Other stakeholders consist of communities in the Study area, including but not limited to, the War in the Pacific National Historical Park managed by the National Park Service.

19.0 NOTIFICATION OF SPONSOR

The NFS, Government of Guam, as represented by the Department of Public Works 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. The 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.

20.0 OTHER RELEVANT REAL ESTATE ISSUES

There are no other known relevant real estate issues in the Study area.

Attachment 1: Sponsor's Acquisition Capability Assessment

Assessment of Non-Federal Sponsor's Real Estate Acquisition Capability

Project: Agat Emergency Shoreline Protection
Project Authority: Section 14 of the 1946 Flood Control Act, as amended (33 U.S.C. § 701r)
Non-Federal Sponsor: Government of Guam
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 non-Federal sponsor have "quick-take" authority for this project?		
4. Are any land/interests in lands required for this project located outside the non-Federal sponsor'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?		
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 indicated 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:**
Patricia Lemay Realty Specialist USACE Alaska District	Name Title Office
Date:	Date:

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.

Attachment 2: Letter Advising of Early Acquisition

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

May 1, 2024

Real Estate Division

Subject: Agat Emergency Shoreline Protection Integrated Feasibility Report/ Risks of Early Acquisition

Matthew Santos
Deputy Director, Bureau of Statistics and Plans
P.O. Box 2950
Hagåtña, Guam 96910

Dear Mr. Santos:

Reference is made to the Agat Emergency Shoreline Protection Integrated Feasibility Report and Environmental Assessment (Study) as authorized under Section 14 of the 1946 Flood Control Act, as amended (33 U.S.C. § 701r). The Government of Guam, 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 Government of Guam 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 or/benefit payment under Public Law 91-646 or additional payment of fair market value to affected

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 Patricia Lemay, Realty Specialist, USACE Alaska District, Real Estate Division, at (907) 753-2852.

Sincerely,

LABESTE.ERICA.A.1286957435 Digitally signed by LABESTE.ERICA.A.1286957435 Date: 2024.05.01 11:52:05 -10'00'

Erica Labeste
Chief, Real Estate Division
U.S. Army Corps of Engineers,
Honolulu District

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

February 28, 2024

Real Estate Division

SUBJECT: Agat Emergency Shoreline Protection 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 Government of Guam for the Agat Emergency Shoreline Protection 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 Government of Guam, as the Non-Federal Sponsor, and landowners.

In accordance with the Project Partnership Agreement (PPA) dated xx, the Government of Guam 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 Government of Guam 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 Government of Guam 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 Government of Guam 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 further questions, please contact the USACE Alaska District, Real Estate Branch, at (907) 753-2852.

Sincerely,

Matthew J. Des Forge
Chief, Real Estate Division
USACE Alaska District

AGAT EMERGENCY SHORELINE PROTECTION
CONTINUING AUTHORITIES PROGRAM - SECTION 14
AGAT, GUAM

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

Agat Emergency Shoreline Protection

CAP Section 14

Agat, Guam

Draft Integrated Feasibility Report and Environmental Assessment

September 2024

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 Agat Emergency Shoreline Protection 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 Government of Guam, represented by the Department of Public Works.

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/Agat-Shoreline-Protection-Sec-14/ beginning on September 30, 2024 ChST. Concurrent to publication of the report, a press release with public notice will be distributed to media contacts both in Hawaii and in Guam, as well as through various social media outlets. The non-Federal sponsor will also post the press release to their website and help to notify the public of its availability.

Consistent with the requirements of NEPA and HRS Chapter 343, the draft IFR/EA will be circulated for a 30-day public review, beginning on October 1 and ending on October 30, 2024 ChST. 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. Hard copies of the Draft IFR/EA will be available for viewing at the Agat Mayor’s Office and the Guam Bureau of Statistics and Plans office.

3. Public Meeting

A public meeting will be held on October 16, 2024 at 6:00 p.m. ChST 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: October 16, 2024 at 6:00 p.m. ChST (or October 15 at 10:30 p.m. HST)

Meeting location:

- Hagat Mayor Office
  393 2, Hågat, Guam

Virtual via Google Meet:meet.google.com/wpr-gpdu-cgx
Dial in (U.S.): +1 617-675-4444
PIN: 376 609 761 4076#

4. Public Comment Period

A 30-day public comment period will begin on October 1, 2024 ChST following posting of the Draft IFR/EA and Public Notice to the project website on September 30, 2024 ChST. The public comment period will end on October 30, 2024 ChST. Public comments may be submitted to:

By E-Mail:
CEPOH-Planning@usace.army.mil
Subject line: Agat Section 14 public comment

By Postal Mail:
U.S. Army Corps of Engineers, Honolulu District
Attn: CEPOH-PPC (Agat S14)
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.

6. Non-Federal Sponsor Communications

The Non-Federal Sponsor (NFS) for the Agat Emergency Shoreline Protection Feasibility Study is the Government of Guam, represented by the Guam Department of Public Works (GDPW). Although the project is represented by GDPW, the Guam Bureau of Statistics (GBSP) is the planning coordinating agency authorized by the Government of Guam to solicit support from Federal agencies to address coastal management concerns. Based on data collected from the Agat Mayor's Office and preliminary assessments conducted by GDPW and GBSP, the Government of Guam sought expert guidance and support from USACE. A letter from GBSP dated 15 August 2019 (Attachment 1), requested for USACE assistance in reducing the risk from coastal storm damage in the municipality of Agat. In 2020, under the Planning Assistance to the States program, USACE prepared an Agat Bay Regional Shoreline Assessment Report (USACE, 2020b), highlighting the necessity for shoreline protection measures at certain areas along the Agat shoreline. A Federal Interest Determination (FID) investigation was conducted between 2021 to 2022, demonstrating sufficient Federal interest in proceeding into a feasibility study to evaluate emergency shoreline measures at the Agat Mayor’s Complex. Recognizing the critical nature of this issue, GBSP submitted a letter dated 12 April 2022 (Attachment 2), requesting USACE assistance for a study under the CAP Section 14 authority. USACE Pacific Ocean Division authorized a feasibility study under the Section 14 authority, in a memorandum dated 14 July 2022 (Attachment 3). A feasibility cost sharing agreement was executed in February 2023 between the USACE Honolulu District and the Government of Guam, initiating the current feasibility study.

Lourdes A. Leon Guerrero
Governor of Guam

Joshua F. Tenorio
Lieutenant Governor

BUREAU OF STATISTICS & PLANS
SAGAN PLANU SIHA YAN EMFOTMASION
Government of Guam
P.O. Box 2950 Hagåtña, Guam 96932
Tel: (671) 472-4201/3
Fax: (671) 477-1812

Tyrone J. Taitano
Director

Matthew C. Santos
Deputy Director

AUG 1 5 2019

LTC Kathryn P. Sanborn
District Engineer
U.S. Army Corps of Engineers
Honolulu District
Building 230
Fort Shafter, Hawaii 96858-5440

Dear LTC Sanborn:

This letter is to request the assistance of the U.S. Army Corps of Engineers under Section 103 of the River and Harbor Act of 1962, as amended, in reducing the risk from coastal storm damage in the municipality of Agat.

Agat's coast has been experiencing significant damages due to adverse wave action and flood inundation during tropical cyclones and high wave events. Parks, power utility assets, civic structures, and commercial and residential structures are at risk and in need of protection. Additionally, the loss of natural shoreline associated with these events increases vulnerability to storm damage.

We understand that as a local sponsor under the Section 103 program, we are responsible for 50 percent of the feasibility study costs exceeding $100,000 and 35 percent of project design and construction costs, if a feasible plan is identified. We further understand that Section 1156 of the Water Resources Development Act of 1986 (33 U.S.C. 2310), as amended, provides a waiver for non-Federal cost-sharing of studies and projects, and that the current waiver amount is $484,000. We acknowledge that the cost share contribution can be in the form of "in-kind" services that contribute a direct component to the study, cash or a combination.

The Bureau of Statistics and Plans has designated Mr. Edwin Reyes, Guam Coastal Management Program Administrator as the point of contact for this project.

Sincerely,

Tyrone J Taitano

Tyrone Taitano
Director

LOLA E. LEON GUERRERO
(Acting) Director
MATTHEW C SANTOS
Deputy Director

THE BUREAU OF STATISTICS AND PLANS

Sagan Planu Siha Yan Emfotmasion

LOURDES A. LEON GUERRERO
Governor of Guam
JOSHUA F. TENORIO
Lieutenant Governor

April 12, 2022

LTC Eric S. Marshall
District Engineer
Civil and Public Works
Honolulu District, USACE
Bldg 230, Fort Shafter, HI 96858

Subject: Hagat Mayor's Compound Study

Dear LTC Marshall,

The Government of Guam requests the continued support of USACE for the Feasibility Study under CAP Section 14 at the Mayor's Complex in the Village of Agat, Guam. The Government of Guam participated in a scoping meeting and site visit with the Corps of Engineers during their trip to Guam in January, 2022. We concur with the Corps determination that a shoreline protection project is in the interest of both the Government of Guam and the Federal Government. We understand the cost share for the Study is 50% Federal and 50% non-federal, as well as the Government of Guam being eligible for a cost sharing waiver. For Federal Fiscal Year 2022 that waiver is $530,000. We understand the current estimate for a study to protect Agat Mayor's Compound is $937,500 total cost with a shared study of cost of $407,500. The Government of Guam is responsible for 50% of the shared study cost which is approximately $204,000. We also understand that we can contribute via cash or work in kind contributions. We are prepared to negotiate a cost sharing agreement within the next 6 months for the Study and if a feasible project is identified, we are prepared to enter into design and construction within one year of the study completion.

Please do not hesitate to contact Mr. Edwin Reyes, Guam Coastal Management Program at 671-475-9672 or via email at edwin.reyes@bsp.guam.gov or myself at 671-4759661 or via email at lolalg@bsp.guam.gov.

Lola E. Leon Guerrero
Acting Director

THE BUREAU OF STATISTICS & PLANS - GOVERNMENT OF GUAM
Mail: P.O. Box 2950 Hagåtña, Guam 96932 Tel: (671) 472-4201/3 Fax: (671) 477-1812 Web: www.BSP.Guam.Gov

DEPARTMENT OF THE ARMY
PACIFIC OCEAN DIVISION, U.S. ARMY CORPS OF ENGINEERS
573 BONNEY LOOP, BUILDING 525
FORT SHAFTER, HAWAII 96858-5440

14 July 2022

CEPOD-PDC (1105)

MEMORANDUM FOR Commander, Honolulu Engineer District, U.S. Army Corps of Engineers (CEPOH-PPC/B. Reder), Honolulu District, Fort Shafter, Hawaii 96858-5440

SUBJECT: Agat (Hagat) Shoreline, Guam - Continuing Authorities Program (CAP), Section 14 Emergency Stream Bank and Shoreline Protection, Federal Interest Determination (FID) Report

1. Reference memorandum, Honolulu District, CEPOH-PPC, dated 31 May 2022, subject as above (Encl 1).

2. POD has reviewed and approves your revised Federal Interest Determination (FID) Section 14 Report (Encl 2). Your revised FID Report satisfactorily demonstrates federal interest and all comments submitted by POD reviewers have been addressed.

3. You are hereby authorized to proceed with continuation of this Section 14 study into the Feasibility Phase. Please schedule Federal funding capability up to $50,000 in the CAP database to prepare your Project Management Plan and Review Plan and to prepare and execute a Feasibility Cost Sharing Agreement (FCSA). The FCSA should be executed within 6 months from the receipt of Federal funding.

4. IAW CEPOD-PDC Memorandum, 1 Jun 2021, Subject: Continued Delegation of Approval Authority for Model Feasibility Cost Share Agreement (FCSA) for Continuing Authorities Program Projects, the responsibility for review and approval of a FCSA for a CAP project that does not deviate from the approved model was delegated by the POD Commander to the Honolulu District Commander. District Counsel concurrence that the agreement does not deviate from the subject model, and is appropriate for use for the particular proposal, is required prior to approval and execution. If there are questions whether a deviation is substantive or non-substantive, please consult with your District Counsel.

5. If deviations are required (substantive or non-substantive), then please coordinate with the POD CAP Program Manager for submittal requirements for CAP FCSA packages. Agreements with substantive deviations, unique circumstances, or controversial material must be coordinated with the POD CAP Program Manager for further coordination with the HQUSACE RIT prior to execution of the FCSA.

6. The POC for this action is Ms. Sharon Ishikawa, POD CAP Manager, Civil Works Integration Division, at 808-563-0594 or via e-mail: sharon.m.ishikawa@usace.army.mil.

LILLY.DAMON.P.1012425810 Digitally signed by LILLY.DAMON.P.1012425810 Date: 2022.07.14 16:39:56 -10'00'

Encls

DAMON P. LILLY, SES
Director of Programs