PROJECT SUMMARY

The United States (U.S.) Navy's Construction Battalion known as the 'Seabees' was created in January 1942 from the demand for a unique set of both engineering and combat skills. This is exemplified in the Seabee motto; "We Build, We Fight". The Seabees were instrumental in the Pacific theater during World War II, and played a significant role in rebuilding Guam. Evidence of this rich history remains in a submerged site known as the Seabee Junkyard due to the dumping of Seabee materials and equipment after the war. The site, which is located in Apra Harbor at the end of the Glass Breakwater, is classified as artificial fill; a product of the building of the breakwater which was completed in 1947. WWII equipment including an LVT (landing vehicle, tracked), dozers, pontoon outboard motors, rope, and dump trucks cover over 4,000 meters squared of benthic surface area. While the breakwater largely protects the site from natural disturbances, it remains exposed to human disturbances including recreational diving and is a popular dive site amongst local and visiting divers. The site is also significant because it exemplifies the rapid demobilization of the U.S. Navy following WWII, and the subsequent dumping of war-related equipment and material.

The objective of this project was to provide a holistic interpretation of this site and to promote its management and interpretation amongst local stakeholders. Holistic interpretation is the collective study of different aspects of the site and their interconnectedness in order to represent and explain it as a whole. This study encompasses diverse aspects of a site which are traditionally monitored and managed individually. Aspects examined in this study include elements of the natural environment such as fish, invertebrates and vegetation, submerged cultural evidence, and site history. Project outcomes completed with this objective consisted of three parts. A historical report and material inventory complete with photo documentation, and a baseline environmental reference assessment which captured a snapshot of the site during the research period and compared the site to a similar site without WWII material. The assessment was designed to provide baseline information for future monitoring of this site and other submerged cultural sites on Guam. The final outcome is an "Outreach Toolkit" reflecting the findings of the historical report, the material inventory, and baseline environmental reference assessment. The toolkit included educational presentations, an underwater dive guide, informational pamphlets, and a project website. Presentations were conducted on Guam, Hawaii, Palau and Japan to audiences including

environmental scientists, high school students, community members on Guam, underwater archaeologists, National Park Service visitors, recreational divers, and military service members. During the delivery of the outreach toolkit, stakeholders including recreational divers, high school students and community members engaged in discussions about the importance of non-disturbance diving and the values of interpreting the history and environment of submerged cultural material.

The historical report and material inventory provided positive identification of the material at the site as originating with the Seabees used during and immediately after the war. The material shows signs of preparation prior to dumping which may have included removing reusable materials and diesel fuel. While WWII era documents confirm that dumping at sea was an authorized practice at this time and was authorized in many areas near Apra Harbor, there is no written record of dumping at this specific site. The environmental reference assessment revealed that submerged World War II material at the site did not have a measurable effect on the biotic community. Fish, megafauna and mobile vertebrate populations were comparable in quantity, species diversity, and individual size to the control site with no World War II materials.

INTRODUCTION

Submerged cultural resource sites contain cultural or historical evidence of human existence which are in contact with or submerged by water. Cultural or historical evidence may be the remains of structures, sediments, and contents. Evidence at submerged cultural resource sites may include artifacts of regional history and past ways of life such as fishing weirs, or objects remaining from historic events such as artifacts from World War II. Such sites may have value as local history or tourism assets, however they are vulnerable to both artificial and natural processes as well as unique combinations of the two (Maarleveld, 2013). Natural processes are specific to the environment a site is located in and may include regional biology, water movement and water quality (Keith, 2004). Information about the natural environment, including fish, invertebrates and vegetation, may add value to a site from an environmental or biological perspective while concurrently playing a role in the preservation of the cultural materials (Jeffery, 2007). Eventual, an equilibrium has to be established between the artifacts and the natural environment (Maarleveld, 2013). Gaining a better understanding of the natural environment of a site may also provide insight into the impacts of the cultural evidence on the submerged natural environment (Keith, 2004, Muckelroy, 1978). This delicate balance and complicated interaction is exemplified in the study of submerged World War II materials. Understanding the interacting effects is crucial to preserving the history and culture of the materials while minimizing negative impacts to the environment.

LITERATURE REVIEW

Multidisciplinary studies are beginning to emerge regarding mid-20th century underwater cultural resource sites and the effect of the environment on them. A study of the USS *Arizona*, sunk during the attack on Pearl Harbor in 1941, was conducted utilizing diverse research disciplines which included scientific divers and underwater archaeologists from the National Park Service Submerged Resources Center, marine biologists and environmental scientists from the Marine BioMedicine and Environmental Sciences Center at the Medical University of South Carolina, the Center for Coastal Environmental Health and Biomolecular Research, and the Hollings Marine Laboratory, NOAA (Russell et al., 2004). Project outcomes included a software program to model structural changes in the superstructure of the ship, and to help predict when a substantial oil release would likely occur. A strategy to assess the risk of environmental damage due to oil leakage was also developed. This multi-year study was intended to provide a foundation for site management, while also serving as a model for submerged historical iron and steel wrecks that have potential for leakage internationally (Russell et al., 2004). Similarly, an Earthwatch Project was completed by a team of underwater archaeologists and marine biologists in Chuuk in 2006-2008. Researchers studied the state of shipwrecks while simultaneously comparing reef communities, coral and fish diversity at natural sites with those among the shipwrecks (Jeffery, 2012).

Guidelines for monitoring the natural and cultural attributes of submerged historic sites were developed for the National Historic Preservation Office (HPO), Federated States of Micronesia, Pohnpei to more uniformly address research of this variety (Jeffery et al., 2007). These guidelines were intended to be used throughout Micronesia, and sought to promote education and training so that additional culturally significant sites could be studied in concert with environmental issues. The guidelines included maritime archaeology, marine biology, and surveying of corrosion. Regular local monitoring for the best management was stressed as was the *in situ c*onservation of artifacts, preventative conservation to minimize future deterioration and loss of artifacts, and curative conservation prevent further damage. The development of a database regional database including information on each submerged site was also recommended (Jeffery et al., 2007).

Study of these submerged cultural resource sites is not only culturally relevant, but also can be used to assess potential harm to the environment. Currently 27% of the world's coral reefs are at high risk and 31% at moderate risk due to human disturbance (World Resources Institute, 2013). The effects of submerged material from recreational, commercial, and military activities are among these disturbances. Risks from pollution from WWII wrecks pose a real and increasing threat as they deteriorate. Over 11 million tonnes of vessels spread over 3,800 shipwrecks are contained in the Pacific WW II information database (Monfils *et al*., 2006). Pollution results from leaking oil, fuel, chemicals and unexploded ordinance. Many of these old sites are rapidly deteriorating, leading to accelerated rates of pollution output. The Pacific Ocean Pollution Prevention Program of the South Pacific Regional Environment Program (SPREP) developed a regional strategy to investigate ways of minimizing environmental damage resulting from these sites, while also preserving site sanctity (Monfils et al., 2006).

The practice of intentionally creating artificial reefs by sinking de-fouled ships or other materials has been received with mixed reviews. Despite objections and permit petitions in opposition, artificial reef societies actively continue to acquire, strip and sink material. An example is the Artificial Reef Society of British Columbia which has obtained a permit and is planning to sink the HMCAS *Annapolis* in Halkett Bay Provincial Marine Park in the near future (ARSBC, 2014). In the United States, the Maritime Administration (MARAD) discontinued donating ships for reefing as of 2012. Nonetheless, another group promoting the used of artificial reefs, California Ships to Reefs, actively seeks to acquire decommissioned vessels constructed after 1985 and which contain no polychlorinated biphenyls (California Ships to Reefs, 2014). Ideally, the creation of an artificial reef minimizes potential environmental risks by removing potential pollutants prior to intentionally sinking material or a vessel in a pre-determined location. The Victorian Artificial Reef Society in Australia scuttled the ex *HMAS Canberra* in 2005 to create an artificial reef dive site. A biological assessment of the site conducted in 2006 established that the wreck, while less diverse than the natural reef in the area nearby, served as a habitat to multiple fish and invertebrate species. The study was intended as a baseline to which future assessments could be compared as the reef aged (Schlacher-Hoenlinger et al., 2006).

A 2013 study sought to analyze methods and suggest a framework for risk assessment (Landquist, 2013). The National Oceanic and Atmosphere Administration (NOAA) Damage As-

sessment Center found that factors in coral reef and resource decline include complications such as lack of funding which inhibit abandoned vessel removal as well as vessel impact resulting from physical contact with reefs (Smith et al., 2003). Initial evaluations revealed that 600-1,000 wrecks in American waters posed pollution threats of varying degrees. Utilizing further assessment tools, the list of significant potential pollution threats was reduced to 87 wrecks. One of the vessels assessed was the WWII Japanese *Tokai Maru* in Guam's Apra Harbor. During further screening, scores were applied to identify risk factors including the amount of oil that could be on board and an archaeological assessment. The *Tokai Maru* was given a low risk rating, indicating a lower risk potential for pollution. Recommendations from the Office of National Marine Sanctuaries (ONMS) included noting the site in the Area Contingency Plan and identified the helpfulness of ongoing outreach efforts to the technical and recreational dive community in order to increase awareness regarding site specific spills (ONMS, 2013).

With the passing of time, sites where material from WWII is located have come to be considered cultural resource sites. The conservation of such sites is of concern on the island of Guam due, in part, to loss from looters and salvagers. Protecting these sites is challenging because of the ease of access to them and due to the lack of formal management by local or federal agencies. The Guam Historic Preservation Office provides some legal protection by issuing permits to those seeking to recover material under Title 21: Real Property, Chapter 76: Historical Objects and Sites (Supreme Court of Guam, 2015). The U.S. protects its sovereignty over sunken government vessels, aircraft and spacecraft. Recovery of such craft is not allowed without permission (Federal Register, 2004). The U.S. Navy does not allow recovery or disturbance of material nor alteration of sites which are on land managed by either the U.S. Navy or the local state historic preservation office, the Guam Historic Preservation Office. WWII sites on Guam comprise about 20% of the island's submerged cultural heritage sites (Jeffery, 2013).

In July 2012, the Seabee Junkyard was mapped and surveyed by a Maritime Archaeology Field School at the University of Guam funded by the Guam Preservation Trust. The field school recommended the distribution of the site plan to the community on Guam including recreational dive establishments and tourism operations as well as educational outreach and further historical research to improve site interpretation and management. The site survey (Figure 1) resulted in the positive identification of WWII U.S. Navy Construction Battalion, known as "Seabees", ma-

terial at the site. The Seabee Junkyard is one of at least 31 known locations of submerged material in Apra Harbor, 29 of which are shipwrecks including fishing boats, barges, landing craft utility vessels, and WWII Japanese freighters (Dixon, 2013). The sites in Apra Harbor make up 37% of the known submerged sites in the waters around Guam (Jeffery and Drew, 2007). Among them are two Nationally Registered Historic Places (NRHP) and Guam Register of Historic Places (GRHP): *Tokai Maru*, a Japanese passenger-cargo freighter struck down by a U.S. submarine in 1943 and *SMS Cormoran*, a German ship destroyed in 1917 (Dixon, 2013). A number of other sites in the area may qualify as NRHP or GRHP as well but have not yet been nominated. On Guam, additional confirmed intentional sea dump sites include Shark's Pit, Haputo Point, and Asan Beach. The potential effects of toxicity resulting from the intentional ordinance dump at Asan Beach are currently being studied by the National Park Service.

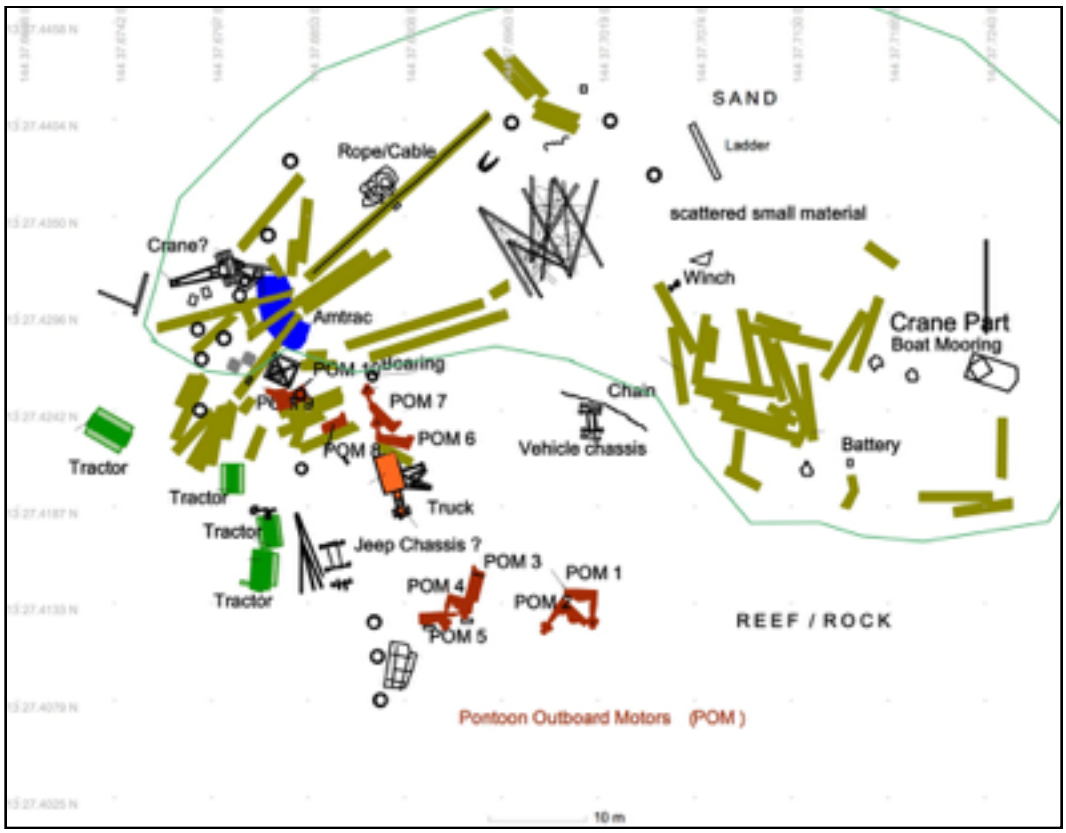


Figure 1. Nautical Archaeology Society Course Survey July 2012, B. Jeffery 2013.

OBJECTIVES AND PROJECT DESIGN

The combination of historical and environmental factors present on Guam and at Seabee Junkyard offered a unique opportunity to study the development of the natural environment around submerged cultural resource material. The project objective was to design a holistic approach to *in situ* interpretation of Seabee Junkyard that was inclusive of site history, cultural values and environmental studies. Three outcomes identified for this project were description of historical findings, preparation of an environmental report and the development of an outreach toolkit.

The first outcome was to examine the site and determine the historical events which led to its creation. A wide range of data sources were used to identify events that resulted in the presence of the material. Archival research was conducted at the National Archives and Records Administration (NARA) Pacific Region at San Francisco in San Bruno, California and the Micronesian Area Research Center at the University of Guam, Mangilao, Guam. Findings from this research were compiled to produce an inventory of documentation regarding Naval Construction and Surplus Equipment on Guam. Inquiries for information were made to the U.S. Navy Seabee Museum, National Archives and Records Administration at College Park, the National Park Service, the Department of Agriculture, and the Environmental Protection Agency. Approval for access to research the site was obtained from Naval Base Guam environmental and archaeological staff. An Archaeological Resources Protection Act (ARPA) permit was not necessary because it was a non-removal study. The Guam Historical Preservation Office and Guam Preservation Trust were notified of the project in order to confirm that no permitting from local entities was required. Additional surveys for historically relevant information were conducted within the community on island, including the collection of oral interviews from survivors that lived on Guam during or immediately after World War II.

The second outcome was to produce an environmental reference assessment which described the natural environment at the site, and in doing so develop and recommend tools for *in situ* monitoring and management. The reference assessment was designed to have two parts, the first to examine the benthic community and the second to survey fish, megafauna, and mobile invertebrates at the site. For both parts of the assessment, the research site was compared to a control site. Additional benthic surveying was conducted within the site in order to describe the biota on

the submerged material in contrast with that on natural substrate. This assessment was designed as a baseline for future monitoring efforts at this site. It also may be used at other sites with submerged WWII material to determine the need for further surveying.

The final outcome was to holistically interpret the findings and produce and distribute outreach materials and tools for the local community and stakeholders. Outreach presentations were to be made throughout the Pacific region to a variety of audiences including local stakeholders such as students, recreational divers and non-profit groups, but also given to archaeologists and environmental scientists. The production and distribution of outreach tools was to include a website, informational pamphlet, underwater dive guide, material inventory and standard educational presentation. This study may serve as an *in situ* holistic interpretation model for other submerged cultural resource sites both on Guam and in the region.

RESEARCH SITE

Guam is the largest and most populated island in the Mariana Archipelago, a chain of 15 islands in the Pacific, which includes the inhabited islands of Rota, Saipan, and Tinian. It is 51.5 km long and varies from 6.4 to 12.9 km wide. It is geologically unique, in that it is composed of an elevated karst limestone plateau in the northern half and volcanic bedrock dominated by river systems in the southern half (Figure 2). The island is also surrounded by a large reef system (Bureau of Yards and Docks, 1947).

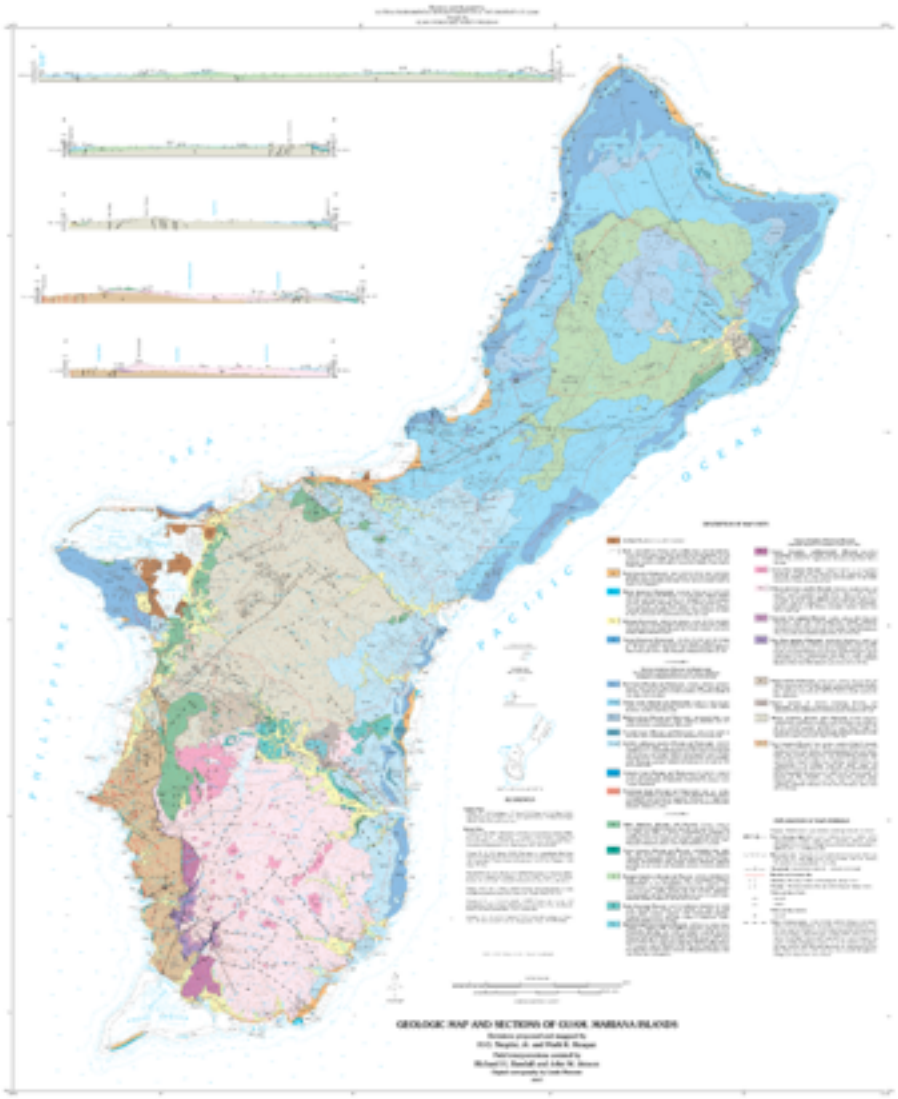


Figure 2: Geological Map and Sections of Guam, Mariana Islands (Siegrest and Reagan, 2007).

Apra Harbor (Figure 3) is the largest port in Guam and is the primary shipping port for the island. It has been predominantly used and exclusively controlled by the U.S. Navy, including exclusive use of the inner harbor, for the naval station and naval supply depot. The outer harbor is also accessed commercially and recreationally. Commercial uses include the Port Authority and the Cabras power plant. Recreational uses include recreational diving (Figure 4), snorkeling, fishing, and jet skiing.

Figure 3. Apra Harbor, Guam, USA. Photo courtesy U.S. Naval Base Guam Facebook 2013.

Figure 4. Submerged cultural resource and natural resource dive sites in or near Apra Harbor, Guam (Palmer, 2014).

Known locally as Seabee Junkyard, this site was selected for this project because it provides a unique opportunity for holistic management and interpretation and would constitute the first project of its kind on Guam.The site is located 200 m inside the northwestern mouth of Apra Harbor along the Glass Breakwater (Figure 3) at a depth of eight to ten meters. The 4.5 km long Glass Breakwater was built in the immediate aftermath of WWII in order to protect harbor occupants from natural and military disturbances (Hammer, 1947). The breakwater and the area immediately surrounding it on which the Seabee Junkyard is located is classified as artificial fill (Figure 2) and includes locally quarried limestone, barges, and vessels (Hammer, 1947). The Seabee Junkyard covers an estimated two acres of surface area the benthic habitat of which includes patches of sand, limestone weathered pavement, and boulders. Also present at the site is WWII material consisting of four tractors, a landing vehicle tracked (LVT) also called an 'Amtrac', ten pontoon outboard motors, cranes, vehicle remains and hundreds of meters of steel piping (Table 1). Confirmed human disturbances at the Seabee Junkyard also include coastal development such as the development of Marine Corp Road, the Guam Port Authority which is a

growing commercial sea port, recreational activities such as diving, tourist facilities, and military activity including nuclear submarines.

There is evidence of removal of contaminants and reusable materials from discarded material prior to dumping at the Seabee Junkyard. The LVT (Figure 5), has holes on its port side indicating primary salvage prior to dumping (Arnold, 2014). The salvaged items at the site, including the LVT, are an indicator that oil was not likely onboard at the time of deposition. According to the U.S. Coast Guard Salvage Engineering Response Team (SERT) Pollution Potential Decision Tree (Figure 6), the site is likely a Low Pollution Risk (Office of Marine Sanctuaries, 2013).

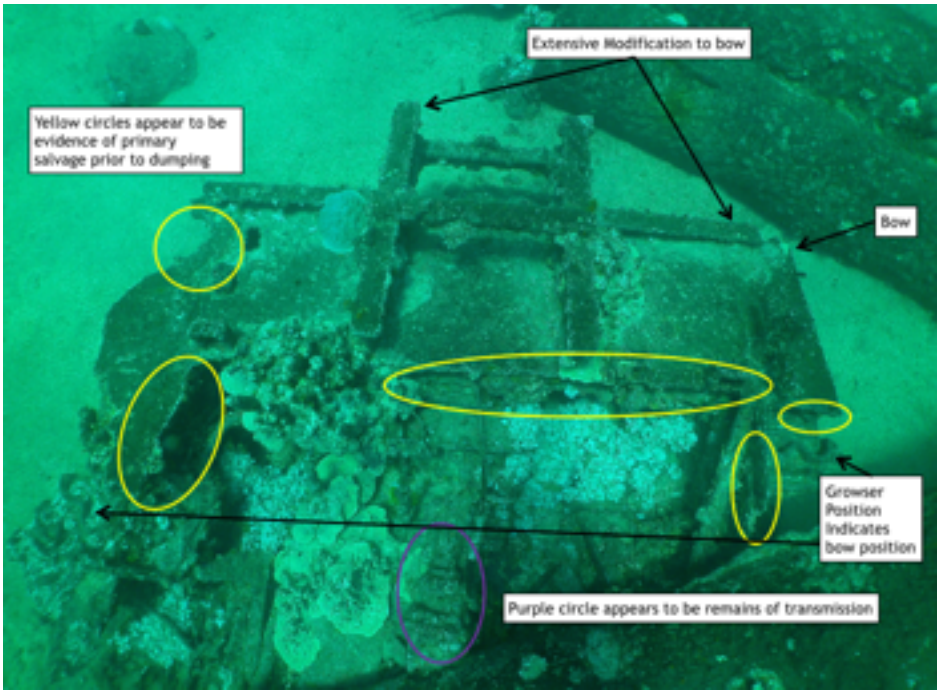


Figure 5. LVT examined for evidence of primary salvage prior to dumping at Seabee Junkyard (Arnold, 2014).

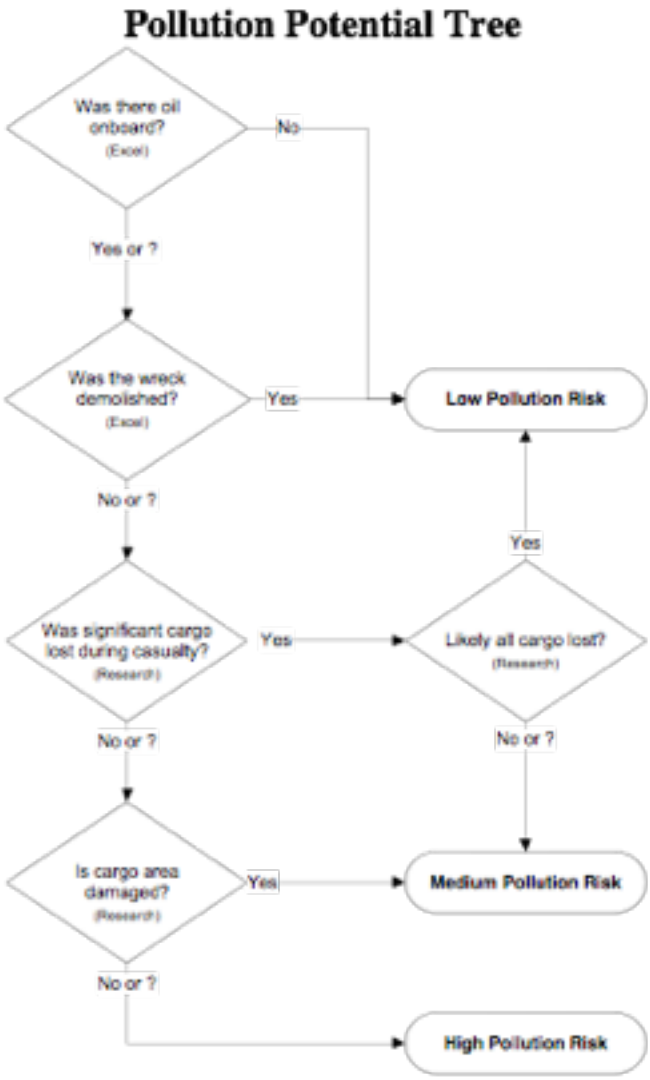


Figure 6. U.S. Coast Guard Salvage Engineering Response Team (SERT) Pollution Potential Decision Tree (Office of Marine Sanctuaries, 2013).

HISTORICAL FINDINGS

Guam before World War II

Anthropological and archaeological evidence supports the biological and cultural diversity of pre-contact Micronesia from around 3,500 BCE, which includes the Chamorro group of people (Dixon et al., 2013). Ferdinand Magellan's arrival in 1521 marked the beginning of Guam's European contact and colonization. Spain officially claimed Guam in 1565 and occupied the island until the U.S. Navy took possession in 1898 following the Spanish-American War (Rogers, 2011).

Located centrally on Guam's west coast, Apra Harbor was the primary port on the island, actively used commercially since the 1500's. In 1945, it was the second busiest port in the world (Bureau of Yards and Docks, 1947). Originally called the Port of San Luis de Apra by the Spanish in the 1700s (Dixon, 2013), Spanish galleons en route to Manila would anchor in the deep waters just outside of the harbor. Alterations to the environment and harbor defenses were built in and around the harbor during and after this time, including a wharf to accommodate vessel cargo and passengers and the development of Fort Orota, presently known as Orote Point (Dixon, 2013).

The western side of Apra Harbor was deep and originally exposed to both natural disturbances such as large swells and to possible military attacks from submarines or other vessels. Luminao Reef, along the northwestern margin of the harbor, was also shallow enough to permit a shallow-draft torpedo to pass (Hammer, 1947). Nevertheless Apra Harbor encompassed the most suitable anchorages on Guam (Hammer, 1947). Charts created as early as 1734 depict the increasing knowledge about Apra Harbor's submerged and terrestrial environment between 1734 and 1938 (Figure 7-9). Developments on charts include an increase in the quantity of depth soundings which better illustrate the location of shallow reefs and deeper coral mounds which may have enabled safer passage around the natural obstructions. Alterations to the Harbor's natural environment began as early as 1904 with mechanical dredging, providing fill which enabled the construction of a road from Piti to the beach at Cabras Island (Dixon, 2013).

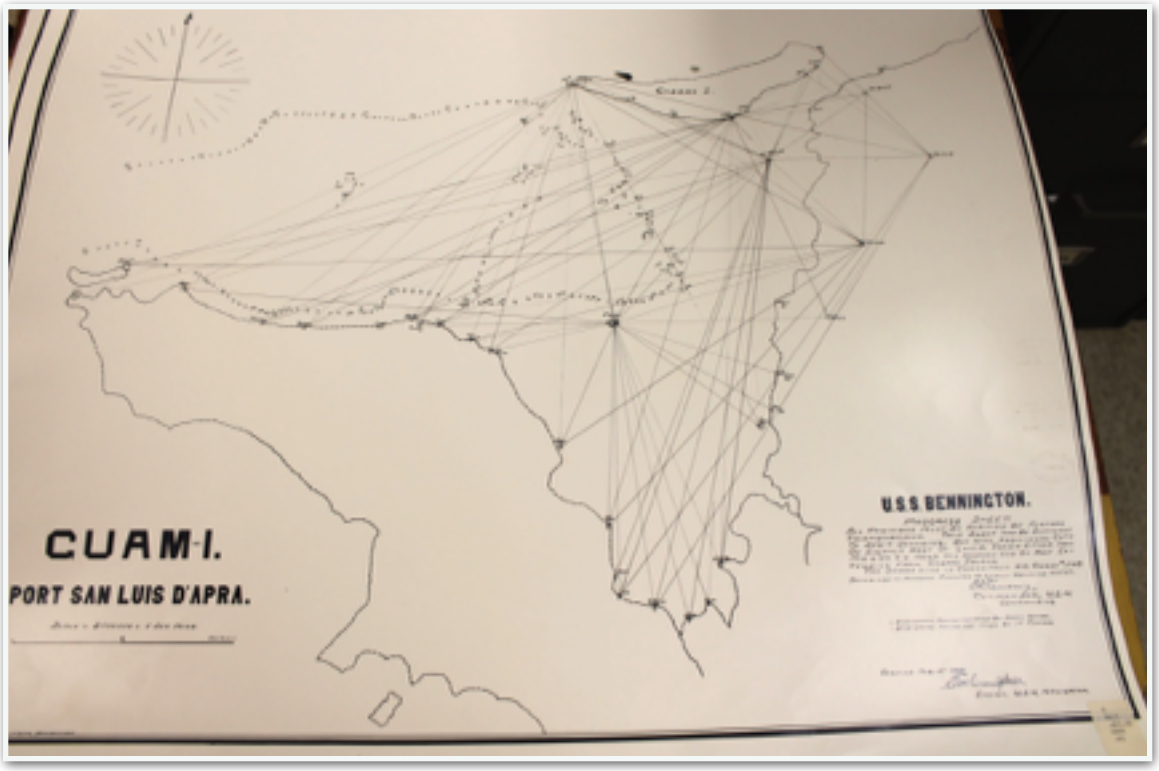


Figure 7. Mapa de la entrada y puerto de San Luis de Apra, 1734 (Map of the Entrance and Port of San Luis of Apra) Courtesy Micronesian Area Research Center.

Figure 8. Apra Harbor, 1901. Courtesy Micronesian Area Reasearch Center.

Figure 9. Map of Apra Harbor US Naval Station Guam showing conditions on June 30, 1938 including the recommended runway and hangar arrangement. Courtesy Micronesia Area Research Center.

In 1898 most residents lived in the capital of Hagatña or in small villages in the south with farm lands laying outside of the capital. Rice was a staple crop, having been grown as long ago as the pre-contact time period. Coconuts for the harvest of copra for the extraction of coconut oil were also grown and exported to Japan through World War I. Changes during the early years of the United States Navy occupation included varying increases in land tax which were formerly one percent of land value. Increases in property taxes, which began in 1903, depended on the type of land and property location. This was challenging for locals who were "land rich but cash poor". As a result of forfeiture due to delinquent taxes, the U.S. naval government increased its land acquisition (Rogers, 2011). There were also a number of Japanese-owned businesses on Guam which the United States tried to deter by encouraging US business expansion.

Recognizing the strategic value of Guam, the U.S. Navy began requesting funds to fortify its position in 1904. Shortly after, contingency war plans were drafted by the U.S. Navy identifying Japan as a potential threat (Rogers, 2011). In 1921, a naval seaplane base was established at

Sumay, the same location where whalers had ported decades before. It was a successful commercial village located along the harbor where locals primarily farmed and fished. The seaplane base increased the military presence on the island and buildup in the area, including fuel piers, a hangar, and dock at Sumay (Hammer, 1947).

In 1929, Commander Willis W. Bradley, Jr. became governor and was the first to recommend that Guam citizens be granted a bill of rights. He proclaimed a bill of rights and re-established the Guam Congress in 1930. Subsequently, the Guam Congress repeatedly adopted resolutions requesting American citizenship for Guam's people from the United States Congress. Upon initial rejection, the Chamorro population criticized the U.S. Naval occupation as unjustified.

Guam during WWII

In 1938, the Hepburn Report, a comprehensive and coordinated plan for Naval development, recommended Guam as a location for an advanced base (Bureau of Yards and Docks, 1947). This expansion would develop a fortified base which included airfields and naval facilities (Bureau of Yards and Docks, 1947). Such a base would be logistically equipped to support mobile combatant forces which may need to move west quickly during future wars. The further development of Apra Harbor was prioritized, including the construction of a breakwater along the northwest side of the harbor to protect it from exposure to the environment and potential attacks (Hammer, 1947).

Almost two km of the breakwater had been built extending along Luminao Reef when the Japanese bombed Guam on December 8, 1941 (Bureau of Yards and Docks, 1947). The attack ultimately resulted in the Japanese occupation of Guam which lasted until 1945. Advanced base work was halted (Bureau of Yards and Docks, 1947) and pre-existing U.S. documents on the island were destroyed by the Japanese (Glass, 2013). Foreign vessel access to the harbor was restricted, putting an end to commercial access as well. In 1941, Chamorro residents endured a subsistence economy (Rogers, 2011).

The Japanese renamed Guam "Omiya Jima" meaning Great Shrine Island. During the first part of this occupation, the island was managed by the Japanese army who were housed in schools and government buildings. Government rule was assumed by the Japanese Navy in 1942. Locals

were forced to learn and speak Japanese, use Japanese yen and learn Japanese customs. Useful commodities including cars and cameras were confiscated and food was rationed. The Japanese military also confiscated local homes, sometimes without warning. Displaced locals rebuilt wooden framed structures. Some of the first displaced included the entire village of Sumay to Santa Rita, approximately 2000 people (Rogers, 2011).

Locals endured many brutalities during the war including beatings, rapes, public executions and mass executions. Many residents fled from their homes in villages to their farmlands, went into hiding, or otherwise avoided village centers. Until 1942, Chamorros were given a labeled piece of cloth that acted as a pass and allowed them to move about the island. Anyone associating with Americans or considered sympathetic to them was severely punished, and sometimes executed. Bars were shutdown, reviving the prohibition-style underground production of alcoholic tuba. The Japanese invaders did not originally intend to build large military structures on the island, and did not arrive with the equipment and manpower required to do so. In order to support their new goals for a massive buildup, they imported Korean and Okinawan laborers, and used abandoned American equipment to begin new development projects (Rogers, 2011).

Americans began carrier-based air attacks in early 1944, leading to the liberation of Guam on July 21, 1944, and the end of Japanese occupational presence on the island on August 10. Liberation marked the beginning of a rebuilding period for Guam that resulted in the largest naval base west of Pearl Harbor and the second largest base in the world (Hammer, 1947). This included the construction of naval structures on land, and the recommenced construction on what was to ultimately become the Glass Breakwater, which extends 4.5 km along the northwestern side of Apra Harbor. To undertake this task, the U.S. Navy Construction Battalions known as Seabees, landed with the Marine forces during the liberation efforts. The Second Marine Engineer Battalion and Army Corp of Engineers were also credited with helping to rebuild and develop the island after the war (Bureau of Yards and Docks, 1947).

The Seabees had been originally organized to support combat forces by building advanced bases in active war zones (Hammer, 1947). The Seabees were initially organized by the Bureau of Yards and Docks while their field operations were controlled by the theatre commander (Bureau of Yards and Docks, 1947). Personnel were trained in both combat and construction; and includ-

ed men with a “can do” attitude. The battalions were organized in lions, with a “Standard Lion” being adequate to provide all construction support needed for the operation of a large base. Lion Six began movement to Guam on May 1, 1944. The Seabees brought a vast amount of equipment that was required to conduct a massive and rapid build-up in active war zones (Hammer, 1947).

The reacquisition and development of Apra Harbor was one of the primary objectives for the U.S. when they captured Guam. After the island was reclaimed and personnel and materials arrived, nets were strung along the exposed westward portion of the harbor for protection until the construction was complete. As work was completed for a section, the nets were removed. The nets were Japanese; this was the only documented time that Japanese equipment was used by Americans during the war (Hammer, 1947). In 1944 (Figure 10), the harbor could accommodate only eight ships. However by 1945, 231 ships were docked in the harbor (Hammer, 1947).

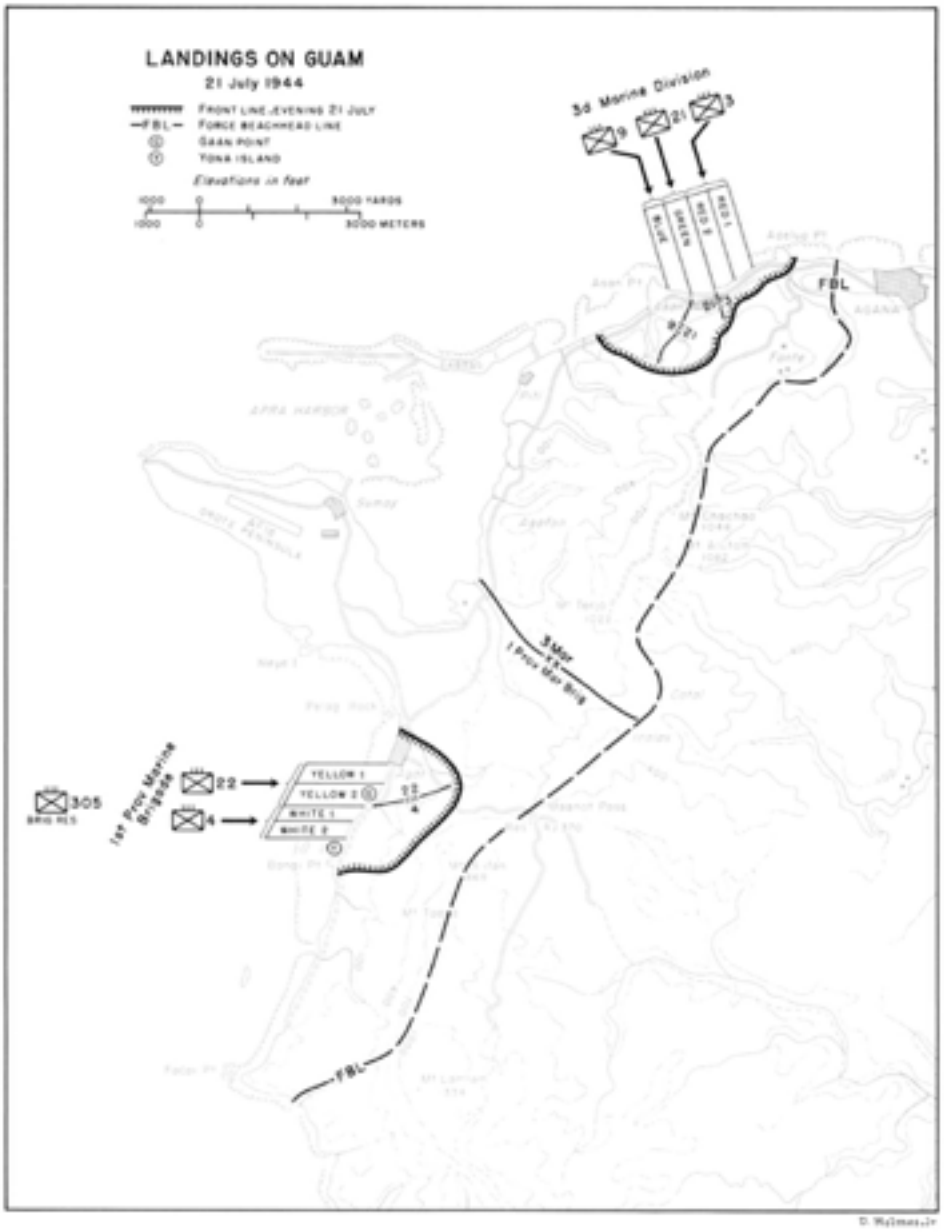


Figure 10. A map of the landings on Guam also shows the harbor and breakwater before the additional developments (Holmes, 1944).

The increase in usable space could be credited to two methods of work including a "harbor stretcher" unit and suction dredges. The "harbor stretcher" cleared obstructions including coral reefs containing large and shallow water corals, some of which had risen from more than 30 m of depth. "Harbor stretching" was undertaken rapidly; heavy blasts resulted in water shooting over 60 m into the air. Suction dredges were used to remove shoals from the inner harbor to create over 150,000 m^2 of shallow harbor. Fill from dredging and coral reefs was used to raise the land

surrounding the harbor up. After the land was filled, shops and machinery were installed along raised areas (Hammer, 1947).

Among the difficulties faced by Seabees in the early days of harbor development were enemy fire, lack of material and tropical storms. Enemy fire included snipers which shot at and around them while they worked. In October 1944, a typhoon washed away six dry docks and set work back a month. There were also logistical obstacles to overcome. Shortages of material delayed progress on building a tank farm for fueling (Bureau of Docks and Yards, 1947). Getting supplies to and from shore was accomplished by loading goods from freighters into Landing Craft Mechanical [LCMs] and Higgins boats or Landing Craft Vehicle Personnel [LCVPs]. From there they were transferred to LVTs (Figure 11). These boats could collect supplies and then maneuver over reefs to the beach where cargo was unloaded by cranes and loaded into trucks. Amphibious tractors were also used to withdraw fuel from tankers (Hammer, 1947).

Figure 11. A U.S. Army Jeep is lowered into a landing craft in Normandy, 1944. The same methods were used in Guam. Photo from www.Olive-Drab.com, 2014.

Although the harbor had expanded to accommodate more ships, there were still many logistical obstacles to overcome. The naval base was still being developed and required enormously detailed plans to execute larger scale operations. One of these was the accommodation and loading of 15,000 Marines for the subsequent invasion of Iwo Jima. The task of loading was handled with the support of a fleet of small craft, LCVPs, LCMs and Landing Craft Tanks [LCTs] which were used to take men and supplies to ships (Hammer, 1947).

Guam after World War II

World War II ended soon after the bombing of Nagasaki and Hiroshima August 1945 (National Park Service, 2013). With the end of the war, the United Nations was organized in San Francisco in 1945, with fifty countries initially signing the UN Charter (United Nations, 2014).
Work steadily continued on the Glass Breakwater during the end of the war and time period immediately after it. Some of the barges that had been used to transport the Seabee's supplies were sunk and used in the building of the breakwater. Limestone quarried from Cabras Island was also used to build part of the breakwater. By 1945, a year after Liberation, the breakwater totaled nearly 5 km in length and additional harbor developments completed by this time included 2,286,000 cubic meters of inner harbor dredging, a eight linear km of quay wall, 14 quay-wall berths, nine pontoon piers, two wooden fueling piers, ten LST berths and one submarine pier (Figures 12-14) (Bureau of Yards and Docks, 1947). To accomplish dredging work, crews were sent with additional specialized equipment which could handle 30,800 cubic meters of rock in 30 days (Table 1).

Figure 12. Building the breakwater. Courtesy James Oelke-Farley, National Park Service.

Figure 13. Building the breakwater. Courtesy James Oelke-Farley, National Park Service.

Figure 14. Building the breakwater. Courtesy James Oelke-Farley, National Park Service.

Table 1. Seabee Equipment shipped with Construction Battalions including equipment for dredging units

Light Vehicles	Heavy Vehicles	Earth Moving Equipment	Dredging Equipment
• 3/4-ton ambulances • 1/4-ton reconnaissance cars (jeeps)	• 2 1/2-ton, six-by-six cargo • 4-ton, six-by-six, cargo • 2 1/2-ton, six-by-six dump • 2 1/2-ton oilfield body • 2 1/2-ton, six-by-six trailers • fifth-wheel trailers	• 6-ton cranes with clamshell and dragline bucket attachments • 13-ton cranes • 5-ton cargo cranes • 30-ton unit of 1 1/2-cubic yard capacity with clamshell, dragline and shovel attachments • 3/4-yard excavators with backhoe attachment • tractors ranging from 113-drawbar horsepower to 35-drawbar horsepower (ex. Caterpillar D-8 Tractor with Armored Cab) • pneumatic rock hammers • concrete mixers • 300-gph portable diaphragm pumps	• Suction and dipper dredges • Pontoon barge-mounted clamshells • Wagon mounted drills • 1 1/2-cubic yard and • 2 1/2-cubic yard excavation machines with crawler cranes, clamshell, dragline buckets and shovel attachments • dump bottom, 13-cubic yard trailers • 10-cubic yard dump trucks • 4-ton, six-by-six dump trucks • 50-hole blasting machines • Thirty-five wagon-mounted drills

Seabees can be credited with 75% of the total post-war construction on Guam with 37,000 construction troops used in the completion of Advanced Base Guam (Navy Department, 1947). Marine Corps Drive along the western side of the island was completed by the Seabees as well as the construction of the Agaña Boat Basin. Ninety-three miles of road were built in both the Navy Depot and Ammunition Depot (Hammer, 1947). Harbor developments were not just limited to the building of the breakwater. The lands immediately surrounding the harbor were made from dredged materials extracted from the harbor during and after WWII (Dixon, 2013). Although seen in an estimation of costs for the 1950LSSDB report issued on October 22, 1947 (Parker, 1947), documentation of continued work on the breakwater was not found on any paperwork after this time (Records Group 313 and 181, 1944-1950). Images and maps collected from reports published 1947 show a completed Glass Breakwater, comparable to its state today (Figure 15-16).

GUAM IN THE CROWDED DAYS
Outline map of the island, showing how the Armed Forces Establishments were scattered from Ritidian to Merizo.

Figure 15. Guam in the crowded days (Hammer, 1947). The map shows military installments as well as local villages. The Glass Breakwater is depicted as it is today in photographs and maps, located on the northwestern side of Apra Harbor across the water from Gab Gab.

Figure 16. Apra Harbor and the Breakwater (Bureau of Yards and Docks, 1947).

The Seabee's projects were planned but the logistics of their execution was not pre-planned and consequently was completed regardless of property lines, particularly with the production of Marine Corps Drive, one of Guam's main and longest roads (Rogers, 2005). These projects were not always welcome. Some Chamorro residents at the time, including Maria Cruz who was a teenager during WWII, recognized that although they were not desirable to everyone, projects such as Marine Corps Road played an important role in the redevelopment of Guam (Cruz, 2014). Much of the land used by the military was private and was not properly rented or paid for by the military. Previous occupants of Sumay village actually remained in refugee camps during this time (Rogers, 2005). The focus of the Navy had been on moving the front line forward and creating bases in the Pacific with equipment that was considered mobile such as floating dry docks, landing ships, and fueling equipment (Hammer, 1947). Later projects involved improving infrastructure on the island.

Following the build-up developments, the military decided to release some of the land that it had been using. In a memo from the Director, Dept. of Agricultures and Fishers to Government of Guam on January 23, 1948, it was stated that lands should be made available to previous owners before being available for sale to other interested parties. Land with structures on it would be sold according to the value of the structures, or the structures would be removed prior to return by the Military Command which had occupied the land.

Local exposure to American culture increased in the period after the war largely due to an increase in off-island teachers in the school system and the elimination of segregated schools. Eng-

lish-only language policies that had been pursued prior to World War II were continued in the school system and other facets of civil service and home life on Guam. The Navy encouraged English speaking hires and at school, students caught speaking Chamorro were punished (Rogers, 2005). As the era of rebuilding came to a close, the Organic Act was signed on August 1, 1950, making Chamorros U.S. citizens with limited self-government.

Demobilization

As the war started to come to an end, the War Department had started to authorize some individual demobilization from both European and Pacific located forces. This demobilization favored combat veterans, although this practice created divisions within units and reduced morale (Sandler, 2001). The Navy and Army had developed plans in anticipation of the end of the war. The intent was to sustain some forces in the aftermath of the war while continuing individual demobilization based on a point system reflecting soldiers and sailors, length of service, combat, participation, parenthood, overseas time, and awards. Plans took into account staffing to process discharges, ongoing work and shipping available for bringing overseas troops home (Stewart, 2005).

As soon as the war ended, “Magic Carpet” operations to get troops home began due to demand and public outcry that forces were not needed any longer (Hammer, 1947). The result was a rapid pace and large scale demobilization resulting in disorganization and infighting. The Truman administration sought post-war foreign policy aimed at establishing economic, not military, power. Truman avoided the increase in deficits and military expenditures, prioritizing the balancing of the budget and ’dismantling the military machine’ (Pollard, 1985). When demobilization was slowed in order to meet some of the troops’ responsibilities such as dealing with the massive amounts of equipment shipped to territories and advanced bases in support of the war effort, public protest increased (Stewart, 2005).

Higher ranking and more senior men were demobilizing and requests for lower ranking replacements were put in. A year after the war ended, in the spring of 1946, half of the men had been demobilized. Facilities on Guam began to close, including the Anti-Aircraft Training Center, while others, such as the Industrial Department servicing machinery, struggled to continue functioning. However, some facilities continued to grow, such as the Supply Depot, which expanded

to take on supplies at Saipan as well as aviation and construction materials on Guam (Hammer, 1947).

The Seabees were among those severely reduced during the post-war period (Hammer, 1947). At their peak, the Seabees were 250,000 strong but by 1946, they were down to 20,000. Seabee battalions still at work included those on Guam but also included forces building a weather station in Russia, a series of harbors and airfields in multiple locations in China, infrastructure rebuilding across Japan and facilities in anticipation of atomic bomb tests on Bikini Atoll. A total of 37,000 construction troops had taken part in the effort to build the advanced base on Guam (Bureau of Yards and Docks, 1947). Many immediately seized upon the opportunity to go home while others, including Lieutenant Joseph J. Wojcik and Chief Yeoman Les Lahner, extended to help with the demobilization (Hammer, 1947).

Despite the Seabees continuing work on the island, by 1946, when more than half of the men on Guam had been sent home, the Naval Operating Base began to deteriorate (Hammer, 1947). By 1949, the Seabees had been reduced to 3,300 although infrastructure projects continued (Naval History and Heritage Command, 2014).

Equipment & Dumping

At the end of the war, Seabee equipment and war supplies were being shipped out to the Pacific in their highest quantities in order to support of what has been called the “greatest construction war of history” (Department of the Navy Bureau of Yards and Docks, 1947). As they could not be sent back or diverted without contributing to the post-war chaos, they continued to pour in to Guam from the U.S. mainland (Hammer, 1947). In their war concept, advanced bases are admittedly wasteful. Equipment was worked non-stop unloading and reloading supplies for ships in port. Towards the end of the war 120 Liberty ships and 20 tankers could be unloaded in one month. The supplies at the Guam Depot resulted in a Naval Supply Center, nicknamed, “Pacific Supermarket” that brought supplies 6,000 miles closer to the Pacific forces, covered 6,384 acres and held over 1,500 pieces of equipment (Hammer, 1947).

Less than one year after the liberation of Guam from the Japanese, the problem of how to deal with surplus equipment and materials grew exponentially. With the rapid demobilization of

troops, maintenance staff had been reduced and remaining service members were short-handed. The remaining heavily worked equipment deteriorated rapidly due to lack of maintenance (Stewart, 2005). Costly equipment and machinery sat in the open because there was no one to store it properly (Hammer, 1947).

In 1944, U.S. Navy memos began circulating about the issue of salvageable and surplus materials including metals, lumber and crashed planes which were accumulating in large quantity on the island (O'Neil 1945) . In response to concerns that a metal scrap dump within the base was starting to "encroach" upon operational areas (Cole, 1945), a metal dump was proposed and later established in Agana Field (Figure 17). Memos started addressing unauthorized dumping in 1945 (Salisbury, 1945) and reports to Congress were made in early 1946 alleging the destruction of valuable government material. Usable material including metal and lumber was being dumped at sea (Figure 18), ashore, and even burned (Hermle, 1946, Eberhard, 1946). As a result, organizations in custody of the material to be destroyed were required to maintain a record and report the destruction (Dessez, 1946). Memorandums and directives on the issue were often amended and varying between 1945 and 1948.

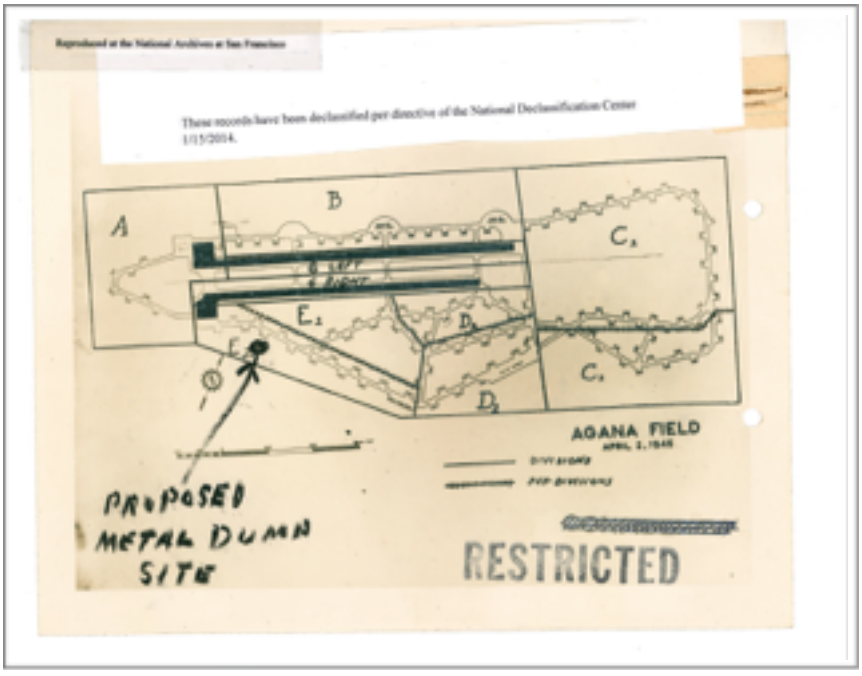
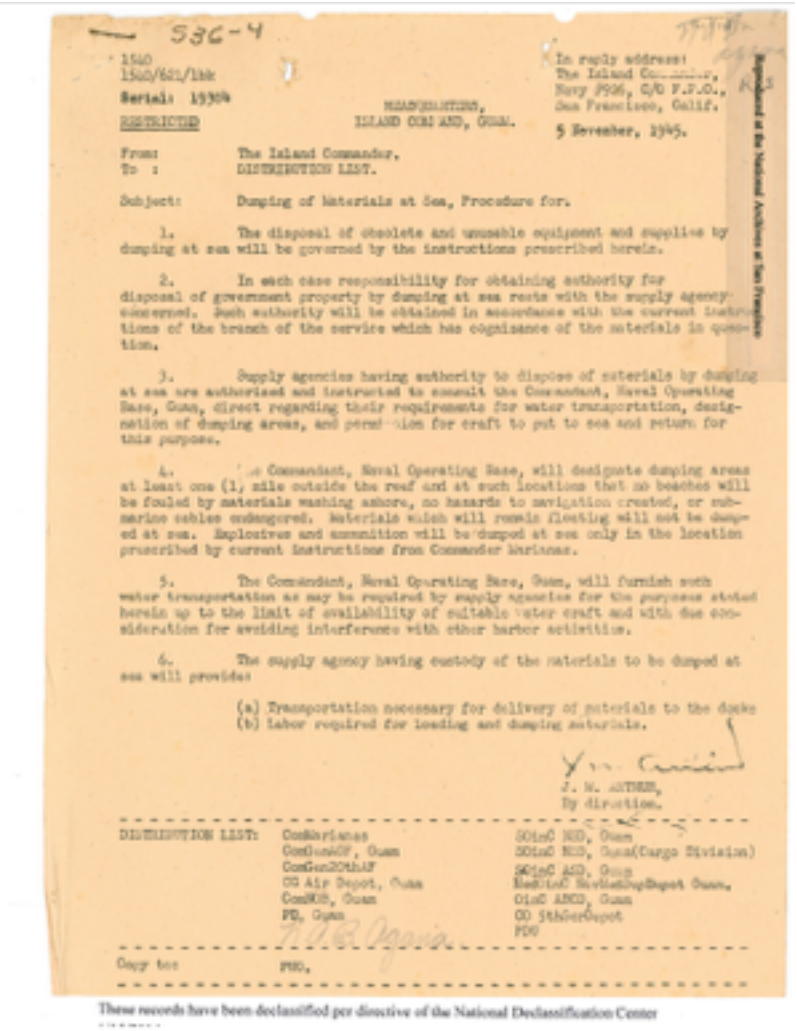


Figure 17. Proposed metal dump map included in memo from the Commanding Officer to the Island Commander, Guam on July 26, 1946. (Pownall, 1946)



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Serial: 1339

RESTRICTED

HEADQUARTERS,
ISLAND COMMAND, GUAM.

In reply address:
The Island Commander,
Navy #926, C/O F.P.O.,
San Francisco, Calif.

5 November, 1945.

From: The Island Commander.
To : DISTRIBUTION LIST.

Subject: Dumping of Materials at Sea, Procedure for.

1. The disposal of obsolete and unusable equipment and supplies by dumping at sea will be governed by the instructions prescribed herein.

2. In each case responsibility for obtaining authority for disposal of government property by dumping at sea rests with the supply agency concerned. Such authority will be obtained in accordance with the current instructions of the branch of the service which has cognizance of the materials in question.

3. Supply agencies having authority to dispose of materials by dumping at sea are authorized and instructed to consult the Commandant, Naval Operating Base, Guam, direct regarding their requirements for water transportation, designation of dumping areas, and permission for craft to put to sea and return for this purpose.

4. The Commandant, Naval Operating Base, will designate dumping areas at least one (1) mile outside the reef and at such locations that no beaches will be fouled by materials washing ashore, no hazards to navigation created, or submarine cables endangered. Materials which will remain floating will not be dumped at sea. Explosives and ammunition will be dumped at sea only in the location prescribed by current instructions from Commander Marianas.

5. The Commandant, Naval Operating Base, Guam, will furnish such water transportation as may be required by supply agencies for the purposes stated herein up to the limit of availability of suitable water craft and with due consideration for avoiding interference with other harbor activities.

6. The supply agency having custody of the materials to be dumped at sea will provide:

(a) Transportation necessary for delivery of materials to the docks
(b) Labor required for loading and dumping materials.

J. M. ARTHUR,
By direction.

DISTRIBUTION LIST: ComMarianas
ComIslandCF, Guam
ComGun204thAF
CG Air Depot, Guam
ComNOB, Guam
PD, Guam

SOinC NID, Guam
SOinC NID, Guam(Cargo Division)
SOinC AID, Guam
MedSOinC SeaBeeSupDepot Guam,
OinC ASCD, Guam
CO 5thSeaDepot
PDO

Copy to: PHO,

These records have been declassified per directive of the National Declassification Center

Figure 18. "Dumping of Materials at Sea, Procedure for." (Arthur, 1945).

A 1945 memo detailed instructions on how to dump at sea (Arthur, 1945). After obtaining authority in accordance with the instructions for their branch of service, supply agencies were required to consult with the Commandant of Naval Base, Guam to arrange water transportation and identify proper designated dump areas. Designated dump areas were established one mile beyond the reef at locations where beaches would not be fouled by materials washing ashore, and materials would not disrupt navigational paths or submarine wires. Additionally, all materials deposited were required to be non-floating. Explosives and ammunition were only to be dumped under instruction of the Commander Marianas at a specified location. The Commandant, Naval Base Guam would provide means of water transportation such as a pontoon or LCV which the

supply agency in custody of the disposable materials would use to transport themselves and the materials to the docks and provide the labor for loading and dumping the material.

The instructions for dumping at sea were reissued in 1946, and stated that prior approval for dumping must be obtained from the Commander, Navy Region Marianas or higher Navy or Marine Corps Authority (Dessez, 1946). Navy authority to dispose of government property by destruction, abandonment or donation was limited to cases of military necessity, safety or consideration of health or security. The memo emphasized that meeting the requirement for the completion date of an activity was "not" considered military necessity. Prior to dumping, serviceable parts of equipment were to be removed and retained, all recoverable scrap metal was to be removed, and the parts turned over to the appropriate body before the Commanding Office, 5th Service Depot and the Island Public Works Officer would authorize dumping at sea (Hermle, 1946).

Despite the multiple sea and shore dumpsites that have been found on or near Guam, no records of requests and or permissions have been located in the record boxes from the National Archive, at the U.S. Navy Seabee Museum Archives (Blazich, 2014), or at the National Archives at College Park in the Record of the Bureau of Yards and Docks for the period between 1942-1947 (Patch, 2014). There exist significant gaps in the Records of the Bureau of Yards and Docks from 1942-1947, and correspondence from 1947 and after is limited with much of it unable to be viewed due to the classification of the parent documents (Patch, 2014). The low morale among the military forces during this period was fueled by redeployments, individual demobilizations, and individual desires to return home following the war's end. These factors may have contributed to the poor handling of surplus equipment and the lack of required records. Many of the records cited in this text were declassified upon my request in January 2014. The entire Department of the Navy Records Group 181 was among the documents to be declassified, and included 45 boxes of documents from 1944-1948. Among the declassified documents were those regarding dumping and dumping at sea (Figure 18).

Specifically authorized at-sea dumpsites included Shark's Pit, Haputo Point and Asan Beach. Asan Beach was the site designated for explosives and ammunition dumping, and is located on the central western side of the island, just south of Agaña and north of the current Navy Base

near Sumay Village (Tibbatts, 2014). Haputo Point was a site for salvageable and other “critical” metals including brass and platinum. The metals were to be hauled and cast into the sea at Haputo Point, located on the northern western side of Guam (O’Neill, 1945).

Shark’s Pit, as it is known today, is located off Orote Peninsula on the southern end of Apra Harbor. This site became the dump for much of the island’s trash in the aftermath of the war. A garbage chute was constructed which allowed for dump truck contents to be released into the open ocean 50 m below. After loads were dumped, a gasoline engine pumped water to a high pressure hose to clean the dump truck and chute to reduce flies. Although protections were in place to stop vehicles for backing up too far, one ten-wheel truck did go over the edge of the cliff, its driver jumping to safety (Hammer, 1947).

Garbage disposal for the ships in port was a logistically intensive task. As a solution, large self-propelled pontoon barges were built stateside by the Seabees, altered to suit conditions on Guam and manned by local Guamanians (Figures 19-21). Ships would fly the International Code Flag G for garbage service. Upon collection, barges were taken out to sea for dumping. A fire pump on the barge was used to flush it clean after dumping (Hammer, 1947). Units could also be fitted together to form ramps, barges, and floating dry docks (Department of the Navy Bureau of Yards and Docks, 1947). Some of these barges were later used as fill material to build the breakwater (Dixon, 2013).

In order to relinquish ownership of surplus equipment and help with the struggling rebuilding efforts in villages such as Agat, in1948 the Navy started making material available to Guamanians. The aim of the Navy shifted from solely dumping and disposing to include the distribution of materials among those in need. Guamanian interests had the first opportunity to purchase the excess and resale was not permitted unless the purchasing party was properly licensed (Wright, 1948). Surplus material was not just a consequence of military work. Construction companies had secured open contracts to support the build-up and rebuilding initiatives (Mailloux, 2014).

Figure 19. Raised pontoon outboard motor on a pontoon barge. Courtesy Jack Sprengle, U.S. Navy Seabee Museum, 2012.

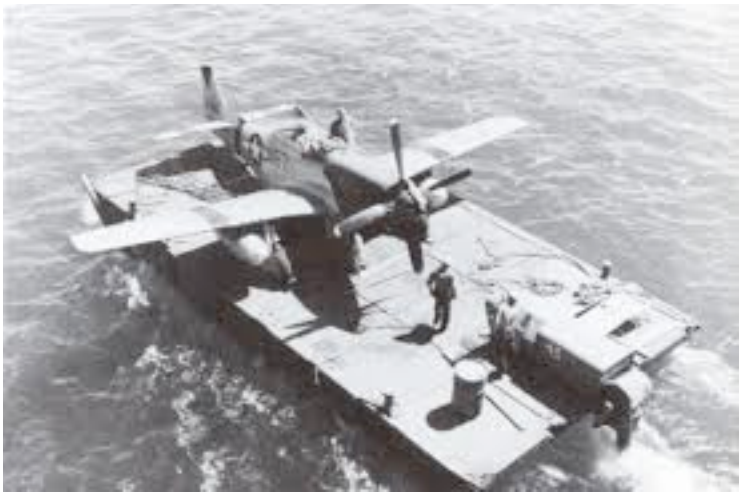


Figure 20. Pontoon barge, propelled by a pontoon outboard motor, transports a plane. Courtesy Jack Sprengle, U.S. Navy Seabee Museum, 2012.

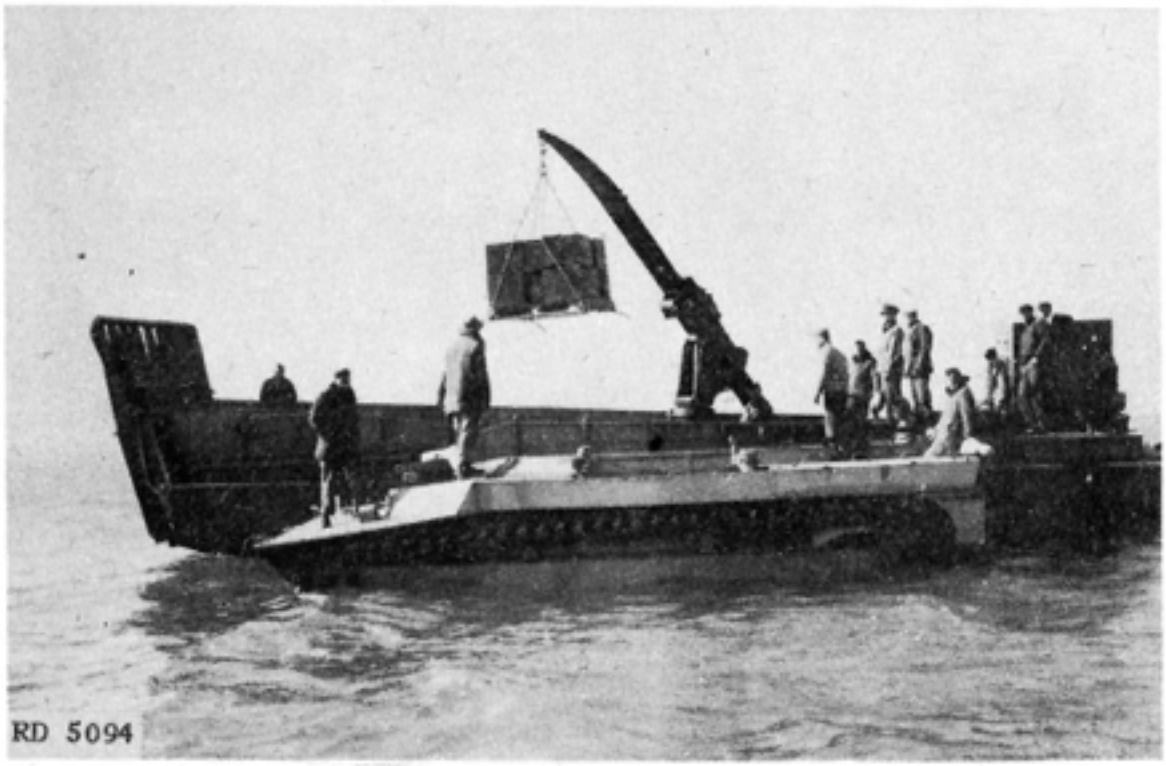


Figure 3.—Floating crane for use in transfer area. This is a mobile hydraulic crane mounted in an LCM being used by marines on training maneuvers.

Figure 21. A LCM (Landing Craft Mechanical) and pontoon barge exchange equipment on the water. (U.S. Marine Corp, 1945).

As WWII receded into the past, dumping on Guam proceeded. Dumping into the waters immediately surrounding the island continued well into the 1960s. In 2013, the Department of Agriculture on Guam discovered photo documentation of the dumping of various items including a vehicle used as a blood donation bus, various scrap materials, and refrigerators (Figures 22-23) into Apra Harbor (Tibbatts, 2014).

Figure 22 Materials for dumping in the 1960's, documented by the Department of Agriculture (Tibbatts, 2013).

Figure 23. Submerged materials after dumping in the 1960's, documented by the Department of Agriculture (Tibbatts, 2013).

Submerged WWII Evidence of Dumping at Seabee Junkyard

The location of the Seabee Junkyard is not indicated as a specifically approved sea dumpsite in archived materials. No records were found in the National Archives that included maps of any at sea dumpsites despite memos that were found indicating their existence (Arthur, 1945, Dessez, 1946). No records of requests or authorizations for dumping of any specific material, including that at the Seabee Junkyard have been located. The regulations for dumping at sea indicate that dumping must take place at least 1-mile outside of the reef however it was possible that the Apra Harbor, which had been extensively dredged and blasted which demolished large portions of its natural habitat, was not considered as a "reef" area. Located at the further end of the harbor, the site was, and is today, a quick boat ride from Navy Operating Base (NOB), Guam (Figure 15). As a result of the breakwater, Apra Harbor is protected from heavy swells, it is accessible on all days excluding those during a typhoon. same features that may have made this site an optimal

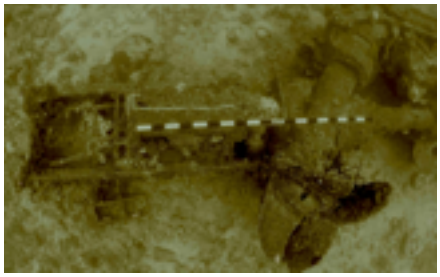
dump at sea site have preserved a wealth of WWII evidence connected to this time period in the immediate aftermath of WWII (Table 2).

Table 2: Seabee Junkyard Site Inventory: Pictures from the Past, Present and Identification Status of submerged material.

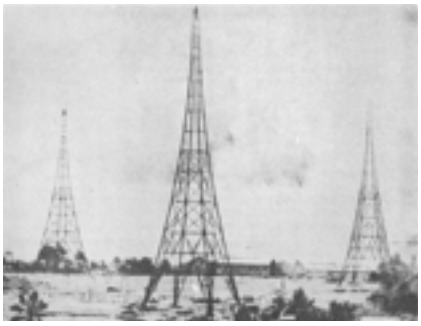
Artifact	Equipment During WWII	Equipment Submerged at Seabee Junkyard	Status
Caterpillar D4 Tractor	 Photo from www.olive-drab.com, 2013.	 Photo courtesy S. Newsome, 2012. 	Tentative

Artifact	Equipment During WWII	Equipment Submerged at Seabee Junkyard	Status
Allis-Chalmers Co. HD10W, 1944	 Photo from www.olive-drab.com, 2013.	 Photo courtesy S. Newsome, 2012.	Confirmed
GMC CCKW 2 1/2 Ton 6x6 Cargo Truck (G-508)	 Photo courtesy James Oelke- Farley, NPS, 2013.	 Photo courtesy B. Jeffery, 2012.	Confirmed

Artifact	Equipment During WWII	Equipment Submerged at Seabee Junkyard	Status
Landing Vehicle Tracked **"Alligator" or "Buffalo"**	 Photo John Florea, Life, 1944.  Photo provided by Homer Beach, 2012.	 Photo courtesy B. Jeffery, 2012. 	Model Uncomfirmed

Artifact	Equipment During WWII	Equipment Submerged at Seabee Junkyard	Status
Pontoon Outboard Motor	 Photo courtesy James Oelke-Farley, NPS, 2013.	  Photos courtesy B. Jeffery, 2012.  Photo courtesy Sean Newsome, 2012.	Confirmed

Artifact	Equipment During WWII	Equipment Submerged at Seabee Junkyard	Status
Piping	 Photo Department of the Navy ,1947.	 Photo courtesy B. Jeffery, 2012 	Unconfirmed: Large piping that is 1-meter in diameter sits at the site. On Guam, the Seabees built at asphalt plant (pictured left) which had piping. Other piping during WWII was used for fuel however it was smaller (an interior diameter of 24 inches).
Unidentified equipment with tracks	None	 Photo courtesy B. Jeffery, 2012	Unconfirmed

Artifact	Equipment During WWII	Equipment Submerged at Seabee Junkyard	Status
Crane **(Present day boat mooring)**	 Photo courtesy James Oelke- Farley, NPS, 2013.	 Photo courtesy B. Jeffery, 2012.	Tentative
Triangular Rubbish used for building structures such as radio towers during the war	 Photo P.I.C., Anacostia, D.C.	 Photo courtesy B. Jeffery, 2012.	Radio towers were built by both the Japanese and Americans on Guam. Among the Seabee's tasks on Guam was building the radio towers. Material origin unknown and use is tentative.

Artifact	Equipment During WWII	Equipment Submerged at Seabee Junkyard	Status
Unidentified	 Figure 4.—LST unloading directly on beach. Note ramp built out to facilitate vehicular access. (South Saipan, Marianas Islands.)  Figure 5.—Use of mobile hydraulic crane in unloading small amphibious craft. Note use of lines to stabilize crane in handling heavy loads. (Marines in the Marianas.) Photo from U.S. Marine Corp, 1945.	 	Unconfirmed. The submerged material appears similar to the LCM (Landing Craft Mechanical) but the status remains unconfirmed. (This material was not included in the July 2012 survey)

Artifact	Equipment During WWII	Equipment Submerged at Seabee Junkyard	Status
Chevrolet 1.5 ton 4x4 cargo truck (G7127) **or** **U.S. Navy International Harvester FFN-3 Class Fire and Crash Truck built on a M-3L-4 chases, 1.5 ton and 4x4**	  Photos from www.Olive-Drab.com		Unconfirmed but similar to the material pictured, both used in large quantities in WWII. (This material was not included in the July 2012 survey)
Jeep Chassis	  Photos from www.Olive-Drab.com	 Photo courtesy B. Jeffery, 2012.	Unconfirmed

There is evidence confirming that Seabees on Guam dumped their equipment as they demobilized. In the book Lion Six (Hammer, 1947), which chronicled Seabee work on Guam during and immediately after WWII, the author noted that as demobilization began, Seabees dumped tractors, also known as dozers, in the jungle and tore roofs off storage sheds that exposed them to the elements and hastened deterioration (Hammer, 1947). According to the U.S. Navy Seabee Museum, the Seabees destroyed their material for two reasons. The first was that it was too expensive to ship home. Many Seabee locations during WWII were far from the U.S. mainland. The second reason was more complex - not repatriating some materials to the U.S. mainland created a demand for continued production for the U.S. domestic market. Returning tractors and bulldozers that could be repurposed following the war effort would not stimulate the economy (Sprengle, 2013).

Submerged material at Seabee Junkyard is a concrete reminder of the period of rebuilding immediately after the war. While it is evidence of the innovation and handwork required to design and build the breakwater, it also reveals the great haste of the military to leave the island. It may also be interpreted as indicative of the low perception of the environmental value of the ocean and land on which the equipment was disposed. At the western most end of Seabee Junkyard four tractors sit upright. Two have been tentatively identified as Caterpillar D4 Tractors and the other two confirmed as Allis-Chalmers Co. bulldozers. Earth moving equipment such as these tractors was used in order to build the breakwater. East of the tractors is a GMC CCKW 2.5 ton 6x6 cargo truck. These vehicles were plentiful during this time period and used for a multitude of transportation related tasks for cargo including personnel, material, and often garbage. Just beyond the truck is a jeep chassis, used for localized travel of personnel (www.Olive-drab.com, 2013).

Amphibious vehicles can be also be found at the site. An LVT with evidence of stripping is confirmed although its model number is unknown and an item that may be an LST remains unconfirmed. Amphibious vehicles played a large role in fueling, loading, and unloading larger vessels in the waters of Apra Harbor and Agat (U.S. Marine Corps, 1945). They accomplished these tasks in combination with pontoon barges sometimes arranged in larger assemblies. Outboard motors were used to power the barges, eight of which are confirmed at the site. These motors could be raised from and lowered into the water and were used to support barge activity which

also included trash and garbage collection from ships, and the dumping of material at sea (Hammer, 1947).

Tentatively identified material at the site includes the base of a crane, triangular rubbish, 1-meter in diameter piping, and a truck. The crane, which is used as the recreational dive boat mooring today, may have been used to maneuver large pieces of quarried rock to build the breakwater. The triangular rubbish at the site resembles that used to build radio equipment on Guam, a task also completed by the Seabees (Bureau of Yards and Docks, 1947). The source and use for the piping is unknown. An asphalt plant was in use at the time that utilized similar large pipes but the quantity and the size are untraceable to that as a definitive source. An unidentified truck may be a U.S. Navy International Harvester FFN-3 Class Fire and Crash Truck or a Chevrolet 1.5 ton 4x4 cargo truck, both of which were used in the Pacific during that time. However these also are unconfirmed (www.Olive-drab.com, 2013).

ENVIRONMENTAL REFERENCE ASSESSMENT REPORT

The purpose of the environmental studies objective was to provide a snapshot (Chabanet et al, 2005) of the site, and to examine the development of the biotic community at an artificial reef of submerged WWII material. The environmental community of a site with submerged material may vary from that of a site without submerged material because submerged material offers different settlement substrates for benthic species and vegetation. This impacts the building of a reef framework by corals (Done et al, 1991). Submerged WWII material may also attract different fish communities and megafauna which may include sting rays and reef sharks. In order to test this hypothesis, an environmental baseline assessment was designed and executed at the Seabee Junkyard and at an intact site, a site located along the breakwater without the presence of submerged WWII material. The assessment utilized benthic surveying and stationary point count surveying. Data collected from these surveys may establish a baseline for long-term monitoring. Findings from the assessment may identify the interaction between the natural environment and the submerged material, giving insight into the effects of the environment on the submerged material and vice versa.

METHODS

Site Descriptions

A control site without submerged WWII material was identified to determine if the submerged WWII material at Seabee Junkyard affected the development of the environmental community. Like the Seabee Junkyard, the control site was located in Apra Harbor along the Glass Breakwater and was therefore largely protected from natural disturbances. Situated just northwest of the Seabee Junkyard (Figure 2), it is also classified as artificial fill and sits at a depth of 8-10 m. Both sites are in the vicinity of human disturbances including recreational diving, spear fishing, tourism operations, commercial port traffic and military activity including nuclear-powered submarines. The control site was chosen using drift dive surveys along the breakwater to identify areas without submerged material.

Stationary Point Count Surveys (SPC)

The Stationary Point Count (SPC) method is optimal for assessing or monitoring large and mobile species. A 50-meter transect line was randomly was laid through the Seabee Junkyard and the control site. At each site, three replicate cylindrical areas raising from the benthic floor into the water column were assigned. Each was ten-meters in diameter and intersected the transect lines at 0-10 meters, 20-30 meters, and 40-50 meters. Fish, mobile invertebrates, and megafauna were tallied in those areas. Surveying was started with five minutes of observation during which time species were listed. After the observation period, the surveyor proceeded with five minutes of fish counting. Only fish penetrating the cylindrical area were recorded. Recorded data included quantity, species, and size estimation (Ayotte et al., 2011). Fish data was collected by Andrea Herschberger who used NOAA in-water models to perfect the technique before using it in the field (Herschberger, 2014).

Benthic Community Surveys

Benthic community composition was estimated using replicate quadrats. The purpose of the survey was to describe the benthic biotic communities at the Seabee Junkyard and a site with less material, the intact site, and see if there were significant differences between them. The percentage of substrate types and the percentage of living organisms growing on them within each quadrant was recorded. The non-living substrate type was divided into two categories, “manmade” or “natural”. “Manmade” substrates consisted of Seabee materials and included wood, metal, and plastic. “Natural” substrates included limestone pavement (naturally occurring rock), dead standing coral, sand, rubble, and rock boulders. Living organisms growing on these substrates were categorized as live hard coral, soft coral, macro-algae, crustose coralline algae, sponges, and recently killed coral. Recently killed coral consisted of limestone skeletons that were still intact and un-weathered. There were either bare or coated with new algae.

The first benthic survey assessed both the intact site and the Seabee Junkyard. Six randomly placed 1 m^2 quadrats were laid at Seabee Junkyard, with each quadrat partitioned into 64 equal sized squares. Within each partition the dominant substrates and benthic growth on the substrates were recorded. Photos were also taken of each quadrat. The benthic survey was then performed at the intact site as well.

The second benthic survey further assessed the Seabee Junkyard by examining what was growing on the natural substrates compared to manmade substrates. Three transects were laid parallel to the Breakwater. A transect tape was used to lay 51 m transect lines. Every ten meters a pair of 0.5 m^2 quadrats were positioned along each transect, one on each side for a total of twelve quadrats along each transect. Within each quadrat the dominant substrates and growth on the substrates were quantified. Live hard coral at the site was identified by species and size class. Species identification was confirmed using photos taken of every quadrat, and which included every partition within the quadrat. Corals were measured at their widest diameter and assigned to one of six size classes: 1 (<10 cm), 2 (11-30 cm), 3 (31-60 cm), 4 (61-100 cm), 5 (1-2m), 6 (>2m) (Raymundo et al, 2011). Smaller corals were measured using a hand ruler and larger corals using a 30 m long transect tape.

Statistical Analyses

Data from each benthic survey was tested for significance differences between two groups using independent t-tests calculated using Microsoft Excel with a significance level of 0.05. The first benthic survey, conducted at both the Seabee Junkyard and the intact site, examined the growth categories on the substrate at each of the sites. The second benthic survey more closely investigated the benthic biotic community within the Seabee Junkyard examining growth categories on natural and "other" substrates.

To determine if there were significant differences between the two sites, SPC data was also analyzed using independent t-tests which compared the quantity of fish, quantity of species, and average fish size. SPC data was further analyzed using agglomerative hierarchical cluster analysis utilizing a Bray-Curtis measure of dissimilarity and the XLStat add-in macro for Excel. Data findings were organized to show size, abundance, observed location, species and genus for each recorded observation and clustered together using the un-weighted pair group average. Each of the five clusters represent groupings of the most similar samples noted during the SPC. Sample quantity and classification qualities are not pre-determined but determined by the data collected during surveying, allowing each cluster to show similarities which may cover a broad range of samples.

RESULTS

Stationary Point and Count

There was no significant difference in either the quantity of fish species (t (3)=0.16, p=0.89) nor in the abundance of individual fish themselves (t (3)=0.12, p=0.93) between the Seabee Junkyard and the intact site. Estimated individual fish size at the intact site averaged 11 cm with a standard error (SE) of +/- 5.2 while the average size at Seabee Junkyard was 11.4 cm with an SE of +/- 6.2. There were 123 individual fish within 30 species observed at the Seabee Junkyard. The intact site had 128 fish representing 32 different species (Figure 24).

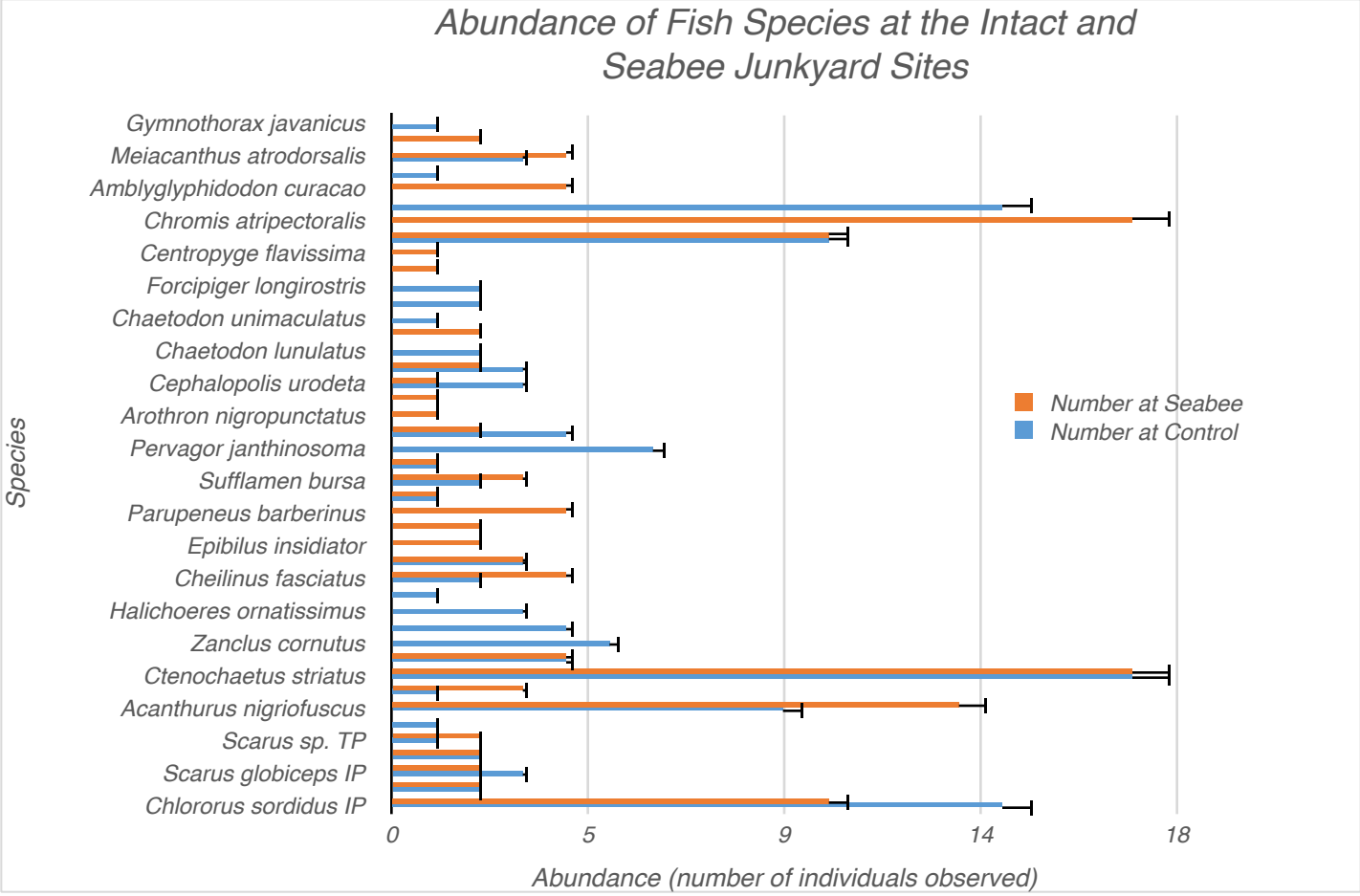


Figure 24: Abundance of mobile species observed at Seabee Junkyard and the Intact site.

Agglomerated Hierarchical Clustering created five clusters based on the abundance and size of each observation. Each cluster consisted equally of observations from both sites revealing that no specific quantity and species diversity was particular to either site. Following the analysis, clusters were analyzed for the species and genus. This showed that the largest clusters were diverse

in genus and species while the smaller clusters contained very specific genus and species. Each cluster shows average abundance (Figure 25). Two visible outliers were Cluster 5 and Cluster 2. The two outlier clusters can be visually identified in Figure 25 by their significantly different slope from the others. Cluster 5 included *Pomacentridae* spp. juveniles and *Chromis atripectoralis*. It had the smallest size fish in the highest abundance. On the opposite end of the spectrum, Cluster 2 had the largest size of fish observed but the lowest abundance including *Scarus sp., Chlororus sordidus*, and *Lethrinus xanthochilus.* The cluster data shows that there is no significant difference in fish variety, size, or abundance between the two sites.

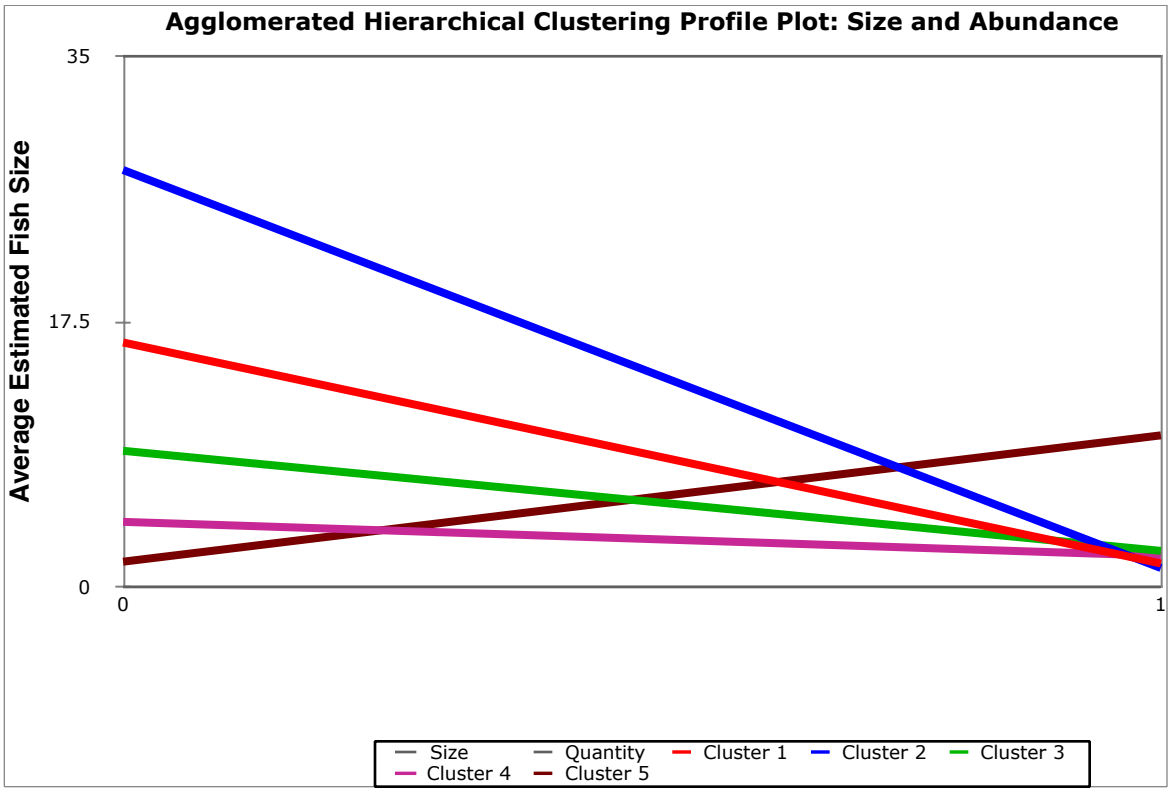


Figure 25. Agglomerated Hierarchical Clustering Profile Plot characterizing the content of each cluster by average estimated size on the left hand Y-axis and average abundance on the right hand Y-axis.

Benthic Community Composition

No significant differences between Seabee Junkyard and the intact site were found with regards to the relative percentages of the different growth categories quantified (Table 3) although the

difference in the percentage of natural substrate between the two sites was significant (t(9)=7.1420, p=0.0001).

Table 3. Comparison of growth classifications between the Seabee Junkyard and Intact Site (independent t-test)

Growing on Substrate	% in Seabee	% in Control	df	t	p- value
Live Hard Coral	0.0317 % (STDev 0.0493)	0.2522 % (STDev 0.3758)	10	1.4371	0.1812
No Biota (includes the presence of turf algae and sponges)	0.8750 % (STDev 0.1477)	0.7422 % (STDev 0.3700)	10	0.8006	0.4220
Macroalgae	0.0600 % (STDev 0.1467)	0 % (STDev 0)	10	1.0	0.3409
Crustose Coralline Algae	0.0039% (STDev 0.0065)	0 % (STDev 0)	10	1.4639	0.1739
Recently Killed Coral	0.02734 % (STDev 0.0478)	0.0065 % (STDev 0.0104)	9	1.0297	0.3300

The second benthic survey was completed within Seabee Junkyard only. Manmade substrate, metal from the post WWII period, comprised 16.15% while natural substrate comprised the remaining 83.85% of the area surveyed. Between natural and manmade substrates, no significant was found in the growth categories of live hard coral (t(4)=1.24, p=0.28) and macro-algae (t(4)=. 66, p=0.54). There was a significant difference in the category of no biota which also includes the presence of turf algae (t(4)=8.56, p= 0.001) which may be attributed to patches of sand amongst the natural substrates.

The two benthic surveys resulted in similar findings. The percentage of the no biota category were highest followed by that of live hard coral and macro-algae. Crustose coralline algae and recently killed coral were found in low percentages when contrasting Seabee Junkyard and the intact site (Figure 26), and not dominantly present when further surveyed within the Seabee Junkyard (Figure 27). Although there are different percentages of growth categories when comparing findings at the control and the Seabee Junkyard sites, they were not statistically significant. This includes the live hard coral coverage which was 22% higher at the intact site, and

macro-algae which made up 6% of coverage at the Seabee Junkyard survey in contrast with 0% of coverage at the intact site (Figure 26).

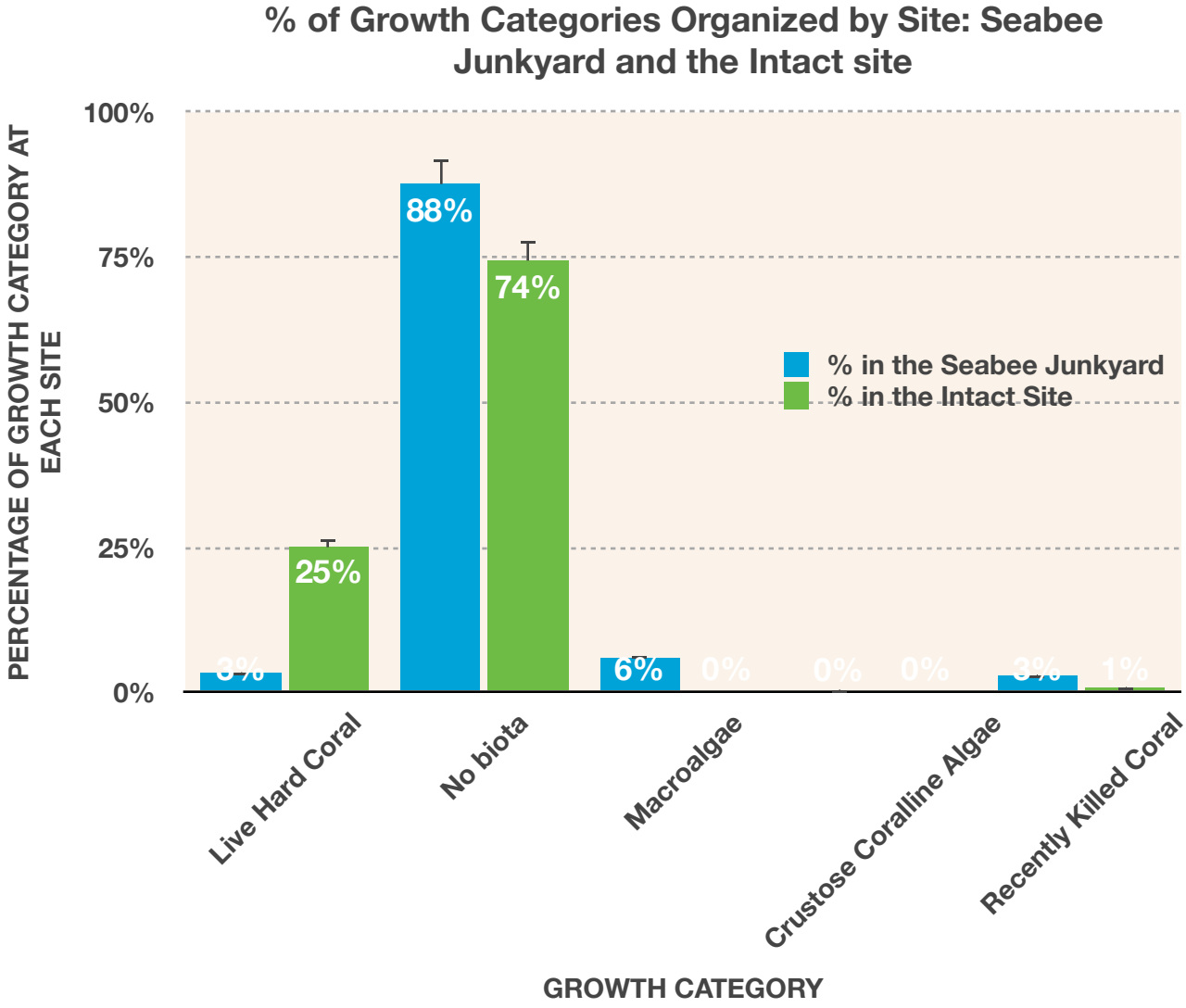


Figure 26: Percentage of growth categories organized by site including standard error bars.

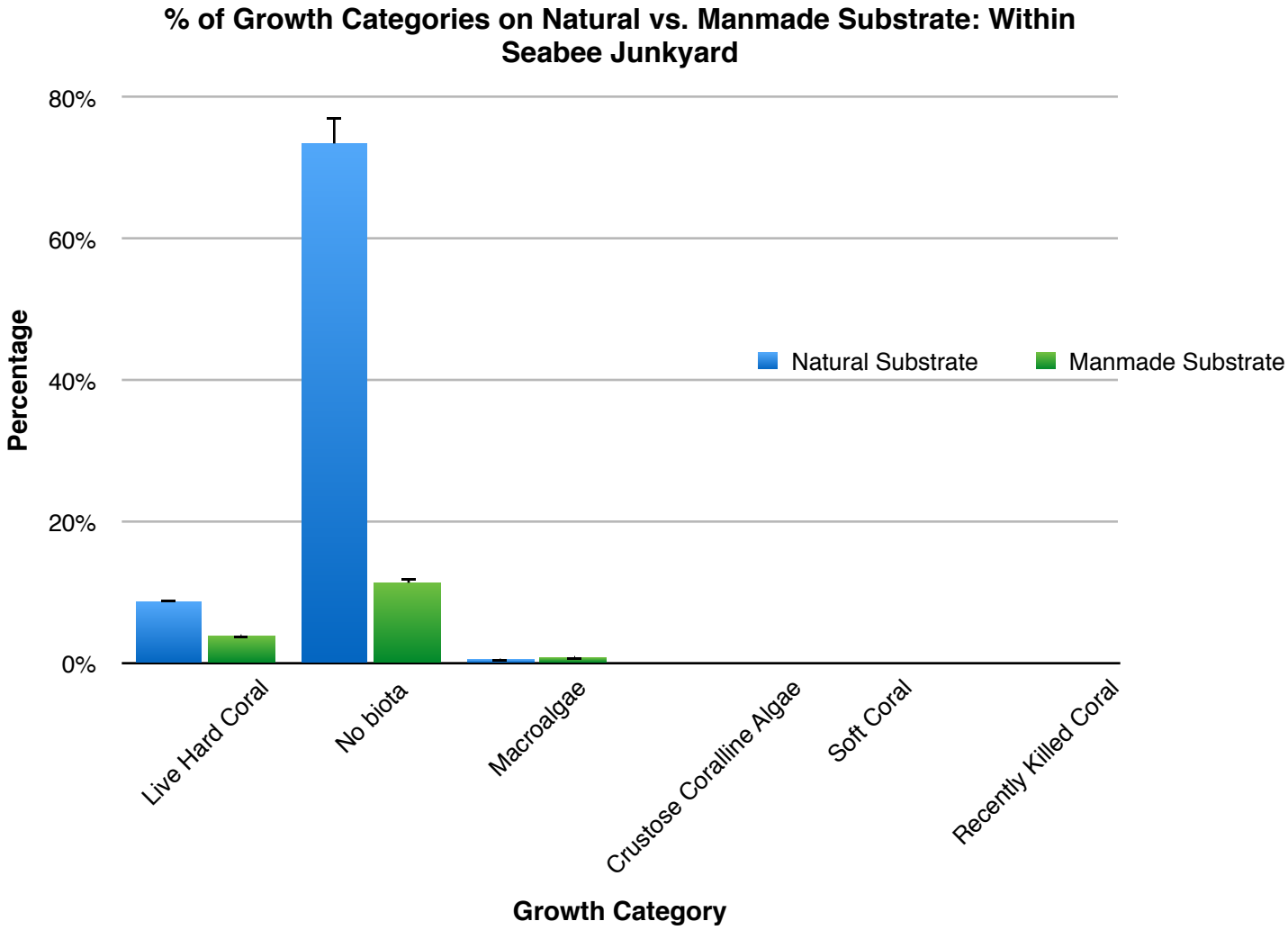


Figure 27: Percentage of Growth Categories on Natural vs Manmade Substrate: Within Seabee Junkyard with standard error bars. Although present crustose coralline algae, soft coral nor recently killed coral were dominant percentages in the surveyed area within Seabee Junkyard.

A total of seven live hard coral species were identified within the Seabee Junkyard including 31 individual colonies, ranging from 2 to 150 centimeters in maximum diameter (Figure 28). Live hard coral covered 12.5% of the area surveyed. The most dominant category on substrate was no biota (NB) which covered 82.9% of the surveyed area and included the presence of turf algae. Also at the site covering less than 2% of the total surveyed area each were sponges, rubble coral, and algae including crustose coralline algae and macro-algae. There was less than 1% of dead coral within the surveyed area. No recently killed coral, soft coral or macro-algae was identified as sizable growth category within the surveyed area (Figure 27).

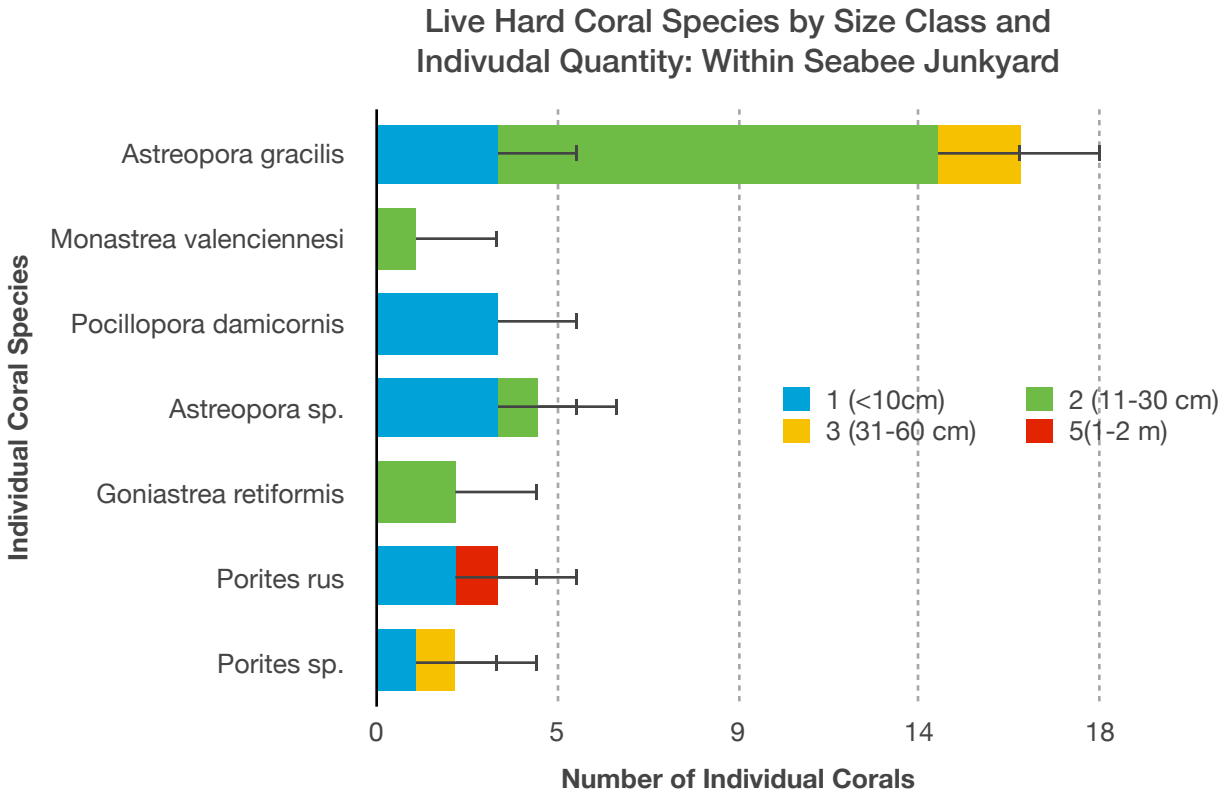


Figure 28. Live Hard Coral Species by Size Class at Seabee Junkyard with standard error bars (Indicated by number of individual species per size class).

COMPARATIVE ANALYSIS

Results of both the benthic and SPC surveys showed that the presence of manmade material at Seabee Junkyard did not result in a significant difference in broad categories of the natural environment than that of a site without such material along the Glass Breakwater. Broad categories included fish, mobile invertebrates, megafauna, and benthic biota such as live hard coral and macro-algae. Within the Seabee Junkyard, there was not a significant difference in the benthic biota that exists on WWII material, manmade substrate, in comparison to natural substrates including rock, pavement and dead standing coral. Both the control site and Seabee Junkyard have sand patches throughout. The benthic survey within Seabee Junkyard resulted in a high percentage of no growth on natural substrate because of the presence of sand patches along the transect lines. Sand is a natural substrate but not an optimal settlement surface.

The lack of a significant difference between the results of the surveys demonstrates that the presence of WWII material is not altering the development of the environment at the site. While every site is unique, the Seabee Junkyard is also located in a man-made environment, classified as artificial fill. There may have been challenges to developments within the natural environment which resulted from an entirely man-made habitat as opposed to the presence of WWII material that this study did not address.

Material at Seabee Junkyard shows evidence of stripping prior to water entry. The process, which would have removed many potential contaminants including petroleum products and reusable parts, may have been a contributing factor in the lack of difference between Seabee Junkyard and the control site as well as amongst substrates within the site itself. Another factor to consider is that the site is still relatively young at 67 years old and the natural environment is still developing. The assessment was designed as a framework to be used for future monitoring on the site which may yield different results over time.

Findings from this study may contribute to the information about the relationship between the natural environment and submerged cultural resource material regarding the many submerged WWII sites throughout the Pacific that are both unintentional and intentional (Monfils et al., 2006. Arnold, 2014). This includes artificial reefs such as the *HMAS Canberra* which showed evidence of a developing natural environment one year after scuttling but was still significantly

different than that of a natural reef. This contributes to the growing body of research about the interconnectivity between submerged cultural resource sites and the natural environment they are located in. Presentations and outreach efforts initiated discussions with experts in marine biology and underwater archaeology as well as stakeholders on island. Discussion centered on the concept of conducting research and management simultaneously as well as examining the conflicting history and perceived community value of the Seabee Junkyard. This site is both a testament to Seabee ingenuity and also highlights one of the island's many dumpsites and a reminder of the painful past.

As this study was designed to establish a baseline of the site, it did not address the effects of human disturbances in the area, past or present, which may have affected the development of the natural environment (Chabanet et al, 2005) and condition of the submerged cultural resource material at the site. In the past, this includes the building of the man-made habitat itself and the dredging and blasting of the vast majority of Apra Harbor at the time of the site's creation. Present day disturbances include recreational, commercial or military activity and within proximity of the site this includes spear fishing, recreational diving, and work reinforcing or repairing the breakwater. Furthermore, this study did not address sedimentation, corrosion, toxicology, water quality, or larval dispersal and abundance; the study of which may contribute better understanding the development of Seabee Junkyard and other submerged cultural resources as well as the natural environment along the breakwater today.

It may be difficult to secure continued monitoring and research at the site. Despite the support of local dive leaders, is no current funding for ongoing research. Neither the Navy nor the Guam Historic Preservation Office have expressed interest in pursuing or funding additional research. The site also lacks the allure of a shipwreck and the controversy of a potential environmental impact such as the *Tokai Maru.*

RECOMMENDATIONS

Based on the findings and outcomes resulting from this project, recommendations are being made in the areas of further research, site management, outreach and education, tourism applications and the regional replication of this study. Further research is recommended because there is much more to learn within the research site, on Guam, and in the region. Within the Seabee Junkyard, further research can contribute to a more complete theory of the site's formation inclusive of site biology and interaction with the natural environment in which it sits. Corrosion studies on the material are recommended; such studies have been conducted internationally on submerged cultural resource material (Jeffery, 2012). A corrosion study at the Seabee Junkyard would identify decomposition and corrosion rates experienced by the different materials at the site, identify factors influencing the site's condition, and finally help determine the potential longevity of the site (Jeffery, 2012). The corrosion analysis can identify the annual corrosion rate of the metals at the site which correlates with the corrosion potential of the site (Jeffery, 2012). Continued environmental monitoring at the site is also recommended. Such monitoring may help identify if any changes in the natural environment and artificial reef formation develop, such as the recruitment of biological species. Over time, the documentation of changes may also inform research about the degree of effect of natural weather events and or human disturbances.

Management recommendations resulting from this project will be submitted to the U.S. Navy and the Guam National Historic Preservation Division, the State Historic Preservation Office. Management recommendations include the nomination of the Glass Breakwater and Seabee Junkyard to the National Register of Historic Places (NRHP) and Guam Register of Historic Places (GRHP), increase in non-disturbance diving education amongst recreational divers and tourism operations, and finally increased enforcement of the protection of submerged cultural resources on Guam.

An official listing on the NRHP and GRHP acknowledges the value of historic sites by indicating that they are deserving of preservation (National Park Service, 2015). To be eligible, a site's age, current state and historical significance are considered. Information that is reflected in this report may be utilized in the nomination process which is lengthy and may be time consuming. Consequently, support in the form of funding from the U.S. Navy or Guam State Historic Preservation

Office is recommended. Once nominated, there are many benefits for sites including access to grants from planning and rehabilitation, preservation easements to nonprofit organizations (National Park Service, 2015), and using a site's registration to further advance tourism and education. Furthermore, a listing on the NRHP and GRHP acknowledges the Seabees significant engineering feat in the building of the breakwater, the ingenuity of their equipment development to meet the needs of the war effort but also serves as a formal documentation of material dumping during and immediately after WWII in the islands of the Pacific which remains evident today.

As indicated in the literature review, both of these organizations provide a degree of legal protection for WWII cultural resource sites on Guam. In conjunction with enforcing the protection of submerged material, both entities should support and help fund the development and implementation of non-disturbance diving education to local recreational divers and tourism operations. For the purpose of this report, non-disturbance diving is identified as diving without making contact with the submerged material or the natural environment at the site. This includes such prohibited activities as temporary lifting, and replacing or removing items from the site. Informing recreational and tourism entities about the historic value of the sites, the sensitivity of the artificial reefs developing on them and steps that they can take to aid in their longevity may help with site preservation. Informing dive guides and instructors about proper behavior at submerged cultural resource sites may empower them to regulate and manage their divers in the water.

In addition to providing education about non-disturbance diving, continued outreach and education efforts should be made. Education and outreach can be implemented in the form of presentations given to local stakeholders including local schools, community groups and military establishments on Guam. Education and outreach may also be conducted in other forms with informative posters at museums and other publicly accessible locations on island. Materials from the outreach toolkit have been dispersed and remains accessible including underwater dive guides at recreational dive shops and informative pamphlets distributed through tourism organizations such as Guam Tourism Bureau.

Recommended tourism applications extend beyond the dispersement of the underwater dive guide and informative pamphlet. Guam hosts a natural coral reef habitat, located in warm relatively clear waters, and the presence of submerged WWII material is an added benefit for touring

recreational divers. In fact, the submerged material may be the primary factor motivating touring divers. A study in conducted amongst divers who traveled to Chuuk revealed that they made the trip to see the historically significant WWII wrecks and marine life while diving (Edney, 2012).

Using the format of a heritage trail such as the WWII Maritime Heritage Trail - Battle of Saipan on neighboring Saipan, promoting Guam's submerged cultural heritage sites for recreational dive tourism is recommended. Like Seabee Junkyard, the sites in Saipan are interpreted with an underwater dive guide and accompanied by a poster series available at locations on-island or in a downloadable format (World War II Heritage Trail, 2012). Local dive operations already make regularly scheduled trips to many sites including but not limited to the NRHP Amtrak in Agat (WWII), *Tokai Maru* (WWII), SMS *Cormoran* (WWI), American Tanker (WWII), *Kitsugawa Maru* (WWII), Harley Reef (WWII) and the Val Bomber (WWII). Tours could be packaged for both local and off-island WWII dive enthusiasts.

Finally, in order to better understand the impacts of submerged WWII dumpsites on and around Guam, the replication of this study on other identified sites is also recommended. This report identifies sites on Guam where submerged WWII material is located. Some of these sites were documented by the U.S. Navy in the 1940's as approved at sea dump sites including Shark Pit, the trash and material dump that is off of Orote Point right outside of Apra Harbor and the ordinance dump at Camel Rock located in the waters off of Asan National Park. Other sites were not formally documented by the Navy but have positively identified WWII material including Harley Reef along the Glass Breakwater, the sea plane and material near the fuel piers at Sumay, the amtrak in Agat, and the amtrak at Asan cut. Studying these sites can increase our understanding of the holistic site formation process of submerged WWII material on Guam and its role as an artificial reef. Findings from a larger study of this variety may be analyzed at a regional level: there is documented material dumps on and around neighboring Saipan as well. At this time, there is limited documentation of the state and extent of submerged World War II dumpsites. As stated in this report, in the decades immediately following the war, dumping remained an alternative to shipping large waste off-island. Broader research can help identify trends in dumping regionally which may have its roots in this time period immediately after WWII, and other reasons, such as any specific local issues that caused the material to be dumped and where it was dumped.

As indicated in the literature review, the value of interdisciplinary research on submerged material has been identified previously and work combining these fields has begun to be undertaken. Increasing the scope of this study to encompass more sites can place Guam in a pioneering position for the field of holistic submerged site interpretation while simultaneously informing knowledge about the currently unknown extent and consequences of WWII dumping in the Pacific islands. Research findings may indicate the anticipated longevity of these sites which can aid in their utilization as a community resource in areas such as education and tourism applications.

CONCLUSION

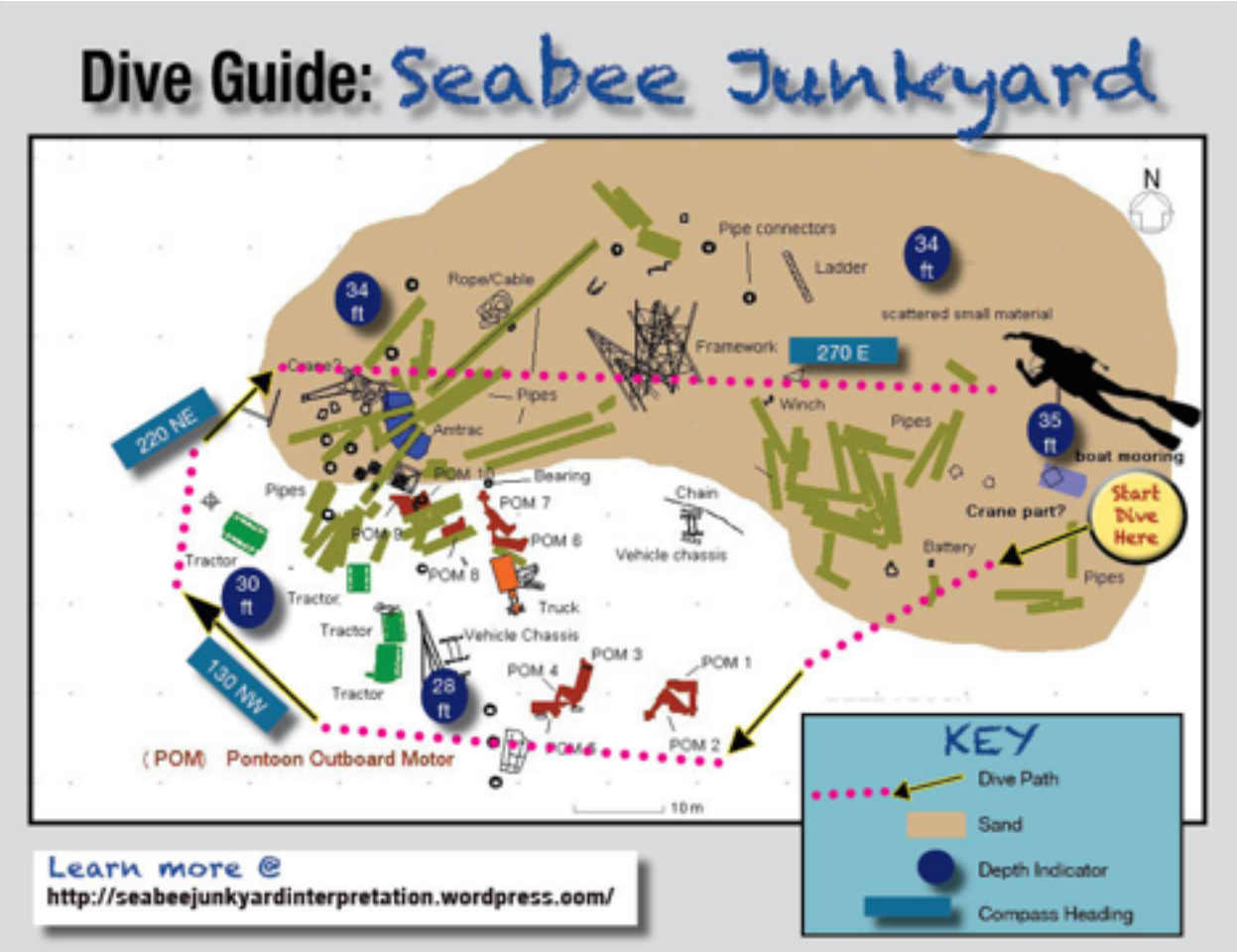
The holistic *in situ* interpretation of the Seabee Junkyard adds value to the site. The historical interpretation gives insight into how and why the site was created, as Seabees sought to literally work their way towards demobilization and their ticket home in the rebuilding of Guam in the wake of destruction and demand for defenses of World War II. Short on time, increasingly short staffed, and working with inadequately maintained equipment, dumpsites such as Seabee Junkyard had become a solution. The Seabee Junkyard is a physical representation of the ingenuity of the Seabees, developing the harbor, designing their own equipment, building the breakwater while also serving as a reminder of the wastefulness and excess created in order to conduct war. Furthermore, the wastefulness and excess still remains visible on Guam at sites such as this both on land and underwater. To some it may serve as a reminder of the war including the desire of service members to leave quickly, and of the willful and un-willful sacrifices made by everyone affected including Guamanians.

The environmental interpretation sheds light on the submerged site formation process in combination with the natural environment. In a first of its kind study on Guam, the community is described taking into account the submerged World War II material. As noted, Seabee Junkyard is especially unique because the area on which the site sits is manmade with artificial fill. Knowledge gained from the monitoring may be shared with the local community and stakeholders including local schools, tourism operations, and recreational dive services. This is important on Guam where the natural environment is vulnerable to human disturbances including a potential increase in population and military activity in the future. Understanding the effects of human activity such as dumpsites may serve to inform future decision making.

The study may serve as a model for holistic *in situ* management that can be replicated on other sites throughout Guam and elsewhere, particularly in the Pacific region. This study can be used for continued monitoring, as often as annually, to see if there are significant changes in quantity, size and diversity of species at the site and or presence of submerged cultural resource material. Education about the interconnectedness of cultural heritage sights and the natural environment may add additional value to the interpretation and reach a wider array of stakeholders.

OUTREACH MATERIAL

Underwater dive guide



Then Crane Base

Now Mooring

Dive Between Dozers

About the Site

The site where Seabee Junkyard was created by 1947 the aftermath of World War II. The natural environment at Seabee Junkyard is still considered young and developing. A baseline environmental assessment survey conducted in 2014 revealed that the material at the site has not yet impacted the species size, quantity and diversity at the site.

Learn more!

http://seabeejunkyardinterpretation.wordpress.com/

Common species at Seabee Junkyard

PARROTFISH

Bullethead Parrotfish- *Chlorurus sordidus* (Photo by Keoki Stender)

SURGEONFISH

Bristletooth surgeonfish- *Ctenochaetus striatus* (Photo by R. Field)

DAMSELFISH

Green "Black axil" Chromis- *Chromis atripectoralis* (Photo by Keoki Stender)

INVERTEBRATES

Day octopus- *Octopus cyanea* *(Photo by mauialmanac.com)*

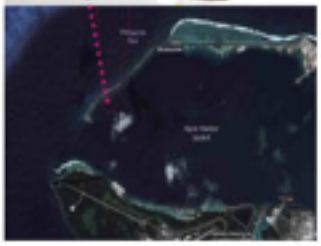
Blue starfish- *Linckia laevigata*

Coral Species: *Porites rus* (Photo G. Paulay) & *Astreopora gracilis*

Amtrac sits in sand

Located in

Apra Harbor, Guam USA



Informational Pamphlet

TIMELINE of EVENTS

1898	U.S. Navy takes possession of Guam.
1911	Seaplane Base built at Sumay.
1938	Hepburn Report authorizes building of Advanced Bases including one on Guam. The military build-up on Guam intensifies, including one mile of what is to become the Glass Breakwater.
1941	Japanese occupy Guam, and undertake a military build-up of their own, using the remaining American equipment.
1944	Liberation from the Japanese marks the continuation of the military build-up by the Seabees and Army Corp of Engineers, prioritizing Apra Harbor development and the building of the Glass Breakwater.
1945	The war ends but equipment is being sent to Guam in the largest quantities yet. The American public demands the immediate return of the troops.
1947	The breakwater is complete.
2012	The Seabee Junkyard is surveyed by a Nautical Archaeology Field School conducted at the University of Guam and sponsored by the Guam Preservation Trust.
2014	A baseline environmental survey on the site reveals no difference between sites with and without World War II material.

NATURAL ENVIRONMENT

A baseline environmental assessment survey conducted at Seabee Junkyard and a control site determined there was no differences in natural communities with significant man-made substrates and those without. Further surveying within the site revealed no significant difference between the benthic community on man-made substrates as opposed to natural substrates. Man-made substrates included WWII material and natural substrates included pavement, rock, and sand.

Monitoring methods used on this site can be replicated at other submerged cultural resource sites. This finding is only representative of Seabee Junkyard and not other WWII dumpsites on Guam.

SITE PLAN

A product of the July 2012 Nautical Archaeology Field School, University of Guam

ADDITIONAL SITE & PROJECT INFORMATION AVAILABLE AT:

https://
seabeejunkyardinterpretation.wordpress.com

SEABEE JUNKYARD

Photo courtesy James Oeller-Farley, National Park

APRA HARBOR - GUAM, USA

A project deliverable of "Seabee Junkyard: A holistic *in situ* interpretation of a site's submerged cultural resources and natural environment including site formation and

Apra Harbor, Guam

Aerial shot of Apra Harbor. At the top of the shot, the Glass Breakwater. At the bottom, Guam Navy base with Orote Point on the left and Cabras Marina on the right.

APRA HARBOR is a deep water harbor that is three square miles and has been active for over 70 years. The majority of the harbor is used by the Navy. During World War II from 1941-1944, the harbor was under Japanese control. Prior to the 20th century, Apra Harbor was an active commercial port, and was a 19th century whaling hub. There are at least thirty-one known locations of submerged material in Apra Harbor including Seabee Junkyard.

The GLASS BREAKWATER forms the northern boundary of Apra Harbor. Developed between 1944 and 1947, harbor obstructions were blasted and cleared by suction dredges. Collected material was used to develop the breakwater including coral, limestone, sludge and boulders. The end result was 7,500 cubic feet of inner harbor dredging, 26,000 lineal-foot quay wall, 14 quay-wall berths and a breakwater that was 4.5 kilometers long and 32 feet wide.

MAKING THE SEABEE JUNKYARD

The US Navy's Construction Battalion called "SEABEE" were born in January 1942 from the demand for a unique combination of skills: the ability to face combat as well as engineer and construct the structures and facilities that would help win World War II. The Seabees operated in many theaters of war and played a significant role in rebuilding Guam.

Today the site hosts the material used in the aftermath of World War II to rebuild the island and support the military build-up. In 1945, at the end of the war, material to support the war effort was being sent to Guam in the highest quantities yet. Used heavily for construction efforts, much of the equipment was poorly maintained. Dump piles were encroaching on work space. As early as 1945, dumping at sea was authorized and identified as an alternative to sending it home, which was expensive, and also could inhibit the economic stimulation for a demand of such materials at home. At the same time, at the end of the war, the public demanded the rapid return of the troops. Truman demobilized aggressively, reducing the Seabees alone by over 90% in the two years after the war.

WWII TODAY

CARGO TRUCK

GMC CCKW 2 1/2 Ton 6x6 Cargo Truck (G-508). Used to haul people, trash and material

PONTOON BARGES OUTBOARD MOTORS

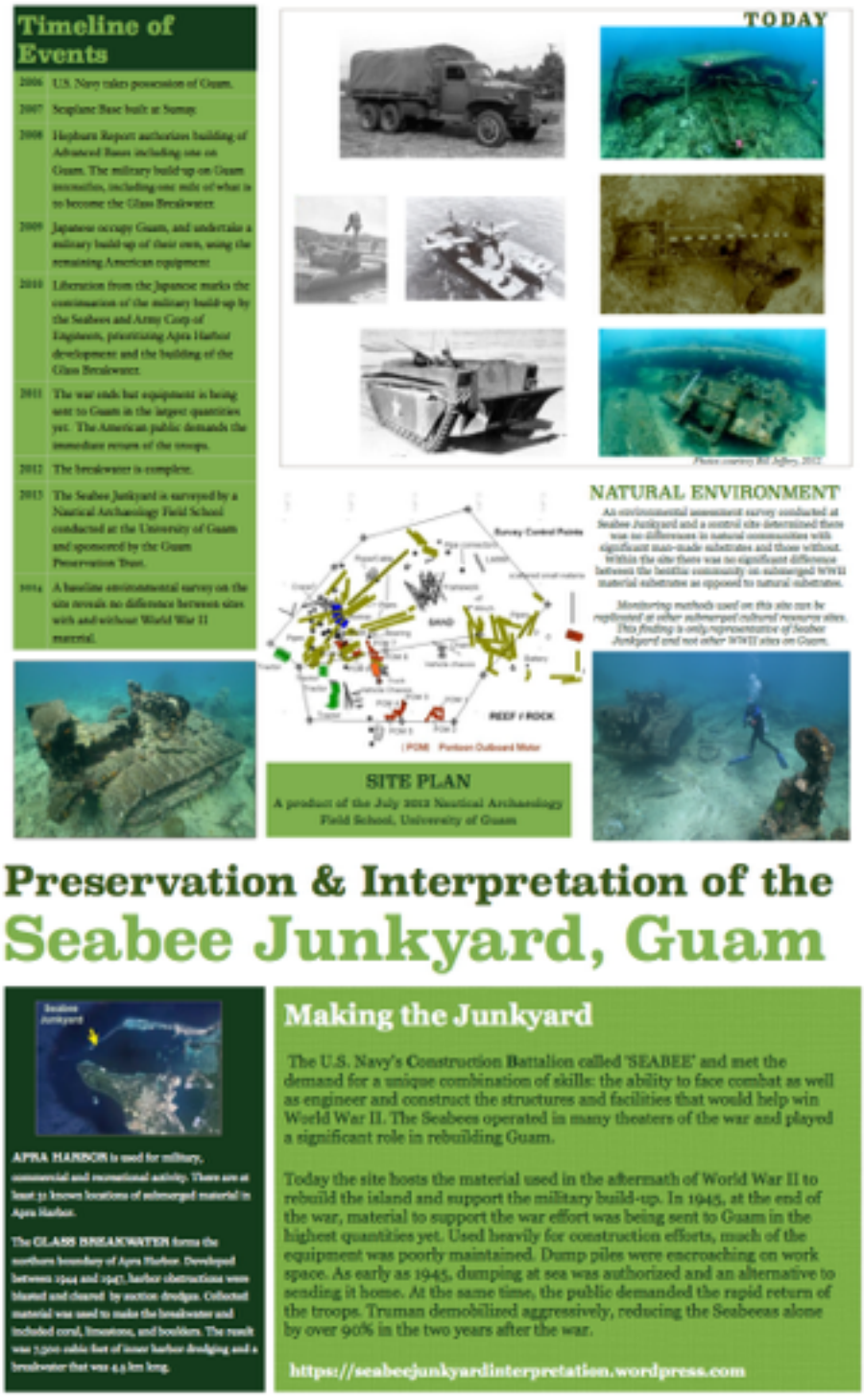
Barges, powered by motors, were used for loading, unloading, fueling and dumping

LVT

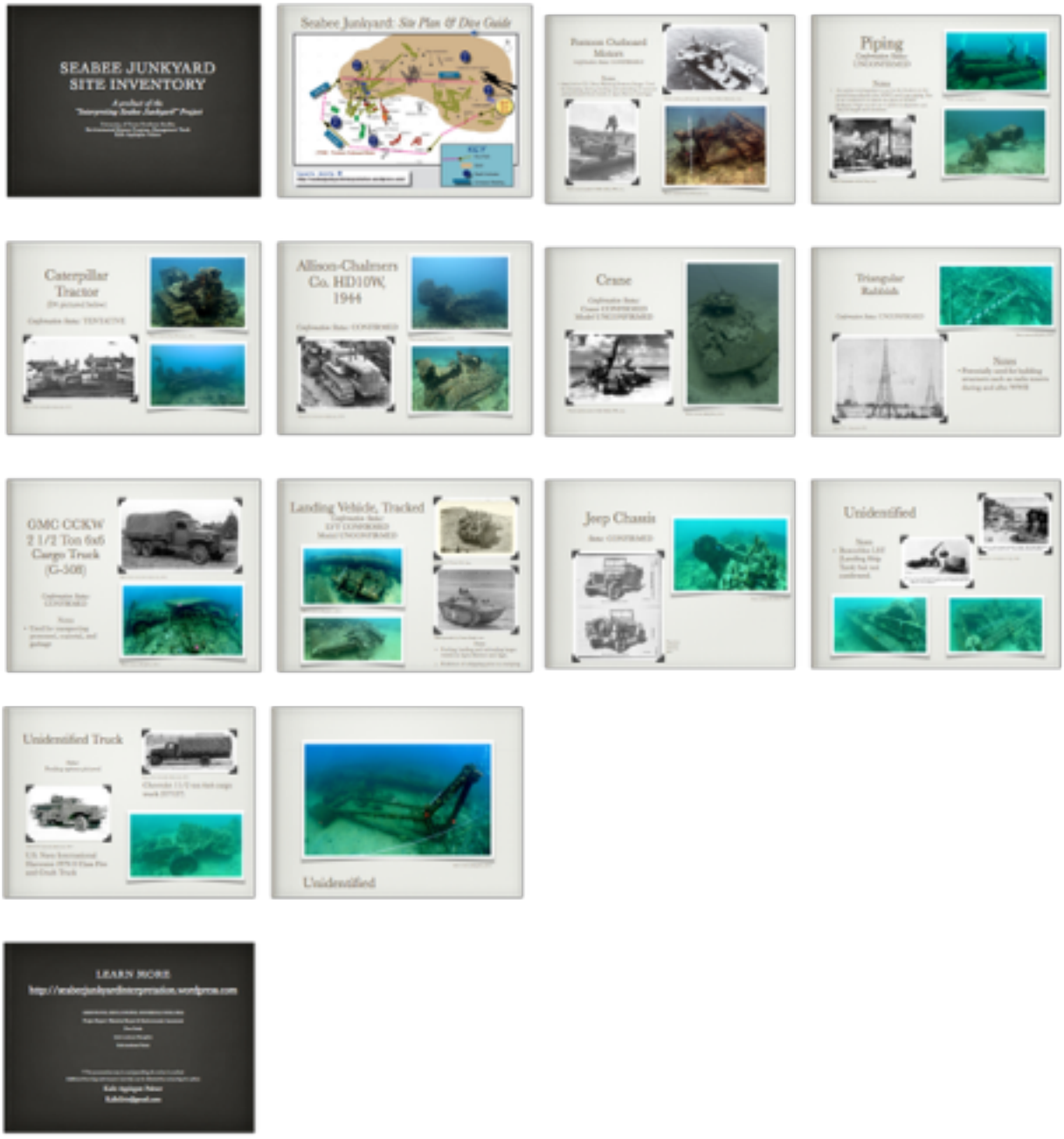
The LVT (Landing Vehicle, Tracked) shows signs of stripping prior to dumping. LVT) loaded and unloaded ships in the harbor.

Photos from Jamie Oelke-Farley, National Park Service, 2013. *Photos courtesy Bill Jeffery, 2012.*

Informational Poster



General Outreach Presentation: Seabee Junkyard Site Inventory


SEABEE JUNKYARD
SITE INVENTORY
Seabee Junkyard: Site Plan & Dive Guide
Piping
Caterpillar
Tractor
Allison-Chalmers
Co. HD10W,
1944
Crane
Triangular
Rubbish
GMC CCKW
2 1/2 Ton 6x6
Cargo Truck
(G-508)
Landing Vehicle, Tracked
Jeep Chassis
Unidentified
Unidentified Truck
Unidentified
LEARN MORE

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APPENDIX A

Inventory of Documentation regarding Naval Construction and Surplus Equipment on Guam 1944-1948: Department of the Navy, National Archives and Records Administration- Pacific Region.

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1944/9/1	E.S. Huntington, By Direction, Director Pacific Division, Bureau of Yards and Docks Navy #128	Inspection Pacific Area- Report on Distribution of Spare Parts for Automotive and Construction Equipment	Observations and recommendations made after an inspection trip covering advanced bases in the Pacific Area. Enclosures: Copy ptr SecNav to Various did 5/16/44, Copy of report by Mr. Long, did 9/4/44 - Poor maintenance reduces the accomplishment of construction in direct ratio to the average number of pieces of equipment deadlined or inoperative per day during he period of a construction project. - Other than the battalions, there is a lack of knowledge on the part of the field activities as to the spare parts.			Huntinton, E.S., 1944, Inspection Pacific Area- Report on Distribution of Spare Parts for Automotive and Construction Equipment, Serial: 4400, 11 September 1944; Box 8, Department of the Navy, Record Group 181; National Archives and Records Administration- Pacific Region.

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1944/10/	Commander in Cheif, U.S. Pacific Fleet and Pacific Ocean Areas.	Salvage Ashore in Central Pacific Area, Serial No. 8707	Salvage Ashore is defined as the recovery, collection, inspection and disposition of all apparently unserviceable or abandoned equipment and material other than floating craft. The Island Commander is responsible for salvage ashore after withdrawal of the Commander of Assault Forces. Island Salvage Officer designated for each base to coordinate all shore salvage. Salvage procedure should be as follows: a) Collection of all abandoned or discarded equipment and materials not possessed by a unit b) Reception of all materials and equipment relegated to scrap by any unit c) Examine all collected equipment and material d) Disposition of equipment and material which has been received is: 1.) Categories and classes of material and equipment: Critical equipment or material, highly technical equipment, obsolescent or surplus equipment 2.) Other items: Serviceable items: All material and equipment which is found to be serviceable in existing form will be turned over to the appropriate local supply officer for return to stock and re-issue. Locally Repairable items: Material and equipment which can be repaired locally will be delivered to local repair facilities for repair and return to the stocks of the appropriate local supply officer. Other repairable items: Material and equipment which is susceptible to economical repair but which requires work beyond the capacity of local facilities, will be reported to the appropriate supply agency on Oahu and disposed of in accordance with instructions issued by these agencies. Non-repairable items: Material and equipment which is beyond economical repair will be stripped of useable parts which will be disposed of in accordance			Commander in Chief, 1944, Salvage Ashore in Central Pacific Area, Serial: 8707, 11 October 1944; Box 8, Department of the Navy, Record Group 181; National Archives and Records Administration-Pacific Region.

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1945/4/8	R.E.O'Neill, Brigadier General, Headquarters, Army Garrison Force	Disposal of Salvage Metals	1. Authority is requested to dispose of salvaged metals other than critical metals, material such as brass, platinum, etc., by hauling and casting into the sea such metal scrap at Haputo Point. 2. The Haputo Point is cited as it is understood that this locality is now being used by the Island Command, and possibly the Navy, for disposing of scrap metals that are not required for shipment to the Mainland or to the Hawaiian Islands. 3. All scrap metal that can possibly be used for any purpose will not be destroyed, but only that scrap material for which no use can be employed will be disposed of at Haputo Point. 4. The critical metals to be retained will be carefully collected and sorted for future shipments.	Disposal of salvage metals	Haputo Point	O'Neil, R.E., 1945, Disposal of Salvage Metals, Serial: 400.93, 8 April 1945; Folder S36-4 Garbage and Trash, Box 8, Department of the Navy, Record Group 181; National Archives and Records and Administration-Pacific Region.
1945/4/1	J.M. Arthur, Headquarters, Island Command, Guam	Disposal of Salvage Metals	Recommend to the Area Assignment Board two locations, one in north central part of island and one in Apra Harbor area, for dumping scrap metal. Areas recommended should preferably be pits from which cascajo has been excavated, the rim of which can be reached in wet weather by trucks. The big cascajo pit at Orote is suggested as one location and the cascajo pit just north of 9th Anti-Aircraft Artillery Battalion camp is suggested as the other location.	Salvage Metals	Apra Harbor, North Central part of the island	Arthur, J.M., 1945, Disposal of Salvage Metals, Serial: 6999, 14 April 1945; Box 8, Department of the Navy, Record Group 181; National Archives and Records Administration-Pacific Region.

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1945/6/1	J.M. Arthur, Headquarters, Island Command, Guam	Salvage and Recovery, General Order No. 29-45	Salvage operations within the Island Command will be under the general coordinator and supervision of the Island Salvage Officer. Directed to Navy, Army & Marine Corps. General Instruction Applicable to All Organizations a) Each organization will be responsible within its area for the collection and forwarding to the cognizant depot all salvable material. b) Scrap material generated as a by-product of screening and salvage operations will be disposed of as follows: 1.) Ferrous scrap, properly segregated by type, will be placed in dump points 3 and 4. Materials include all steel, cast iron, chromium, steel, nickel steel and similar alloys1/8" or more in thicknesss. 2.) All ferrous metals less than 1/8" in thickness, determined to be of no use as scrap, will be disposed of at dump points 1 and 2 and include tin plate, sheet iron, iron wire. 3.) Crashed aircraft will be stock piled separately in dump points 3 and 4. 4.) Non-ferrous scrap includes metals not indicated above. Care should be taken to prevent inclusion of unfired ammunition. 5.) Dumps 1-4 will be operated by agencies designated by Island Command, GU, Memorandum No. 223-45. c) Non-metallic non salvable material, except combustibles, may be dumped at Haputo or Tantapolo points, as long as it does not float. Includes broken bottles, crockery, porcelain, plastics, and miscellaneous heavy items. d) Organization Intelligence Officer will be contacted for disposition of enemy material. Care will be taken that all enemy material with possible intelligence value is not damaged or stripped of name plates by unauthorized persons.	Dump Point No 1-4	Metals and crashed aircraft	Arthur, J.M., 1945, Salvage and Recovery, General Order No. 29-45, 18 June 1945; Box 8, Department of the Navy, Record Group 181; National Archives and Records Administration-Pacific Region.

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1945/7/3	U.S. Naval Air Base, Commanding Officer	Disposition of scrap metal	Volume of the scrap metal dump within the base area has grown to encroach upon the operating area. Looking for confirmation that scrap metal dumping may be authorized for NAB Agana at Dump Point No. 3 on the north side of the main road, west of the Harmon Field control tower.	NAB, Agana	Scrap metal	NB 943, L24, EDG:EWC SERIAL: 1487 FOLDER S94-1, RG 181
1945/7/3	Elwood B. Cole, U.S. Naval Air Base, Agana, Guam	Disposition of scrap metal	1. The scrap metal dump within the base area has accumulated such a volume of scrap that it is slowly enriching upon operating area. 2. NAB Agana based units may authorize the dumping of scrap metal at Dump Point No. 3 on the north side of the main road, west of Harmon Field control tower. If it can be authorized, it is appreciated.	Scrap metal	Dump Point No. 3 in Harmon	Cole, E.B., 1945, Disposition of scrap metal, Serial: 1487, 30 July 1945; Box 8, Department of the Navy, Record Group 181; National Archives and Records Administration-Pacific Region.
1945/10/	John J. Kerwin, Officer in Charge, U.S. Naval Construction Battalion Maintenance Unit No. 511	War Diary Report, Serial: 557	1. Construction and Carpentry 2. Public Works c. Garage and heavy equipment: the shops maintained and service 375 and 75 pieces of equipment respectively for NAB, Agana during the past month including major mechanical repair, lubrication, tire and battery repair. 3. Roads & Air Fields 4. Oil & Gasoline Distribution 5. Storage and Supplies			Kerwin, J.J., 1945, War Diary Report, Serial 557, 8 October 1945; Folder A12-1(1) Log & History, Department of the Navy, Record Group 181; National Archives and Records Administration-Pacific Region.

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1945/11/	Arthur, J.M., By Direction, Island Commander	Dumping of Materials at Sea, Procedure for.	1. The disposal of obsolete and unusable equipment and supplies by dumping at sea will be governed by the instructions prescribed herein. 2. In each case responsibility for obtaining authority for disposal of government property by dumping at sea rests with the supply agency concerned. Such authority will be obtained in accordance with the current instructions of the branch of the service which has cognizance of the materials in question. 3. Supply agencies having authority to dispose of materials by dumping at sea are authorized and instructed to consult the Commandant, Naval Operating Base, Guam, direct regarding their requirement for water transportation, designation of dumping areas, and permission for craft to put to sea and return for this purpose. 4. The Commandant, Naval Operating Base, will designate dumping areas at least (1) mile outside the reef and at such locations that no beaches will be fouled by materials washing ashore, no hazards to navigation created, or submarine cables endangered. Materials which will remain floating will not be dumped at sea. Explosives and ammunition will be dumped at sea only in the location prescribed by current instructions from Commander Marianas. 5. The Commandant, Naval Operating Base, Guam, will furnish such water transportation as may be required by supply agencies for the purpose stated herein up to the limit of availability of suitable water craft and with due consideration for avoiding inter fence with other harbor activities. 6. The supply agency having custody of the materials to be dumped at sea will provide: a) Transportation necessary for delivery of materials to the docks b) Labor required for loading and dumping materials.	Disposal	At sea	Arthur, J.M., 1945, Dumping of Materials at Sea, Procedure for, Serial: 19304, 5 November 1945; Headquarters, Island Command, Guam; Folder S36-4 Garbage and Trash, Box 8, Department of the Navy, Record Group 181; National Archives and Records Administration-Pacific Region.

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1945/12/	K.B. Salisbury, Captain, (A3), USNR Commanding, U.S. Naval Air Base Agana, Guam	Unauthorized Dumping on NAB Agana, Base Memorandum No. 61-45.	1. Unauthorized dumping on Naval Air Base, Agana, not allowed. Certain official dumps are provided. 2. Authorized dump on Naval Air Base, Agana, is located at the southwest corner of the base area below the cliff. For burnable trash only, this does not includee cans. 3. Beer and other cans must be crushed by the using activity and taken to the Island dump at Sumay, The dump will not accept uncrushed cans. Heavy metal may also be taken to this dump. 4. Beer cans or other similar material must not be placed in garbage containers or the collectors will refuse to take the garbage. 5. Strict compliance with this directive is expected.	Burnable trash, beer cans	NAB Agana	Salisbury, K.B., 1945, Unauthorized Dumping on NAB Agana, Base Memorandum No. 61-45, 19 December 1945; U.S. Naval Air Base, Agana, Guam, Box 1, Department of the Navy, Record Group 181; National Archives and Records Administration-Pacific Region.
1946/1/8	K.B. Salisbury, Captain, (A3), USNR Commanding, U.S. Naval Air Base Agana, Guam	Motor vehicles, request for. Serial: 83	Motor vehicles urgently needed to carry out NAB Agana Maintenance. Equipment & uses: Dump Trucks: Primary importance to NAB Agana in carrying coral for continuous maintenance of taxiways and roads. Cargo Trucks: Used in transporting crews and materials to job sites are likewise giving trouble. Fuel trucks: support galley operations, water heaters and emergency generators. Single sanitation: Cares for grease traps and septic tanks. * Request denied 14 January 1946 by J.M. Arthur	Dump trucks, Cargo Trucks, single sanitation truck		Salisbury, K.B., 1946, Motor vehicles request for, Serial: 83, 8 January 1946; Department of the Navy, Record Group 181; National Archives and Records Administration-Pacific Region. Arthur, J.M., 1946, Motor Vehicles, request for., 14 January 1946; Department of the Navy, Record Group 181; National Archives and Records Administration-Pacific Region.

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1946/1/1	L.D. Hermle, Brigadier General, U.S. Marine Corps, Deputy Island Commander, Headquarters, Island Comman, Guam	Base Memorandum No. 16-46: Logistics Material Report-Progress Summary of Redistribution and Disposal	Reports for (A) Copy of Material Report Form, with instructions, (B) Copy of Report of Boats, Barges, and other Floating Equipment, with instructions., (C) Copy of Plant Account Equipment Report, with instructions., will be delivered to Island Command Headquartersby 1800 on the next to last day of each month. This must be met by all reporting units. Not required for Marine Corps units.	None	None	Hermle, L.D., 1946, Logistics Material Report-Progress Summary of Redistribution and Disposal, Base Memorandum No. 16-46, 15 January 1946; Records Group 313; National Archives and Records Administration-Pacific Region.

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1946/1/2	L.D. Hermle, Brigadier General, U.S. Marine Corps, Deputy Island Commander, Headquarters, Island Comman, Guam	Base Memorandum No. 26-46: Disposal of Government Property	Instructions are published to standardize procedures to prevent unauthorized diversion of government property to the private use of individuals and to insure disposition of surveyed property in accordance with current directives. Commanding officers are notified that property may not be gifted to individuals or other activities without authorization. It is their responsibility to dispose of such property in accordance with current directives. Usable supplies and surplus equipment goes to cognizant supply agency. Materials and equipment worn out or damaged beyond repair to be disposed of in accordance with current directives. When the surveying authority directs that vehicles and mobile engineer equipment, be junked, scrapped, dumped or cannibalized, the unit in custody of the equipment with proceed with the following procedure: a) Remove all serviceable parts and retain them in stock. b) Strip all “recoverable scrap” metal parts and deliver to recoverable scrap dumps. c) Turn over the vehicle body and other “non-recoverable scrap” parts to the appropriate agency: From Marine Corps Units- to 5th Service Depot. From Navy Units- to Island Public Works Officer. A receipt will be obtained and filed with the retained copy of the report of the survey. d) Commanding Officer, 5th Service Depot and the Island Public Works Officer will dump at sea (or supervise and insure the dumping at sea by the unit concerned) the “non-recoverable scrap” materials. Instructions do not supersede but are supplementary to directives issued by other branches.	Vehicles and Mobile Engineer Equipment	At sea	Hermle, L.D., 1946, Disposal of Government Property, Base Memorandum No. 26-46, 26 January 1946; Brigadier General, U.S. Marine Corps, Deputy Island Commander, Headquarters, Island Command, Guam; Box 1, Record Group 313; National Archives and Records Administration-Pacific.

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1946/2/6	K.B. Salisbury, Captain, (A3), USNR Commanding, U.S. Naval Air Base Agana, Guam	Government Owned Vehicles-Survey of for Purpose of Surplus Disposal.	Forwarded Information.			

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1946/3/9	L.A. Dessez, Colonel, U.S. Marine Corps, Chief of Staff.	Base Memorandum No. 53-46: Disposal of Government Property	Enclosure (a) Dumping of Materials at Sea, Procedure for. IsCom Memo 26-46, 26Jan46 & IsCom Restricted ptr serial 19304, 5Nov45 are hereby rescinded. Final decision for disposition of government property by destruction, abandonment, or donation rests with local rep. of the Foreign Liquidation Commission except as noted in the next line. The Navy authority to dispose of government property by destruction, abandonment, or donation is limited to 1) Cases of military necessity, safety, or consideration of health or security. The requirement for meeting a date for the close-up of an activity is NOT considered to be a military necessity. 2) Approval will be obtained by the Commander Marianas or higher Navy or Marine Corps authority prior to the disposition of waste, scrap, or salvage material. The organization in custody of the property will maintain a record of each case of destruction, abandonment, or donation of government property, supported by the documentary justification for such action and written approval of the Foreign Liquidation Commission, Commander Marianas, or higher Navy or Marine Corps authority as appropriate. Dumping of Materials at Sea, Procedure For. [Summary] 1.) Disposal of valueless and unusable equipment and supplies by dumping at sea will be governed by the instructions prescribed herein. 2.) In each case for obtaining authority for disposal of government property by dumping at sea rests with the activity having custody of the material in question. 3.) Organizations which have been approved to dump at sea are authorized		At sea	Dessez, L.A., 1946, Disposal of Government Property, Base Memorandum No. 53-46, 9 March 1946; Colonel, U.S. Marine Corps, Chief of Staff, Headquarters, Island Command, Guam, Box 1, Record Group 313; National Archives and Records Administration-Pacific Region.

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1946/3/1	L.A. Dessez, Colonel, U.S. Marine Corps, Chief of Staff.	Modification No. #1 to Base Memorandum No. 53-46: Disposal of Government Property	Insert new paragraph to 4b(3): (3) In reference (f) Commander Marianas established the policy that waste, scrap, and salvage materials will be disposed of by placing them in designated dumps ashore segregated according to the basic contents of the material. Authority will be granted to destroy waste, scrap, or salvage material ONLY when such action is necessary for reasons of health or safety.			Dessez, L.A., 1946, Disposal of Government Property, Modification No. #1 to Base Memorandum No. 53-46, 15 March 1946; Colonel, U.S. Marine Corps, Chief of Staff, Headquarters, Island Command, Guam, Box 1, Record Group 313; National Archives and Records Administration-Pacific Region.
1946/3/1	K.B. Salisbury, Captain, (A3), USNR Commanding, U.S. Naval Air Base Agana, Guam	Title B Material-Inventory of. Base Memorandum No. 19-46	The Supply Department will conduct an inventory of all Title B material held in custody. Future requisition of any and all Title B Custody material will be handled by or coordinated through the Supply Department.			Salisbury, K.B., 1946, Title B Material - Inventory of. Base Memorandum. 19-46, 16 March 1946; U.S. Naval Air Base, Agana, Guam, Box 1, Department of the Navy, Record Group 181; National Archives and Records Administration-Pacific Region.

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1946/3/2	L.A. Dessez, Colonel, U.S. Marine Corps, Chief of Staff.	Blasting and Authorized Explosions on Guam, Base Memorandum No. 62-46	1. Blasting has occurred on the island without notification to vital agencies 2. Information must be disseminated in order to guard against damage, alarm and possible loss of life 3. Accordingly, it is directed that the Island Commander be furnished with this information: a) Time of explosion b) Location of explosion c) Quantity and type of explosive to be used d) Purpose of explosion e) Organization conducting the operation 4. Activities conduction routine explosions of minor proportion such as road construction or breakwater operations, etc., will obtain permission to conduct blasting over a sustained period of time. Such arrangements will be made at the start of the overall job and will be strictly adhered to. Any explosions of greater magnitude than those originally arranged for will be subject to regulations in (3) 5. All underwater blasting conducted in Apra Harbor is subject to the foregoing and in addition to those special regulations prescribed by NOB, Guam. 6. Standing operation procedure for Army Garrison Force on this subject provides for notification to be given to units in vicinity, Island Command headquarters, Island Command Provost Marshall, Commander Marians, and when natives might be involved, the Deputy Chief Military Government Officer.		Apra Harbor, Breakwater	Dessez, L.A., 1946, Blasting and Authorized Explosions on Guam., Base Memorandum No. 62-46, 25 March 1946; Colonel, U.S. Marine Corps, Chief of Staff, Headquarters, Island Command, Guam, Record Group 313; National Archives and Records Administration-Pacific Region.

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1946/3/2	L.A. Dessez, Colonel, U.S. Marine Corps, Chief of Staff.	Disposal of waste petroleum products, Base Memorandum No. 57-46	1. Some contamination of the fresh water supply has resulted from waste petroleum products seeping down to the water table. Such products will not be dumped on the ground. (This restriction does not forbid use of such products for insect control or as dust palliatives.) Authority to dispose of such products by destruction is controlled by the references. 2. In order to provide a place for burning of subject products, when destruction by burning has been authorized, there is established a burn dump in TA 280 (South of Anti-Aircraft Training Center). The Island Public Works Officer will erect adequate signs and provide shallow trenches near the shore in TA 280. 3. Units having been authorized to burn such products will contact the Island Fire Marshall who will provide for supervisory personnel and equipment to be present at the burn dump (TA280). The supervisor will insure that complete combustion takes place in order to prevent any of these liquids reaching fresh or tide water level. Units burning such products will provide personnel necessary for the burning and for policing the area. 4. Attention of unit commanders is invited to the fact that written authority from the Island Command Provost Marshal is required to pass the sentry at the entrance to the Anti-Aircraft Training Center. The Provost Marshal will provide a pass for each trip to kit vehicles to pass through the burn area. The Provost Marshal will, prior to issuing pass for this purpose, collect the documentary authority for disposal by destruction required by reference (a), and deliver to this headquarters.	South of Anti-Aircraft Training Center	Petroleum Products	Dessez, L.A., 1946, Blasting and Authorized Explosions on Guam., Base Memorandum No. 57-46, 27 March 1946; Colonel, U.S. Marine Corps, Chief of Staff, Headquarters, Island Command, Guam, Record Group 313; National Archives and Records Administration-Pacific Region.

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1946/4/9	L.A. Dessez, Colonel, U.S. Marine Corps, Chief of Staff.	Logistics Material Report, Progress summary of redistribution and disposal., Modification No. I to Memorandum No. 16-46	Semi-monthly report of surplus property required to be made to ComServPac. The following information to be included. To the logistics material report, add a column "Total amount of material required for post war mission". Supply Officer in Command, Naval Supply Center is requested to report the amount of material by the 15th of each month to be returned to the U.S. and include measurement tons and dollar value.			Dessez, L.A., 1946, Logistics Material Report, Progress summary of redistribution and disposal., Modification No. I to Memorandum No. 16-46, 9 April 1946; Colonel, U.S. Marine Corps, Chief of Staff, Headquarters, Island Command, Guam, Record Group 313; National Archives and Records Administration-Pacific Region.
1946/4/1	L.A. Dessez, Colonel, U.S. Marine Corps, Chief of Staff.	Construction Priority List of Approved Projecrts for Guam., Serial No. 3109	Enclosed list of approved Construction Projects- Guam. The enclosure has been approved for reference. 4.) 1.040 Supplementary Radio Station - Guam 12.) 1.125 12 AK Berths - Backfill beyond 100			Dessez, L.A., 1946, Construction Priority List of Approved Projects for Guam., Serial No. 3109, 18 April 1946; Colonel, U.S. Marine Corps, Chief of Staff, Headquarters, Island Command, Guam, Box 1_A1-1(1) Plans & Project Folder, Record Group 181; National Archives and Records Administration-Pacific Region.

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1946/7/1	C.A. Pownall, United States Pacific Fleet, Commander Marianas	Marianas Area- Shore Station Development Program, First Report, 14 July 1946, Serial: 0278	Enclosures: (c) Plans showing location of the Areas to be dredged and filled Apra Harbor, Guam, Y& D Drawings Nos. 426, 319,426, 320 (e) Harbor and Harbor Development, Guam, Y&D Drawing No. 427,253		Apra Harbor, Breakwater	Pownall, C.A., 1946, Marianas Area- Shore Station Development Program, First Report, 14 July 1946, Serial: 0278, 15 July 1946; Folder Shore St. Development, Box 30; Department of the Navy, Record Group 181; National Archives and Records Administration- Pacific Region.
1946/8/1	Headquarters, Island Commander, Guam	Metals Dump- Establishment of	Establishment of a metals dump requested in the E2 section of NAB, Agana, near hard stand #5. A dump within the vicinity of other Navy activity is not desirable or essential.	NAB, Agana.	Metals Dump	IPW/619.12/jbc Serial: 10088 Folder s36-4 Garbage & trash, Box 315008. RG 181

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1946/11/	Commander Marianas, United States Pacific Fleet Commander Marians	Special LSSDB Report-Submission of, Serial: 19244	The following comments summary the principal features of the revised report: a) Harbor and Harbor Development (Section 1). Work on the breakwater and the dredging of the harbor should be continued without interruption to completion. Funds should be made available, each fiscal year in sufficient amount to permit operation of all dredging equipment at maximum capacity. A decision to defer the development of the east side of the inner harbor would alter the schedule for filling operations and would to some degree defeat the main objective which is the removal of all material in the inner and outer harbors as required for full development of anchorages, berths, and maneuvering areas for surface craft. 20 Nov. 1946: Area Priority: 1 LSSDB Project No.: MA-1 Project title: Continue dredging and filling Apra Harbor Estimate: 3,000,000 (Funds have been allocated)		Breakwater	Commander Marianas, 1946, Special LSSDB Report-Submission of, Serial: 19244, 29 November 1946; Box 1, Department of the Navy, Record Group 181; National Archives and Records Administration-Pacific Region.
1946/11/	United States Pacific Fleet, Commander Marianas	Special LSSDB Report-Submission of	Harbor and Harbor Development Work on the breakwater and dredging of the harbor to be continued without interruption and funding equipment at maximum capacity until completion. Funds estimated at 3,000,000.	Glass Breakwater, Apra Harbor	Dredging Equipment	RG 181

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1947/4/1	Commander Marianas, United States Pacific Fleet Commander Marians	Littering of Highways and Public Area with Trash, Refuse, Garbage, etc, Serial No.: 10945	Several months ago, a “Clean-up Week” campaign was conducted for clearing up the trash and litter. Although the campaign was successful, the road system has already reached a condition of unsightliness similar to that prior to the campaign. Activity has been directed to police for trash and litter including NOB, Guam.		NOB Guam and more	Commander Marianas, 1947, Littering of Highways and Public Area with Trash, Reuse, Garbage, etc. Serial No.: 10945, 11 April 1947; Folder N1-2 Improvement to Terrain, Box 23, Department of the Navy, Record Group 181; National Archives and Records Administration-Pacific Region.
1947/5/1	J. W. Monn., The Commanding OFficer	Vehicle Inventory - Report of.	Vehicle Inventory for NAS, Agana. Includes USN. No. 66474-8571128	Vehicle Inventory		Monn, J.W., 1947, Vehicle Inventory-Report of., 1781, 16 May 1947; Folder N33-2(1) Motor Vehicle Part III, Box 23, Department of the Navy, Record Group 181; National Archives and Records Administration-Pacific Region.

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1947/7/1	G.C. Emery, Officer in Charge of Construction, Bureau of Yards & Docks Contracts, Marianas Area care of Fleet Post Office, San Francisco, California	Contract NOy-13626- Architectural and Engineering Services for Development of Naval Base, Guam, M.I. A & E Service Request No. 106- Agana Boat Basin (Civilian Rehabilitation) Guam, M.I.	Bureau of Yards and Docks has approved the rehabilitation and development of Agana Boat Basin for the civili a population. Necessary study and exploration for the development of the Agana Boat Basin and Harbor, including repairs to existing wharfs and construction of additional bulkheads, blasting and dreading are approved. Contract drawings and specifications are requested.	Agana Boat Basin and Harbor	None.	Emery, G.C., 1947,Contract NOy-13626- Architectural and Engineering Services for Development of Naval Base, Guam, M.I. A & E Service Request No. 106- Agana Boat Basin (Civilian Rehabilitation) Guam, M.I., 18 July 1948; Folder N1-1(1) Reconstruction of Guam, Box 11, Records Group 313; National Archives and Records Administration- Pacific Region.
1947/9/2	C.A. Pownall, Naval Government of Guam, Office of Civil Administration	Assistance to Construction Activities in Connection with the Rehabilitation of Guam	Local construction companies are manufacturing concrete block and consideration should be given to Noy contractors selling aggregate to Guamanian builders. Locals have necessary vehicles but lack loading equipment.	None	Loading equipment.	Pownall, C.A., 1947, Assistance to Construction Activities in Connection with the Rehabilitation of Guam, Serial: 3354, 20 September 1947; Folder N1-1(1) Reconstruction of Guam, Box 11, Records Group 313; National Archives and Records Administration- Pacific Region.

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1947/10/	Edward N. Parker, Chief of Staff, Commander Marianas	1950 LSSDB Report- Estimating Data for., Serial: 20125	Enclosed (a) Estimating Criteria for Units of Cost, 1 July 1947 These figures can be used for determining estimated cost of projects by applying mark-up multiplication factors. 1 July 1947 Breakwater - Cu.Yd. Volume of Construction Steel Cell Type 10.00/C.Y. Rock Hole Type 4.5/C.Y.		Breakwater	Parker, E.D., 1947, 1950 LSSDB Report - Estimating Data for. Serial: 20125, 22 October 1947; Box 1, Record Group 181; National Archives and Records Administration-Pacific Region.

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1947/11/	W.W.Moore,Jr., Public Works Officer, U.S. Naval Air Station, Agana, Guam, Public Works Department	Public Works Department items for the Information of the Commanding Officer on the Occasion of ComAirPac Inspection	Submission of information as requested: Reduce service personnel and subsequent slow-down on maintenance and construction and delay in recruiting and assigning civilian personnel by Mare Island Naval Shipyard. Problem of procuring spare parts for over-hauls and maintenance of automotive and construction equipment has shown little improvement over the past 4 months. Making maintenance and upkeep even more complicated for already decrepit equipment. Stapled to the report was an unlabeled document including the following information: Pertinent to the comment on the economy of operations of the Air Transport Command during 1946. The Army Air Transport Command contract operations in the Pacific alone costs $3 million in excess of what a military air transport organization would have cost. Naval forces can be self-supporting for short periods of time. “The Navy cannot maintain such an organization on a large scale basis in time of peace….Maintenance of this nucleus in a time of peace is a matter of preparedness in case of war… But efficiency, economy and safety are prime requisites in time of peace and insisting on them is in no way incompatible with proper preparation against future emergency.”			Moore Jr., W.W., 1947, Public Works Department items for the Information of the Commanding Officer on the Occasion of ComAirPac Inspection, 6 November 1947; Box 17, Department of the Navy, Record Group 181; National Archives and Records Administration-Pacific Region.

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1948/2/2	C.A. Pownall, Naval Government of Guam, Governor of Guam	Policy Regarding Disposition of Government-owned Property Remaining on Lands Released for Guamanian Use.	Land near village of Yona, formerly occupied by 3rd Marine Division, were released on 15 September 1947 with the provision the Government has some time to remove Government property still located on the land. It is the responsibility of the Military Command on the land to remove Government property under its control which is located on private land. If government property located on private land has no value or need to the command, the military must arise Commander Marianas to declare the property surplus. When property is surplus to the needs of all Military Commands on Guam, it will be turned over to the Naval Government of Guam for disposition. The land owner on who's property the surplus property exists, has rights to purchase it. If they do not want to buy this, and it has sufficient value to justify its sale, it is to be sold to other purchasers giving priority only to those families who are former land owners or displaced individuals.	Yona	None	Pownall, C.A., 1948, Policy Regarding Disposition of Government-owned Property Remaining on Lands Released for Guamanian Uses., 21 February 1948; Folder N1-1(1) Reconstruction of Guam, Box 11, Records Group 313; National Archives and Records Administration-Pacific Region.
1948/2/2	John L. McCrea, Deputy Chincpacfl t., The Pacific Command and United States Pacific Fleet Headquarters of the Commander in Chief	Rehabilitation of Civilian Facilities, Guam, M.I.	Most projects for civilian population of Guam have been assigned priorities which place them at the bottom of the fiscal year 1950.	None	None.	McCrea, J.L., 1948, Rehabilitation of Civilian Facilities, Guam, M.I., 27 February 1948; Folder N1-1(1) Reconstruction of Guam, Box 11, Records Group 313; National Archives and Records Administration-Pacific Region.

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1948/3/2	Edward N. Parker, Chief of Staff, Commander Marianas	Disposal of Surplus Property	Reference "(a) ComMarianas ltr. Serial 13080 of 28 May 1947" is canceled. Naval Supply Center, Guam, assumes the function of the Property Disposal Unit, Guam. Screening will be included in the Base Development Officer, Commander Marianas. Specific directions regarding the disposition of scrap, salvage, waste and perishable property will be issued in the near future. Sales of material should be the subject of specific authorization from this command.	None.	None.	Parker, E.N., 1948, Disposal of Surplus Porperty, 29 March 1948; Folder N1-1(1) Reconstruction of Guam, Box 11, Records Group 313; National Archives and Records Administration-Pacific Region.

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1948/4/5	A.C. Eberhard, Commander Marianas	Excess and Scrap Building Materials, Segregation of.	Excess material will be reported to the Public Works Officer, Naval Government, Guam for pick up and transport. Salvagable building materials (scrap lumber, damaged galvanized iron, pipe, and other building materials) are currently being burned and destroyed but need to be taken to the approveriate site closest to them- Agana Peninsula or Agat. Large quantities of lumber are being burned and the military recognizes this activity is not economical. Material can be given to the native civilian population once they have been granted permission by the Naval government.	Agat, on the seaward side of Marine Drive beyond the last native housing. Agana at the peninsula in the rear of Guam Commercial company.	Scrap lumber Damaged galvanized iron Pipe Other building materials	Eberhard, A.C., 1948, Excess and Scrap Building Materials, Segregation of, Serial: 3710, 5 April 1948; Commander Marianas; Folder N1-1(1) Reconstruction of Guam, Box 1, Records Group 313; National Archives and Records Administration- Pacific Region.

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1948/4/1	F.L. Sheffield, Jr. Comdr., USN, Head, Department of Internal Affairs, Naval Government of Guam, Department of Internal Affairs Commerce - Industry Division	Surplus items- Availability of.	It is believed that there is a great deal of surplus materials and equipment on Guam. There is not information if maximum use of such materials is to occur. The Dept. of Internal Affairs is inquiring with the Supply Officer for a listing of surplus items.	None.	Various	Sheffield Jr., F.L. 1948, Surplus items- Availability of., 12 April 1948; Folder N1-1(1) Reconstruction of Guam, Box 11, Records Group 313; National Archives and Records Administration- Pacific Region.
1948/4/1	P.B. Souder, Supply Officer,Naval Government of Guam, Governor of Guam	Surplus items, availability of	This office does not have a catalog of surplus items. Naval Government Supply has sold minor amounts of excesses. The Surplus Property officer has contacted Naval government about excesses in its custody.	None	None	Souder, P.B., 1948, Surplus items, availability of, Serial: 1827, 19 April 1948; Naval Government of Guam; Folder Local Housing, Box 11, Records Group 313; National Archives and Records Administration- Pacific Region.

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1948/4/1	M.H. Anderson, Civil Administrator, Naval Government of Guam, Department of Internal Affairs, Commerce - Industry Division	Availability of certain surplus construction materials	Surplus construction materials, located in surplus tents at 103rd NOB area, including canvas and lumber will be made available to the people of Agat at no cost. Individuals must arrange for approval with the Commissioner who will make arrangements with Lt. Comdr. Childers, 103rd NOB. Materials shall be shared by the people of Agat and not one person or group will have sole ownership of large quanitities. The Commissioner will control the distribution. People that can afford to purchase such materials elsewhere will have the last chance at these materials.	Agat	Lumber Canvas	Anderson, M.H., 1948, Availability of certain surplus construction materials, 19 April 1948; Folder N1-1(1) Reconstruction of Guam, Box 11, Records Group 313; National Archives and Records Administration-Pacific Region.
1948/4/2	A.P. Carbullido, Commissioner of Agat, Naval Government of Guam, The Commissioner of Agat	Surplus Construction Materials 103rd NCB Area, report on.	Mass meeting held on 20 April 1948 informing public on order of priority for dissemination of surplus equipment. The Commissioner had been told materials would be available 20 April and later informed that the date would be 26 April. The delay was caused because of transportation logistics. Two individuals, Francisco Rivera Chaco and Tomas C. Charfauros, had already built permanent homes and were there for not needy people but were taking acquiring surplus equipment. During a visit to their property, government officials were met with guns. It is recommended that the men be ordered to return all equipment so that it may be equally distributed amongst the people of Agat.	Agat	Various	Carbullido, A.P., 1948, Surplus Construction Materials 103rd NCB Area, report on., 27 April 1948; Folder N1-1(1) Reconstruction of Guam, Box 11, Records Group 313; National Archives and Records Administration-Pacific Region.

Date (Year/ Month /Day)	Department, Author	Subject Line	Summary	Locations Listed	Materials and Equipments	Citation
1948/8/1	Worth, Jr., D.F., Chief of Staff, Headquarters, Island Command, Guam	Metals Dump- Establishment of	Includes references: (a) CO, NAB, Agana, ltr., NAB 943, 836-4 over HCJ: rwv, serial 1481 dated 26 July 1946 to IsCom, Guam.: Requested authority to establish a metals dump in the E2 section of NAB, Agana, near hard stand #5 Includes map of metal dump location near Agana field. Island Public work has advised the approval of the site and authority to establish is requested from Island Command. (b) Reference provides for recoverable scrap metals to be disposed of by all Navy Activities at Navy Dump #4 in Target Area 414 PQ. Accordingly, the establishment of any other similar dump within any Navy activity is not considered desirable or essential.			Worth Jr., D.F., 1946, Materials Dump- Establishment of., Serial: 10088, 16 August 1946; Box 8, Department of the Navy, Record Group 181; National Archives and Records Administration- Pacific Region.
1948/05	C.H. Wright, Naval Government of Guam, Governor of Guam	Useable Materials- Local Sale of.	Non-local firms have purchased surplus materials which were stockpiled on Guam and nearby islands. They are needed locally and Guamanians have expressed interest in purchasing these. They will be given first opportunity. Sellers notify Naval Government in writing of available items and price.Sales require individual written approval for a matter of record. Resale is not allowed unless the buyer is appropriately licensed by Naval Government.	None	None	Wright, C.H., 1948, Useable Materials- Local Sale of., May 1948; Naval Government of Guam; Folder Local Housing, Box 11, Records Group 313; National Archives and Records Administration- Pacific Region.
Undated	J.D. McAllister, Naval Air Transport Command, Air Transport Squadron Six	Government- Owned Vehicles - Survey of for Purpose of Surplus Disposal	Reference CO NAB Agana ptr NB 943 N33-2(1) ETM: 28 January 1946 Authorized 30 Jeeps, 13 weapons carriers, 3 carry-alls, 3 dump trucks, 2 cargo trucks. Serviceable vehicles include 21 jeeps, 8 weapons carriers, 1 carry-all, 2 dump trucks, 1 cargo trucks. Unserviceable vehicles include 2 jeeps, 1 weapons carriers. 0 Vehicles for return as surplus.	Vehicles and Mobile Engineer Equipment		McAllister, J.D., 1946