

**ENVIRONMENTAL ASSESSMENT FOR
THE DESIGNATION OF A MARINE RESOURCES
PRESERVE ON ANDERSEN AIR FORCE BASE
PROPERTY: DRAFT**



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 633D AIR BASE WING (PACAF)
APO SAN FRANCISCO 96334-5000

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P.O. Box 2950
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24 FEB 1992

25 Mar 1992 (30 days)

Dear Mr. Peter Leon Guerrero

In accordance with Executive Order 12373, Intergovernmental Review of Federal Programs, your review is requested for our proposed action of designating a portion of Andersen Air Force Base coastal and submerged lands as a Marine Resources Preserve. The draft environmental assessment for this proposed action is enclosed (Atch 1). We anticipate your review will identify concerns and provide environmental information regarding any relationship to local land use plans and programs, coastal zone management, or environmental protection, to allow us to complete our environmental documentation.

The comment and review period will close 30 days after the date of this letter. Thank you for your assistance. If you have any questions or desire further information, our point of contact in this matter is Ms Heidi Hirsh, Natural Resources planner at (671) 366-2101/5205.

Sincerely

William G. Schauz

WILLIAM G. SCHAUZ, Lt Col, USAF
Commander, 633d Civil Engineering Squadron

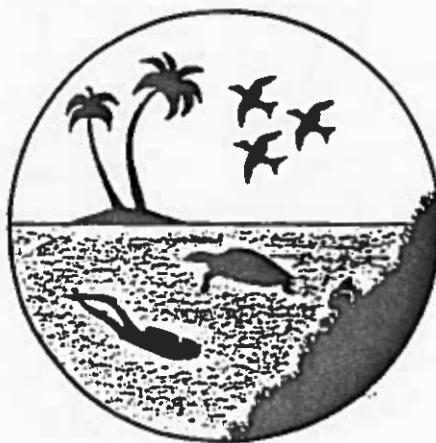
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DRAFT
ENVIRONMENTAL ASSESSMENT
FOR
THE DESIGNATION OF A MARINE RESOURCES PRESERVE
ON ANDERSEN AIR FORCE BASE PROPERTY



FEBRUARY 1992

Prepared by
DEPARTMENT OF THE AIR FORCE
Pacific Air Forces
633 CES/DEV
Andersen AFB, Guam
APO AP 96543-5000

SUMMARY

The Air Force proposes to designate a Marine Resources Preserve on Andersen Air Force Bases's coastline, for the protection and enhancement of critical island marine resources. Ocean currents at this northern location disperse larvae, molluscs, and corals to seed the Island's central and southern reefs. Fishing pressure is increasing on the north end of Guam as other areas become less attractive. The enforcement of no fishing in the proposed area, except by rod and reel from the shoreline, would increase reproductive output by providing populations an opportunity to reach densities high enough for spawning and recruitment to be successful. Species abundance and diversity would increase in the proposed area as well as other areas around Guam.

Baseline data would be gathered to support a marine resources management plan. The application of resource and recreation management techniques, coupled with the routine monitoring of habitats and their ecosystems, will provide the knowledge needed to improve marine resources management. This knowledge or management plan will be available to all for the enhancement of recreational and commercial resources throughout the Island, now and for future generations.

Some opposition to the closure of bottom-fishing in the proposed area is expected. However, removal of this relatively small percentage of area, as compared to the remainder of the Island open to uncontrolled fishing year round, from fishing pressure will make for better fishing overall.

This draft Environmental Assessment if forwarded to all cooperating agencies for a 30 day comment and review. If after the comment period significant impacts are not found, a notice to this affect will be published for another 30 day period. The Air Force will then proceed with the proposed action. If the environmental impacts are significant, then an Environmetnal Impact Statement will be prepared before the Air Force reaches a decision regarding the proposed action.

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1.0 PURPOSE AND NEED FOR ACTION

The Air Force proposes to designate a Marine Resources Preserve on Andersen Air Force Bases' coastline, for the protection and enhancement of critical island marine resources. A Marine Resources Preserve with the necessary baseline data will support a marine resources management plan for a portion of Guam's northern coastline. The application of resource and recreation management techniques, coupled with the routine monitoring of habitats and their ecosystems, will provide the knowledge needed to improve marine resources management. This knowledge or management plan will be available to all for the enhancement of recreational and commercial resources throughout the Island, now and for future generations.

With the ever increasing pressure on Guam's coastal reefs and related resources, the need for a marine preserve is evident. By protecting populations of fish, molluscs and coral, we ensure there will be seed produced to replenish areas which are presently being depleted and damaged. Ocean currents at this proposed northern location carry larvae and juveniles of fish and invertebrates to both sides of the Island. Establishment of a marine resources preserve is the most practical approach for protecting and enhancing populations of marine animals through their entire life cycle.

The need for preserve designation is shown by the severe pressure being exerted on Guam's inshore fisheries (Guam Division of Aquatic and Wildlife Resources (DAWR), FY 87-91 Annual Reports). The reports indicate a decline in both abundance and diversity of fish, invertebrate and coral species throughout the Island.

Designation of this particular proposed site is strongly endorsed by the University of Guam (UOG) Marine Laboratory. Professors of the Marine Lab conducted a survey of the proposed site and found a high diversity, abundance and presence of adults capable of breeding, making this area extremely valuable to the future of Guam's marine resources (Dr Richmond, Dr Amesbury, 1991, Appendix A).

Designation of a MRP is endorsed by the Guam DAWR. The Division has implemented a program to establish marine conservation areas (Project No. FW-2R-26, Job 12) on Guam. The focus of the program is to identify areas which have significant resource value worthy of establishing a management program to enhance and protect Guam's resources. Eight marine areas, from Ipan to Tumon Bay, have been identified as candidate sites and are proposed to the Guam Legislature to be adopted as Marine Conservation Areas. Andersen AFB works closely with the Division and, in this spirit is paralleling the project by proposing the designation of a Marine Resources Preserve.

The need is further supported due to the fragile nature of the Island's reef ecosystems. Because tropical coral reefs host so many species of fish, molluscs, and corals, it is impossible to manage individual species. Individual listing of threatened or endangered species on the Federal Register is more often than not, too late to provide the protection necessary to sustain the species of concern. Species protection must begin with management of the entire habitat upon which species are dependent. Such preserves can

enhance reproductive output by providing populations an opportunity to reach densities high enough for spawning to be successful. In turn, species abundance and diversity will increase in the protected area as well as other areas around Guam.

1.0.1 Site Selection. The proposed area under consideration for designation is located along the perimeter of the Andersen AFB property coastline on northeastern Guam, (fig 1, vicinity map). The proposed Marine Resources Preserve (MRP) site location was selected based on the following benefits and associated designation objectives: 1) the coastal currents at this location carry larvae to seed reefs on both sides of the Island, 2) the access requirements to base properties will continue to keep the molluscs, coral, fish and invertebrate harvest pressure at a minimum, 3) the present Andersen AFB regulations governing the safety, commercial fisheries, and recreational uses of the waters keep user conflict to a minimum, and 4) the area provides excellent research and educational opportunities through the inventorying and monitoring of the reef habitat condition, which will be of value to scientists, fishermen, and the residents of Guam and Micronesia.

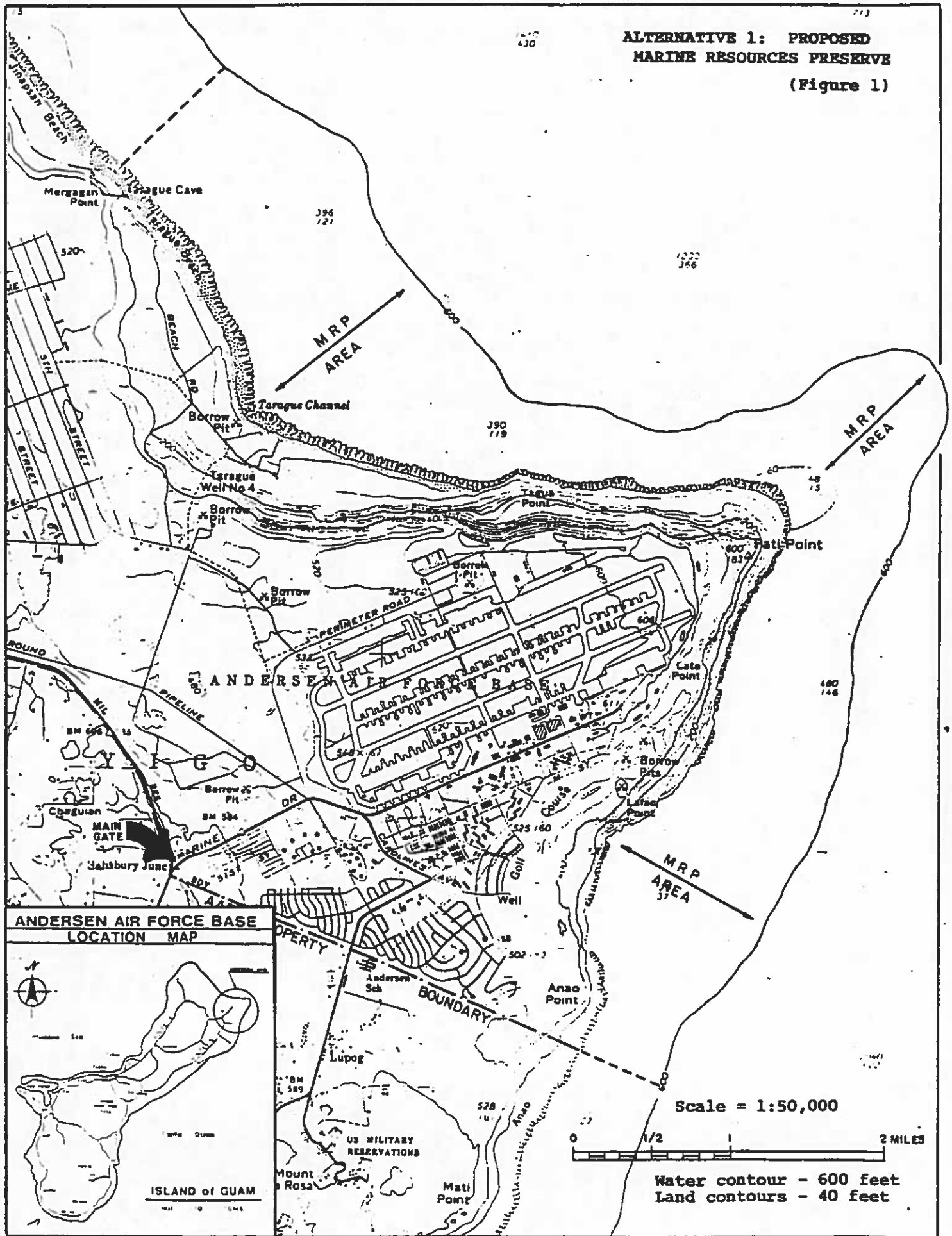
1.0.2. Interagency Coordination. In considering the proposal to designate a MRP, the 633rd Environmental Management Branch consulted with the Guam DAWR, UOG Marine Lab, US Fish & Wildlife Service, National Marine Fisheries Service, and sea turtle expert from the Institute of Ecology, University of Georgia, Dr. James I. Richardson. The Guam DAWR, and the UOG Marine Lab provided background information, relevant biological data, future long-term management support, references, recommendations, and site investigations.

1.0.3. Issues - Scoping. Issues considered throughout this environmental assessment (EA) were primarily, conditions for use, impact of a reduction in waters open to recreational or commercial fishing, biologic and social impacts of the proposed designation, and funding and enforcement considerations. Funding for the baseline data gathering, monitoring, and enforcement of the proposed designation would come primarily from the Air Force, through the DoD Legacy Resources Management Program, or other environmental management/compliance funding sources. Manpower for monitoring, data assessment, expertise, and management recommendations would be contributed jointly by the Guam DAWR and the UOG Marine Lab.

1.0.3.1. Background Information. Other reef related management practices or actions taking place in the Pacific were considered. Public support has been received in the movement to create a Marine Life Conservation District for Waikiki, Hawaii. Marine Sanctuaries not only serve divers and snorkelers, but also allow fish, lobsters, etc., to grow to full reproductive size. Their larvae can then settle in areas that are overexploited. Fisheries biologists have long known that closing areas to fishing makes for better fishing overall (Honolulu Advertiser, 6 Feb 92). Currently there are no known marine conservation areas in Micronesia.

Marine sanctuaries have become an effective tool for managing tropical multi-species fisheries. A sanctuary reserves an area for the protection of marine resources for the enjoyment of non-consumptive recreational users and to provide refuge for breeding stocks that will replenish the island's reefs with juveniles (Sherwood, 1989).

ALTERNATIVE 1: PROPOSED
MARINE RESOURCES PRESERVE
(Figure 1)



An example of a successful sanctuary is Hanauma Bay, Hawaii. In the late 1960's Hawaii experienced a large increase in tourism and heavy fishing pressure. As a result, Hawaii designated Hanauma Bay as a marine life conservation district where consumptive use of marine life is prohibited, including hook and line, spearfishing, and the collecting of any marine organisms. This designation also prohibits all boating activity (including boardsailers, motorboats and jet skis). These prohibitions have lowered the user conflict of the area and increased the fish stocks to such a degree that its popularity attracted over 20,000 visitors per month in 1975.

The Air Force's proposal is not to set aside a sanctuary per say, but to designate a resources preserve where invertebrate, coral, and fish stocks can survive and proliferate, as well as offer controlled fishing, recreation, and interpretative programs, while biologists and resource managers conduct surveys and data assessment to recommend the management plans critical to the future of the Island's marine resources. It is Air Force policy to provide stewardship of our land and water resources under multiple-use and sustained yield principles.

1.1. Regulatory Compliance

The purpose of this Environmental Assessment (EA) is to assess the environmental impacts of the proposed action. If such impacts are not significant, a finding of no significant impact (FONSI) will be prepared and the Air Force will proceed with the proposed action following a 30 day period of the published finding. If the environmental impacts are significant, then an Environmental Impact Statement will be prepared before the Air Force reaches a decision regarding the proposed action. A public meeting will be held to receive comments on the proposed action. To obtain copies of this document or public meeting time, location and dates, refer to section 5.0 of this EA.

This document was prepared in compliance with Air Force Regulation 19-2, which implements the National Environmental Policy Act, Public Law 91-190 and the Council on Environmental Quality (CEQ) regulations (40 CFR 1500 et seq.). The CEQ requires the environmental significance of a proposed action be assessed and documented in terms of the action's context and intensity.

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION.

2.0.1. Alternatives Considered. This section describes the alternatives to the proposed action and summarizes the environmental consequences. The three alternatives to the proposed action of designating a MRP on the northeastern coastline of Guam are; 1) designate Andersen AFB coastal and submerged lands, from the northwest to the southeast property boundaries as a MRP, 2) designate Andersen AFB coastal and submerged lands, from the east side of the Tarague Beach recreational area to Pati Point, and 3) the no-action alternative.

2.1. Alternative 1 - Considers designating Andersen AFB coastal and submerged lands, from the northwest to the southeast property boundaries. Designation would include the area from 20 meters landward beyond the mean high tide mark and extending seaward to the 600 ft depth contour (fig 1).

2.1.1. Conditions for Use. Designation would mean abiding to the existing Andersen AFB and the Government of Guam recreational use and taking and harvesting regulations. This includes no fishing with nets, spears, spear-guns, dynamite or chlorine, with the addition of prohibiting bottom-fishing. Fishing from boats would be illegal in these waters. With the exception of this addition, rod and reel fishing from the shore would be the only means of fishing permitted, as has been historically.

2.1.2. Reduction of Uncontrolled Waters. Closure of bottomfishing, netting, and spearfishing within the proposed area would eliminate a valuable portion of the Island's fishing resources to commercial and recreational fishing. The distance of the 600 ft depth contour is approximately 9.3 miles long. Boats themselves would be permitted in these waters although, fishing from them would be illegal.

2.1.3. Enforcement and Funding. A buoyage would be installed at the north and south MRP boundaries. This system of buoys would then extend along the 600 ft depth contour with buoys set at key locations so that boats operators would know when they were crossing into the MRP. A strong enforcement program would be required to meet the objectives of this proposed action.

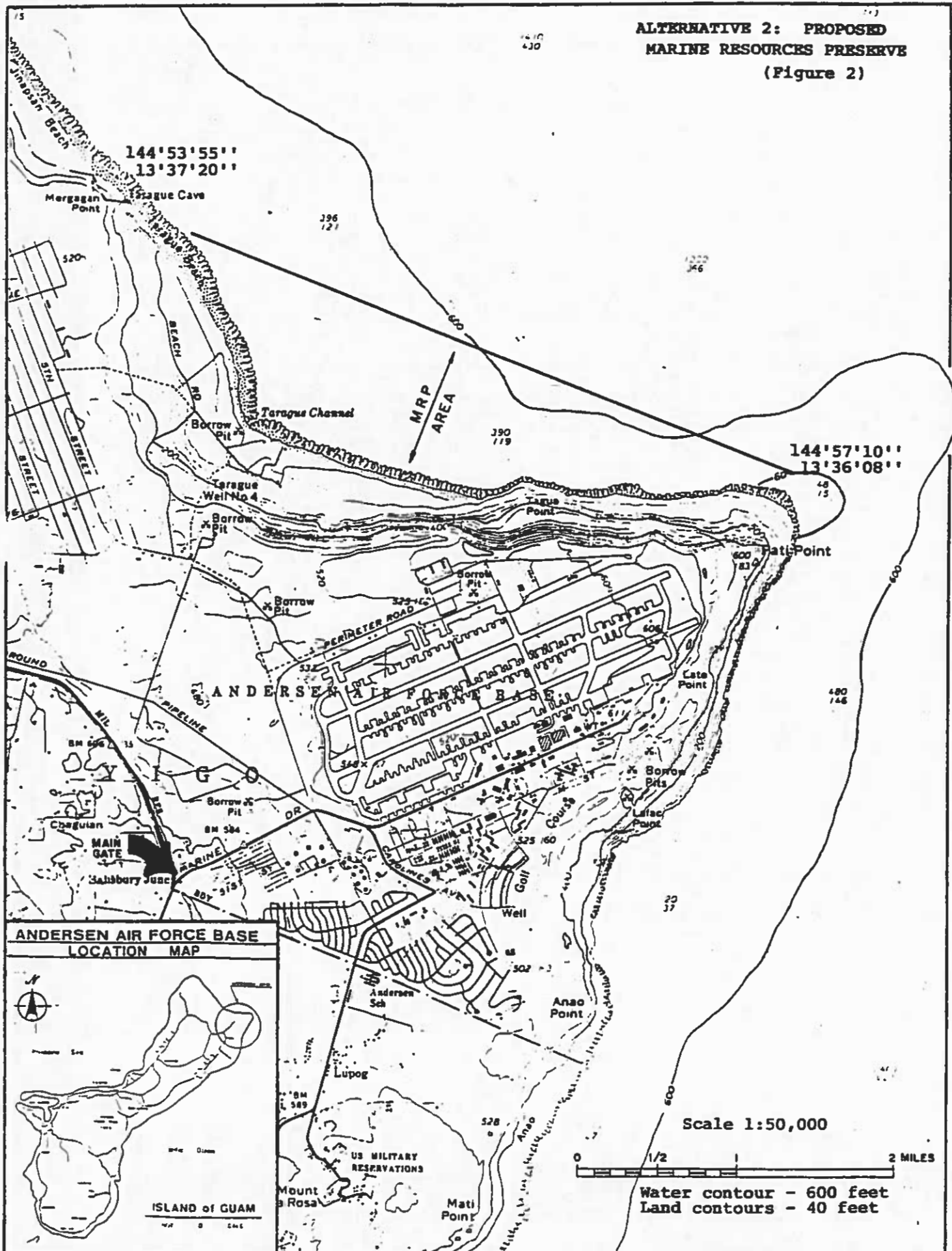
Cost estimates for the installation this buoy system would be derived and submitted to the appropriate Air Force office for funding. Enforcement program options with associated cost estimates would need to be considered to meet the objectives of Alternative 1.

2.1.4. Biologic and Social Impacts. Designation of a preserve this size would protect substantial populations of critical marine resources including fish, corals, decapods, crustaceans, and molluscs. Large bottom-dwelling fish such as wrasses and parrotfish, which are primarily responsible for the genetic base and propagation of these species' population size (due to their logarithmic reproductive characteristics) are often found in the northern waters due to the relative inaccessibility and, are rarely observed elsewhere on Guam in recent years. The protection needed to insure successful recruitment of juveniles to seed the population would be realized. With time, these species would begin to appear again in the waters around Guam, due to the dispersal of larvae from coastal currents in the area being toward the southern end of the island.

The protection of marine resources as proposed in Alternative 1 would increase species abundance and diversity on all areas of the Island. Non-consumptive recreationists, fishermen, and potentially the tourist industry, would enjoy the benefits of increased marine resources abundance through the designation of a MRP as proposed in Alternative 1.

2.2. Alternative 2 - Considers designating of Andersen AFB submerged and coastal lands from Pati Point to the east end of Tarague Beach as a MRP. Designation would include the area from 20 meters landward beyond the mean high tide mark, extending seaward to the line as shown on figure 2.

ALTERNATIVE 2: PROPOSED
MARINE RESOURCES PRESERVE
(Figure 2)



2.2.1. Conditions for Use. Designation would mean abiding to the existing Andersen AFB and the Government of Guam recreational use and taking and harvesting regulations. This includes no fishing with nets, spears, spear-guns, dynamite or chlorine, with the addition of prohibiting bottom-fishing. Fishing from boats would be illegal in these waters. With the exception of this addition, rod and reel fishing from the shore would be the only means of fishing permitted, as has been historically.

2.2.2. Reduction of Uncontrolled Waters. Closure of bottomfishing, netting, and spearfishing within the proposed area would eliminate a portion of the Island's fishing resources to commercial and recreational fishing. The line from east Tarague Beach to Pati Point as shown on fig 2, is estimated to be 3.5 miles long (Landsat Navigator, 5 Dec 91), and surface area of water within these points to be approximately 1,575 acre ft. Boats themselves would be permitted in these waters although, fishing from them would be illegal.

2.2.3. Enforcement and Funding. Channel markers would be installed at the coordinates shown on fig 2. The line of sight from Pati Point to a point at the east side of the Tarague Recreational beach is fairly easy to locate using the natural topography. With the installation of channel markers, boat operators would know exactly when they crossed into the MRP.

The waters inside the reef margin have historically been prohibited to any form of net or spearfishing, however, enforcement has been irregular and inadequate. Designation would serve to relieve the increasing fishing pressure through public notice of the MRP, education programs, and funding to strengthen enforcement of the regulations.

A cost estimate for installation of the channel markers would be derived and submitted to the appropriate Air Force office for funding. Funding would also serve to develop educational and marine ecosystem interpretative programs, as well as law enforcement.

2.2.4. Biologic and Social Impact. Designation of a preserve at this unique location would protect populations of critical marine resources including fish, corals, decapods, crustaceans, and molluscs. Large bottom-dwelling fish such as wrasses and parrotfish, which are primarily responsible for the genetic base and propagation of these species' population size (due to their logarithmic reproductive characteristics) are often found in these waters due to the relative inaccessibility and, are rarely observed elsewhere on Guam in recent years. The protection needed to insure successful recruitment of juveniles to seed the population would be realized. With time, these species would begin to appear again in the waters around Guam, due to the dispersal of larvae from coastal currents in the area being toward the southern end of the island.

The protection of marine resources as proposed in Alternative 2 would increase species abundance and diversity on all areas of the Island. Non-consumptive recreationists, fishermen, and potentially the tourist industry, would enjoy the benefits of increased marine resources abundance through the designation of a MRP as proposed in this Alternative.

2.3. Alternative 3 - No Action or Status Quo.

2.3.1. Conditions for Use. The waters which are accessible along the coastline from Tarague Cave to Tagua Point are open for trolling from boats and rod and reel fishing from the shoreline, only. Harvesting fish, invertebrate, or corals by means of nets (of any kind), spears or spearguns, is prohibited and has been historically through Andersen AFB Regulations. It is Air Force policy to acknowledge and enforce State Fish and Game seasons, harvest methods, and bag limits. Government of Guam fish and game laws, which can be obtained at the Guam DAWR, are enforced on Andersen AFB properties and waters that are accessible from the above mentioned coastline. The eastern most portion of the base waters that are inaccessible via the land or coastline are not addressed under Andersen AFB regulations and are not monitored by Base Security Police.

2.3.2. Reduction of Uncontrolled Waters. Under the No Action Alternative, all waters surrounding Andersen AFB would continue to be uncontrolled, with the exception of some enforcement along the north shoreline by Base Security. No reduction of controlled waters would occur with Alternative 3.

2.3.3. Enforcement and Funding. Air Force Regulations and policies for the stewardship of Andersen AFB submerged and coastal lands are not being fulfilled through status quo management. Unless budgets are increased to support management, preservation, and protection objectives, the resources will continue to deteriorate as the local economy grows. Educational and scientific values play an integral part in marine resources conservation, which are overlooked as a result of the military turnover and current management practices. Status quo management alone cannot provide the protection and conservation techniques needed at this time.

2.3.4. Biologic and Social Impact. Species abundance and diversity is slowly declining in the waters around Guam, partially due to lack of funding to develop and administer adequate scientific and public education programs for proper marine resources management. Boats are regularly seen within the proposed MRP, primarily bottom-fishing, which is legal at this time. Fishing pressure within this proposed and relatively pristine area, will continue to increase as other fishing and/or recreational areas on Guam become less attractive. The no action alternative does not meet the objectives of protection and enhancement of the Island's marine resources.

2.4. Comparison of Alternatives.

2.4.1. Alternative 1. Reduction of Uncontrolled Waters. This proposal would eliminate a large portion of Guam's waters to recreational or commercial fishing. Even though boat access to these waters is limited to the summer months due to the tradewinds and associated rough seas from October through May, boats are seen in these waters virtually year round. Prohibiting fishing from these waters most likely would be felt by the fishing industry.

Biologic and Social Impacts. As fishing pressure moves to the northern end of Guam, this proposed action has the potential to afford the resources and people of Guam the greatest benefit. Alternative 1 is the "environmentally preferred" alternative to ensure species recruitment to the ecosystem for future generations.

Enforcement and funding requirements associated with MRP designation of an area this size would be difficult to meet. Due to the lack of access to the waters on the eastern most coastline of the proposed area, coupled with the funding required to create a MRP boundary and law enforcement program, Alternative 1 was eliminated from further study.

2.4.2. Alternative 2. Air Force preferred Alternative.

Reduction of Uncontrolled Waters. Controlled or restricted harvesting in this area would have little impact on commercial and/or recreational fishing due to the relatively small percentage of area to be controlled, and limited seasonal access (rough seas October through May) to these waters. This is in comparison to the remainder of the Island's uncontrolled and accessible fishing waters, open year round.

Enforcement and Funding. The waters of this proposed alternative are easily accessible from land which would demand less funding for enforcement. Unlike the eastern-most waters, where access from the land is across the limestone cliffline or substantially rough waters eight months of the year, the submerged lands of the area proposed in Alternative 2 can be easily reached from the continuous shoreline. Enforcement officials would be able to control commercial, or recreational-use restrictions. Funding requirements for an area of this size would be feasible and far less than those needed for Alternative 1.

Biologic and Social Impact. The movement of ocean currents at this location makes it an important source area for reseeding Guam's central and southern reefs with larvae and juveniles of fish and invertebrates. The high diversity, abundance, and presence of adults capable of breeding makes this area critical to the future of Guam's marine resources (Appendix A).

2.4.3. Alternative 3. The no-action alternative would not meet the objectives of the proposed action. The contribution this area makes to the island marine resources is important and worthy of MRP designation. Interagency acknowledgement of the site characteristics would support the funding and enforcement requirements necessary to prevent the overharvesting of marine resources and degradation of reef quality that is foreseen if no action is taken. Alternative 3 was eliminated from further study.

3.0 AFFECTED ENVIRONMENT

3.0.1. This section presents the existing environmental characteristics, uses, and regulations that govern the area within the proposed action of Alternative 2.

3.1. Location. The proposed MRP is located between coordinates 13° 37' 20''N, and 144° 53' 55 ''E at the east boundary of the Tarague Beach recreation area and coordinates 13° 36' 08''N and, 144° 57' 10''E at Pati Point (5 Dec 91, Dr. Amesbury, UOG Marine Lab, Landsat Navigator). And, extending 20 m landward of the mean high tide mark, then seaward to the line connecting the above mentioned coordinates (fig 2).

3.1.1 MRP Size. The distance between the coordinates is estimated to be 3.5 miles. The ocean water area within the proposed MRP boundaries is estimated to be 1,575 acre ft.

3.1.2. Conditions for Use (Current Uses). A minimal amount of aquatic activities can or are currently permitted to take place within the proposed MRP due to the hazardous surf conditions and safety concerns that occur here. Andersen AFB Regulations governing the safety, consumptive, and recreational uses of these waters, historically and currently prohibit; 1) reef walking, 2) wading in water greater than ankle depth, 3) swimming, 4) spearfishing, 5) net fishing and, 6) any other consumptive uses or taking of species not in accordance with the Government of Guam regulations (i.e., taking of live coral, spiny lobsters weighing less than 1 lb or carrying eggs, etc.).

Recreational and consumptive uses permitted at this time include rod and reel fishing from the shore, scuba diving in accordance with base regulations, and boating outside the reef margin. Andersen AFB Regulation 126-1, Conservation and Management of Natural Resources, prohibits spearfishing, net fishing, and chumming in waters that are under the control of Andersen AFB.

3.2 Description of Area. The coastline consists of benches, limestone outcrops, and rolling shores. Small portions lack a bench entirely. This entire stretch of coastline is extremely rugged and nearly inaccessible from October through May,

3.2.1 Coastal Currents. Surface currents, subtropical countercurrents, and nearshore currents have been surveyed in Guam and Micronesia (Huddell, Willett, Marchand, 1974). Reports indicate that the currents' movement, coupled with offshore winds and tidal action at the northern end of the Guam, flow in a southern direction. All evidence indicates that the coastal currents at the proposed MRP location move, carry, and disperse marine organisms such as coral, fish larvae, and invertebrate, to seed both sides of the Island.

3.2.2. Reef Zones. From Tagua Point westward to and including Tarague Beach, the coastline is bordered by a fringing reef. The seaward portion of the reef flat consists of a well-developed algal (Porolithon) ridge intersected and undercut by numerous surge channels. This algal ridge is interrupted at Tarague Channel, also known as Scuba Cut. The reef flat adjacent to Tarague Beach has a well-developed moat which contains up to a meter of water at the lowest tides. The inner portion of the moat consists of a sandy substrate which supports extensive stand of the seagrass (Halodule uninervis) which consolidates the sediment giving the bottom a somewhat uneven profile. The outer portion is primarily hard-bottomed consolidated limestone with scattered ramose Acropora and Pocillopora corals. Another shallower (perhaps 0.5 m deep at the lowest tides) moat stretches for about a kilometer on either side of Scuba Cut. This moat, unlike the Tarague Beach moat, lacks seagrasses and has only a thin veneer of sand. It also contains large thickets of staghorn coral, primarily Acropora aspera that are essentially absent in the Tarague moat. The deepest portions of this moat are at the head of Tarague Channel. Here water flow and coral development are the greatest and there are numerous patches of mixed corals and scattered ramose Acropora and Pocillopora coral heads.

The outer reef slope of Guam drops off steeply. Between Tagua and Pati Points the 100 fathom (182 m) contour comes to within 0.6 km of shore. To the west the bottom slopes more gradually with the 600 fathom (one fm = 6 ft) contour located approximately 2 to 2.2 km from the reef margin from Tarague Channel to points west. The upper-most portion of the outer reef slope consists of an extensive "spur and groove" zone that is a seaward extension of the ridges and channels of the algal ridge (also known as the reef front). The shoreward floor of these channels typically consists of rounded rocks and boulders grading into coarse sand with increasing depth. On most of Guam's exposed reefs, these sand-bottomed channels extend perpendicular to the reef, some to depths of over 30 m. At the base of the reef front (typically at 4 to 8 m) there is often a gently-sloping shelf, the submarine shelf, that extends seaward to depths of 10 to 25 m or more, followed by a relatively steep slope (46-60) that sometimes ends on a sandy shelf at depths of 40 to 60 m. Most hard-bottomed areas of the outer reef slope at depths of less than 60 m normally support a luxuriant and diverse community of scleractinian corals. (Much of Guam's outer reef slope has recently been reinvaded by the crown-of-thorns starfish, Acanthaster planci resulting in deunidation of much of the coral cover). The extent of reef damage or recovery as a result of the invasion within the proposed MRP is unknown at this time. The flatter areas of the outer reef slope often contain large patches of sand or extensive areas of large coral mounds surrounded by areas of sand.

3.2.3. Accessibility. The inner reef flat and moats west of Tagua Point are accessible most of the year due to the protection of the outer reef flat and algal ridge. The cut at Tarague Channel (and Tarague Beach) remain treacherous during the months of October through May due to constant outflowing currents. Longshore currents flowing towards these breaks in the reef are present whenever there is significant surf. An outgoing tide can also produce the same currents when there is no surf. During the months of June to September, the surf dies down due to slackening of the trade winds and the disappearance of storms and associated cold fronts north of Guam. It is during this calm season that the outer reef slope becomes accessible to scuba divers and snorkelers entering through Scuba Cut or from the ocean side by boat.

3.2.4. Resources. An initial survey of the proposed Marine Resources Preserve was conducted by the UOG Marine Lab on 30 Jul 91 (Appendix A). Other than this recent preliminary assessment, the waters within the jurisdiction of Andersen Air Force base have never been studied specifically. However, numerous studies have been conducted elsewhere on Guam and the Marianas, which are representative of the proposed MRP. The findings of the three most comprehensive surveys (Jones and Chase, 1975; Molina, 1983; and Myers, 1982) conducted by the UOG Marine Lab and DAWR are combined with the 30 Jul 91 UOG Marine Lab initial assessment findings and are discussed in the following sections.

3.2.4.1. Fishes. As many as 863 species of fishes in 106 families have been recorded from the inshore and near-shore surface waters (to a depth of 200 m) of the Marianas (Myers, 1989). All but 22 of these have been recorded from Guam. The majority of these are associated with coral reefs and occur at depth of 30 m or less. With the exception of a few species identified with deep lagoons, all of these species characteristic of reef flats, shallow moats, and seaward reefs would be expected to be found within the proposed MRP.

The 30 Jul 91 UOG Marine Lab survey reports an impressive fish fauna within the base waters, to include a variety of trophic types, including herbivores, omnivores, carnivores and some planktivores. Of particular note was the presence of all three phases of the sequentially hermaphroditic wrasse Coris aygula, including immature juveniles, transition phase, and terminal phase fish. This fish is not abundant on Guam, and the presence of all three phases is a unique observation for the island. Fish size both in the lagoon and outside the reef was noticeably larger than on other reefs.

Major families containing species that are expected to be found within the proposed MRP, and which are currently heavily exploited around the island, include; holocentrids (squirrelfish), serranids (groupers), carangids (jacks), lutjanids (snappers), lethrinids (emperors), haemulids (sweetlips), mullids (goatfishes), kyphosids (rudderfish), labrids (wrasses), scarids (parrotfish), acanthurids (surgeonfishes), and siganids (rabbitfish). Certain species such as the giant humphead parrotfish, Bolbometopon muricatum are rare elsewhere on Guam but probably more common in the proposed area due to the inaccessibility.

Fish utilize a wide variety of habitats throughout their lifecycle, therefore protection is important to the survivability, maturity, and reproduction of the species. An example of a lifecycle is that of the locally known e'e' (Caranx sp.). E'e' are juvenile jacks that have newly recruited onto the reef. One reason for this recruitment is a change in diet, for micro-invertebrates (while at sea) to small crustaceans and fish (which are plentiful along the shoreline). As these fish mature, they move from the shoreline into deeper water and take up residence on the outer reef margin as adults. During the reproduction phase, eggs are released and sink. After a few days, larvae hatch from the reefs, drift to sea, and begin to feed on micro-invertebrates. The development of the larvae takes from 30 to 60 days after which these fish then return to the reef and start to feed on small crustaceans, thus, restarting the cycle (Sherwood, 1989).

In addition to the economically important fishes, numerous smaller reef fishes occur in the area. Major groups include apogonids (cardinalfish), chaetodontids (butterflyfish), pomacanthids (angelfish), pomacentrids (damselfish), blenniids (blennies), gobiids (gobies), balistids (triggerfish), monacanthids (filefish), and tetradontids (puffers) as well as smaller species mentioned in the previous paragraph.

3.2.4.2. Marine Fauna. The 30 Jul 91 UOG Marine Lab survey reports that the beach environment exhibits both infauna and epifauna, including several species of crabs. The lagoon contains a rich fish fauna, numerous coral species and growth forms (ecomorphs), several species of commercially valuable sea cucumbers (Holothuria nobilis, Bohadschia marmorata, Holothuria nobilis), echinoids, annelids (amphinomids, sabellids and serpulids), and representatives of virtually all shallow water invertebrate phyla.

3.2.4.3. Corals. The July 91 UOG Marine Lab survey reports the lagoon within the proposed MRP to contain a number of porites microatolls, as well as sizable patches of Acropora (staghorn corals). This is significant as they provide habitat for other species of invertebrates and fishes. The outer reef has a very diverse coral fauna, with over 45 species encountered within a 200 m transect. The abundance and diversity of Acroporid corals makes this area an important source of larvae for the synchronous spawning events that occur on Guam's reefs. During the survey, several coral species were found to contain mature eggs and sperm.

3.2.4.4. Turtles. Green sea turtles (Chelonia mydas) actively nest within the proposed MRP area. Hawksbill sea turtles (Eretmocheyls imbricata) nesting is suspected, but unconfirmed. The turtles are protected under the Endangered Species Act, of 1973, and are listed as threatened and endangered, respectively.

4.0 ENVIRONMENTAL CONSEQUENCES.

4.0.1. The environmental consequences of the three alternatives were summarized in Section 2. Further discussion of why Alternatives 1 and 3 were eliminated from detailed study or further discussion of the environmental consequences of such actions is unneeded.

4.1.1. Conditions for use. The environmental consequence of prohibiting fishing from a boat, or taking of fish by any method, other than by rod and reel from thre shore (currently permitted) would be a decrease in fishing pressure.

The proposed action would prevent the expected increase in fishing pressure as other areas on Guam become less attractive. Consequently, fish and molluscs would mature and proliferate species abundance and diversity around Guam.

4.1.1.1. The U.S. Air Force and Department of Defense retain all title to U.S. owned property, submerged lands, affected by this agreement, as well as all easements, appurtenances and facilities belonging to or identified with the designation. No rights, privileges, uses, or other claims on the land, water, or property are hereby created, granted or waived by this agreement, unless expressly stated herein.

4.1.2. Reduction of Uncontrolled Waters.

The environmental impact of controlling the harvest of these waters would create a source area for reseeding the island's reefs. Fish and invertebrate would mature and reach full reproductive size giving populations an opportunity to reach densities high enough for spawning and recruitment to be successful. A refuge for breeding stocks to replenish the island's reefs would be established.

The long-term productivity of the proposed MRP outweighs the loss of fishing in these waters, by means other than rod and reel from the shore. The irreversible and irretrievable commitment of these resources would have no known unavoidable adverse effects.

4.1.3. Enforcement and Funding. The environmental consequences of enforcement of proposed MRP regulations would parpllel those mentioned previously - increased species abundance and diversity in Guam's waters.

The environmental impacts of additional funding to meet the objectives of the proposed action could benefit science and education to:

- Provide outdoor laboratories for the study of natural processes in relatively undisturbed ecosystems.
- Provide benchmarks which both harmful and beneficial effects of mancaused changes can be assessed.
- Serve as a reservoir of genetic diversity.
- Serve as an outdoor classroom for the education of those interested in marine conservation.

In turn, more effective marine conservation enforcement programs would be learned.

4.1.4. Biologic and Social Impact. A marine preserve with adequate enforcement of harvest restrictions, would enhance fish, invertebrate, and coral recruitment, through the adult stages of their life cycle. Initially, fish populations in the area would increase to the limits of available food and space. Once a maximum is obtained, the conservation area could sustain these populations and provide a consistent supply of larvae which will be dispersed to both sides of the island by movement of ocean currents. In time, Guam's central and southern reefs should show an increase in recruited fish available for the fishermen, snorkelers, scuba divers, and students pursuing marine biology education, alike.

4.1.4.1. Turtles. Continued protection would be provided for the turtles. Inclusion of turtle activity monitoring into the Marine Resource Preserve Management Plan would give the direction needed for protection and Endangered Species Act compliance. The expertise and guidance that would be contributed by the DAWR would provide greater insight into turtle behavior, habitat, and nesting characteristics specific to Guam, as well as promote public education and awareness of these popular reptiles.

5.0 LIST OF PREPARERS

5.0.1. This EA was prepared by Ms Heidi Hirsh, Natural Resources Planner, of the Andersen AFB 633 Civil Engineering Squadron, Environmental Management Branch. Background information, survey data, management recommendations and preliminary review of this draft EA were received from Mr. Gerald W. Davis, Fisheries Supervisor of the Guam Division of Aquatic and Wildlife Resources and Dr. Robert Richmond, Associate Professor at the University of Guam Marine Laboratory.

5.0.2. Copies of this document may be obtained at the Andersen AFB Environmental Management Branch, 633 CES/DEV, Andersen AFB, Guam, 96543-5000. Copies are also available at the Government of Guam Division of Aquatic and Wildlife Resources, Fisheries Office, and the GovGuam Bureau of Planning Office, Adelup.

5.0.3. A public meeting is to be held at the Maniglao Community Center, 18 Mar 92, at 1830 to receive public comments.

6.0 REFERENCES CITED.

1. Sherwood, Timothy S., 1989. Research project segment, Project No. FW-2R-26, Job 12. Establishing Permanent Marine Conservation Areas on Guam.
2. Huddell, Willett, and Marchand, 1974. Nearshore currents and coral reef ecology of the west coast of Guam, Mariana Islands Nav. Oceqnog. Off. Sp. Pub. 259, 185 P.
3. Jones and Chase, 1975. Community structure and distribution of fishes in an enclosed high island lagoon in Guam. Micronesia 11(1): 127-148.
4. Molina, 1983. Seasonal and annual variations of coral-reef fishes on the upper reef slope of Guam. 96 p [Thesis chairman: S. S. Amesbury].
5. Myers, R. F. 1982. Fishes. In Randall, R.H., and L.G. Eldredge (eds.), Assessment of the Shoalwater Environments in the Vicinity of the Proposed OTEC Development at Cabras Island, Guam. Univ. Guam Mar. Lab., Tech. Rept. No. 79. 208 P.
6. Myers, R. F. 1989. Micronesian Reef Fishes: A Practical Guide to the Identification of the Inshore Fisheries of the Tropical Central and Western Pacific.

7.0 AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE STATEMENT WERE SENT.

- Environmental Protection Committee - Distribution:

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Det 5, 2 STG/CC		
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HQ PACAF/DE, Hickam AFB, HI 96853		

- Associated Organizations or Agencies:

- COMNAVMARIANAS - Commander Moran
- NAVCAMS - Engineering Dept
- U.S. Fish & Wildlife Service, P.O. Box 50167, Honolulu, Hawaii 96850
- Guam Division of Aquatic and Wildlife Resources
- University of Guam Marine Lab, UOG Station, Mangilao, Guam, 96923
- Guam Clearing House, Bureau of Planning
- Guam Environmental Protection Agency
- Marianas Audubon Society



University of Guam

MARINE LABORATORY
UOG Station, Mangilao, Guam 96923

Initial Survey of Proposed Marine Resources Preserve Andersen Air Force Base

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On July 30, 1991, a preliminary survey of the marine environment adjacent to the Andersen "Scuba Cut" was performed. The purpose of this survey was to gain an overview of the area for future work, planning and establishing a functional database for reviewing the conservation area proposal. We observed an impressive abundance and diversity of marine species which confirms the value of this particular area for conservation designation.

Site Description

The area surveyed consisted of a variety of habitats including a shallow lagoon of approximately 30 - 50 meters width, a back-reef, a well-developed reef flat, a spur and groove reef face, and a sloping reef front. Each of these habitats appeared fairly pristine, with the exception of some cable and debris in one area of the lagoon. The transition area from reef flat to back-reef and lagoon was notable as have more vertical relief and habitat complexity than other such areas on Guam. As a result, there was a greater abundance and diversity of fish and invertebrates than one would encounter in Agana Bay, Gun Beach, or other similar exposures.

Marine Fauna

The beach environment exhibited both infauna and epifauna, including several species of crabs. The lagoon contained a rich fish fauna, numerous coral species and growth forms (ecomorphs), several species of commercially valuable sea cucumbers (Holothuria nobilis, Bohadschia marmorata, Holothuria nobilis), echinoids, annelids (amphinomids, sabellids and serpulids), and representatives of virtually all shallow water invertebrate phyla.

Corals

The lagoon contained a number of Porites microatolls, as well as sizable patches of Acropora (staghorn corals). These are significant as they provide habitat for other species of invertebrates and fishes. The outer reef had a very diverse coral fauna, with over 45 species encountered within a 200 m

transect. The abundance and diversity of Acroporid corals makes this area an important source of larvae from the synchronous spawning events that occur on Guam's reefs. These species have been particularly hard-hit by the erosion and runoff encountered at other sites around the island. While there was evidence of recent wave damage from Typhoon Russ, the coral cover was still high, reaching 80 - 90% on some of the spurs. During the survey, several coral species were found to contain mature eggs and sperm.

Fishes

The fish fauna was also impressive. The lagoon contained a variety of trophic types, including herbivores, omnivores, carnivores, and some planktivores. Of particular note was the presence of all three phases of the sequentially hermaphroditic wrasse Coris aygula, including immature juveniles, transition phase, and terminal phase fish. This fish is not abundant on Guam, and the presence of all three phases is a unique observation for Guam. Fish size both in the lagoon and outside the reef was noticeably larger than on other reefs, perhaps due to lower levels of spear fishing.

Summary

In summary, the site is a perfect choice for a conservation area. Its location in the north makes it an important source area for seeding central and southern reefs with larvae and juveniles of fish and invertebrates. This is of critical importance to Guam at present, as we have documented reproductive failure of reef organisms due to runoff and sedimentation, especially on Guam's southern reefs. The high diversity, abundance, and presence of adults capable of breeding makes this area critical to the future of Guam's marine resources. From a biological point of view, we strongly endorse establishing this as a marine conservation area. Considering Guam's political and social situation, this area is also a good choice for conservation designation, as public access is already limited, but the products of this area can be enjoyed by all, as organisms disperse to other reefs from this source area.

Appendix B. - Glossary

Epifauna - Benthic. Lives on the top of the bottom layer of material (i.e., sediment, plants) which comprise the ocean floor. Species typical of epifauna include ctenoid and starfish.

Infauna - Benthic. Lives within the bottom layer of material (i.e., sediment) that makes up the ocean floor. Species typical of infauna include worms and urchins.

Invertebrate - All kinds of animals lacking a backbone from protozoans to insects and starfish.

Lagoon - the term lagoon refers to the area enclosed by the low tide line of the inner edge of the barrier or atoll reef flat. The depth may vary from less than a meter at low tide to 90 m or more. Lagoons often contain numerous patch reefs ranging in size from a few small pieces of coral to massive pinnacles which may be topped with reef flats and islands (Myers, 1989).

Molluscs - A member of a large phylum of invertebrate animals (mollusca), characterized by soft, unsegmented bodies and usually have a calcareous shell.

Reef Zones: (Sherwood, 1989)

Inner Reef Flat - frequently retains some water during the lowest tides. This zone contains the moat, which is a subtidal area of inner fringing reef not quite deep enough to qualify as a lagoon but deep enough to retain adequate water to avoid overheating.

Outer Reef Flat - this area is exposed during low tide and is bounded on the shoreward side at low tide by water trapped in the moat and on the seaward side by the reef margin. The outer reef flat appears as a flat limestone pavement with scattered boulders and larger rocks that are broken from the reef margin and tossed up on the reef flat by storm waves (Sherwood, 1989).

Reef Margin - the seaward edge of the reef flat platform which is constantly awash even at low tide. The seaward edge is very irregular and it is cut at right angles by short surge channels. The inner portion of the reef margin is irregular due to the presence of small knobs, pinnacles, holes and pools. Shallow extensions of the longer surge channels cut through the inner half of this zone and terminate in small pools 1 to 2 meters deep.

Reef Front - the extreme seaward edge of the reef platform. This is where the reef margin abruptly increases in depth and degree of slope, giving way to the ocean floor.