FEDERAL CONSISTENCY DETERMINATION WITH THE GUAM COASTAL MANAGEMENT PROGRAM

RELOCATABLE OVER-THE-HORIZON RADAR NORTHWEST FIELD, GUAM

Commander
Department of the Navy
Pacific Division
Naval Facilities, Engineering Command
Pearl Harbor, Oahu, Hawaii 96860-7300

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Submitted to: Bureau of Planning
Guam Coastal Management Program
Government of Guam
Agana, Guam 96910

Submitted by: Commander
Department of the Navy
Pacific Division
Naval Facilities Engineering Command
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GUAM COASTAL ZONE CONSISTENCY DETERMINATION

TABLE OF CONTENTS

LIST OF FIGURES

1.0 BACKGROUND

The U.S. Navy has long recognized the need to provide wide area over the horizon surveillance to support maritime tactical forces. Surveillance of critical ocean areas and maritime choke points is necessary for the defense of at-sea battle groups. The proposed Relocatable-Over-the-Horizon Radar (ROTHR) system provides the capability to detect, track, and estimate the composition of groups of ship and aircraft in a fixed angular sector (approximately 60-degrees) with ranges of 500 to 1,800 nautical miles from the radar site. The ROTHR receiver proposed for location within Northwest Field on Guam, Mariana Islands provides an unique early warning coverage of aircraft and ships coming from the Pacific coast of the Soviet Union, China, and Vietnam, including the Soviet facilities at Cam Rahn Bay. No other U.S. location in the western Pacific provides this extensive coverage position. The ROTHR transmitter would be located on Tinian, Commonwealth of the Northern Mariana Islands.

The major need for the ROTHR system stems from the shortcomings of conventional or line-of-sight land or ship based radar systems, which only have detection capability of about 20 nautical miles for low-altitude aircraft and 200 nautical miles for high-altitude aircraft. This type of conventional system provides commanders at sea with limited time (three to six minutes for low-flying aircraft and 15 to 30 minutes for high-flying aircraft) in which to decide, plan, and execute responses to enemy actions. The ROTHR system effectively extends the time for command decisions and actions by providing long range detection and early warning of approaching naval and airborne threats at any altitude. The system can be used for overall surveillance and tracking within the coverage area, spotlighting specific regions to handle targets of special interest, or assessment of the enemy size. The proposed Navy ROTHR system is not designed to detect Intercontinental Ballistic Missiles (ICBM). The system is also not designed to locate small boats which may be lost at sea.

Over-the-horizon surveillance is attained through the use of three major subsystems: transmitter, receiver and operational control center. Radio frequency energy emanating from the ROTHR transmitter is refracted from the ionosphere in such a way that, if the refracted waves hit a target (an aircraft or surface ship) on their way to the earth's surface, a portion of their energy is reflected back to the ionosphere, which then returns a vestige of the original energy (backscatter) in the direction of the receiver. The entire area under this pattern is illuminated by this system for surveillance. The ionospheric phenomenon yields a look down capability well beyond the natural horizon. Because illumination occurs through ionospheric refraction at more than 30 miles altitude, no aircraft flying at any altitude within the effective coverage area of the radar can avoid detection.

By itself, the proposed ROTHR system does not satisfy the overall surveillance requirements for the national defense, but rather provides surveillance of specific areas in the western Pacific. The proposed system can be considered part of a larger coordinated surveillance system

which includes other U.S. Navy ROTHR sites in Alaska and U.S. Air Force Over-the-Horizon Backscatter (OTH-B) sites in the continental United States and Alaska. Information from all these systems can be correlated with data from other sources for dissemination to fleet and tactical commanders.

The system is designated as relocatable because the transmitter, receiver, and operational control center can be moved to previously prepared transmitter and receiver sites within a two-month period. The proposed system is designed to be useful for 20 years. While other broad area surveillance systems may be introduced during this 20-year period, analyses conducted by the U.S. Navy to date show that the ROTHR will provide an important complementary capability to every type of sensor technology now conceived. The ROTHR systems are integral components of the entire network of detection systems and are vital to the national defense.

2.0 PROJECT DESCRIPTION

2.1 INTRODUCTION

The proposed project is to construct and operate one stand-alone ROTHR system consisting of the transmitter on Tinian, the receiver and operational control center (OCC) located near the receiver on Guam. (The project is designated as Military Construction (MILCON) Project P-223.) In addition to the receiver and OCC, support facilities would be constructed and operated in proximity to the receiver and OCC. Support facilities include telephone/communication and utility systems, and standby generators. The amount of cleared land required for these facilities has been reduced to an acceptable minimum.

The proposed project would construct and operate the ROTHR receiver antenna and ground screen, and the OCC on Guam. Construction of the antenna would require removal of all vegetation and other features within the approximate 172-acre site needed for the antenna arrays, ground screens, access and service roads, and operational and support facilities. Portions of the cleared area will be subsequently replanted with grass or other suitable ground cover, or covered with crushed aggregate to control the growth of weeds.

2.2 PROJECT SITE

Ideally, the receiver should be sited in an area with relatively flat terrain to minimize the amount of cutting and filling required to meet the levelness criteria for the antenna and ground screen. The selected project site is located in Northwest Field, within lands currently under the control of Andersen Air Force Base (AAFB). The antenna site would use the northern runway and the land area between runway and northern taxiway for construction of the receiver and is called the Runway site. The receiver antenna at the Runway site would encompass an area of 172 acres and require clearing and vegetation removal from about 110 acres of vegetated lands. Portions of Northwest Field, including the two existing runways, have been proposed as a National Historic Landmark by the U.S. Department of the Interior National Park Service. The proposed receiver site is shown in Figure 2.1.

The OCC would be located on Naval Communications Area Master Station Western Pacific (NAVCAMS WESTPAC), Finegayan on an area which has already been cleared of existing vegetation. The OCC will require an area of about 1.5 acres for the 16 required operational vans. The OCC site is shown on Figure 2.2.

Three other sites were seriously considered for siting Project P-223. The first of these sites, the northern site, is located north of the Runway site and inland of the Northwest Field Perimeter Road. The second site is located on Harmon Annex, also land under the control of AAFB. The last site considered for Project P-223 is on privately-owned property in the Dandan area in southeastern Guam.

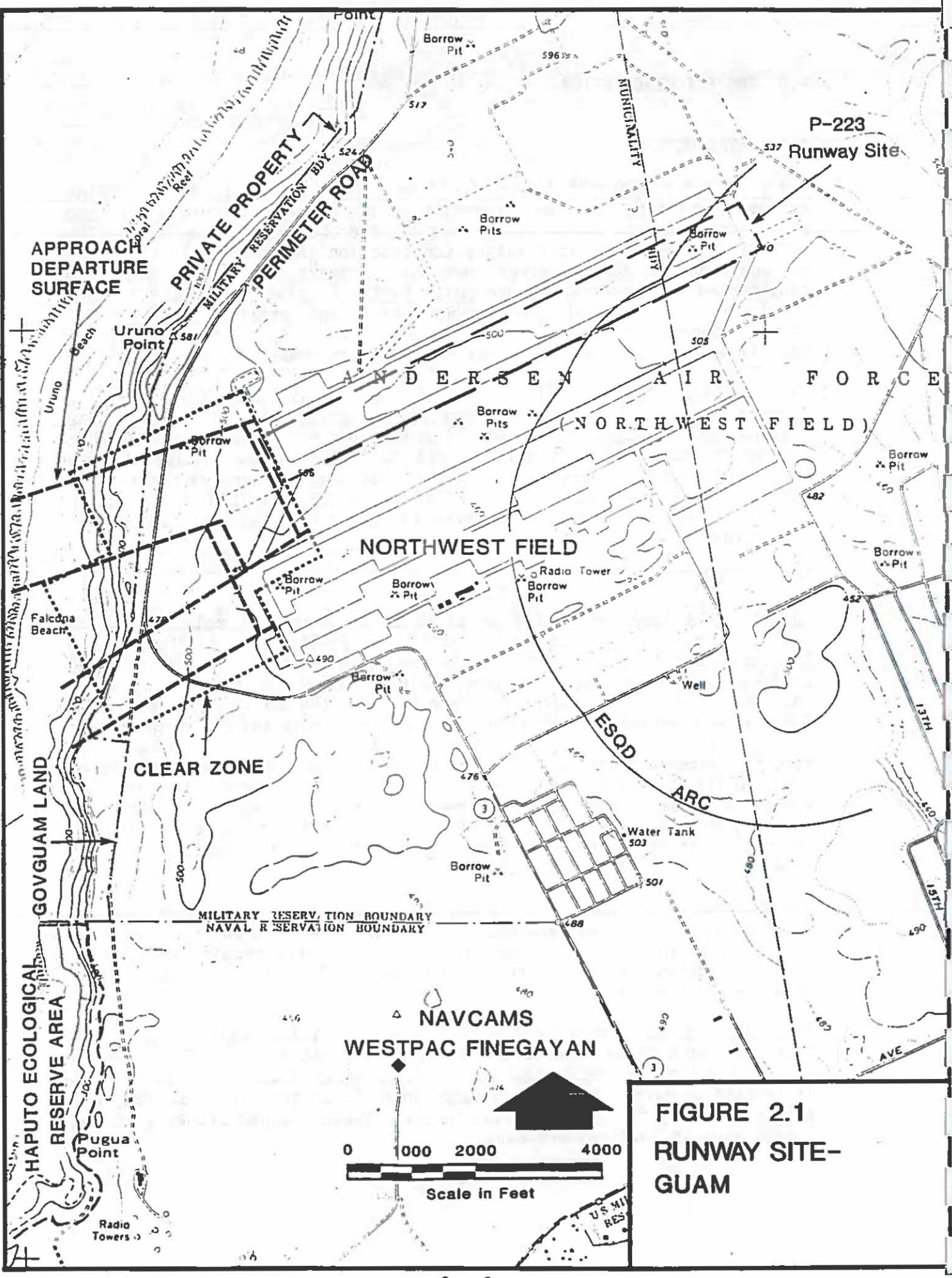


FIGURE 2.1
RUNWAY SITE-
GUAM

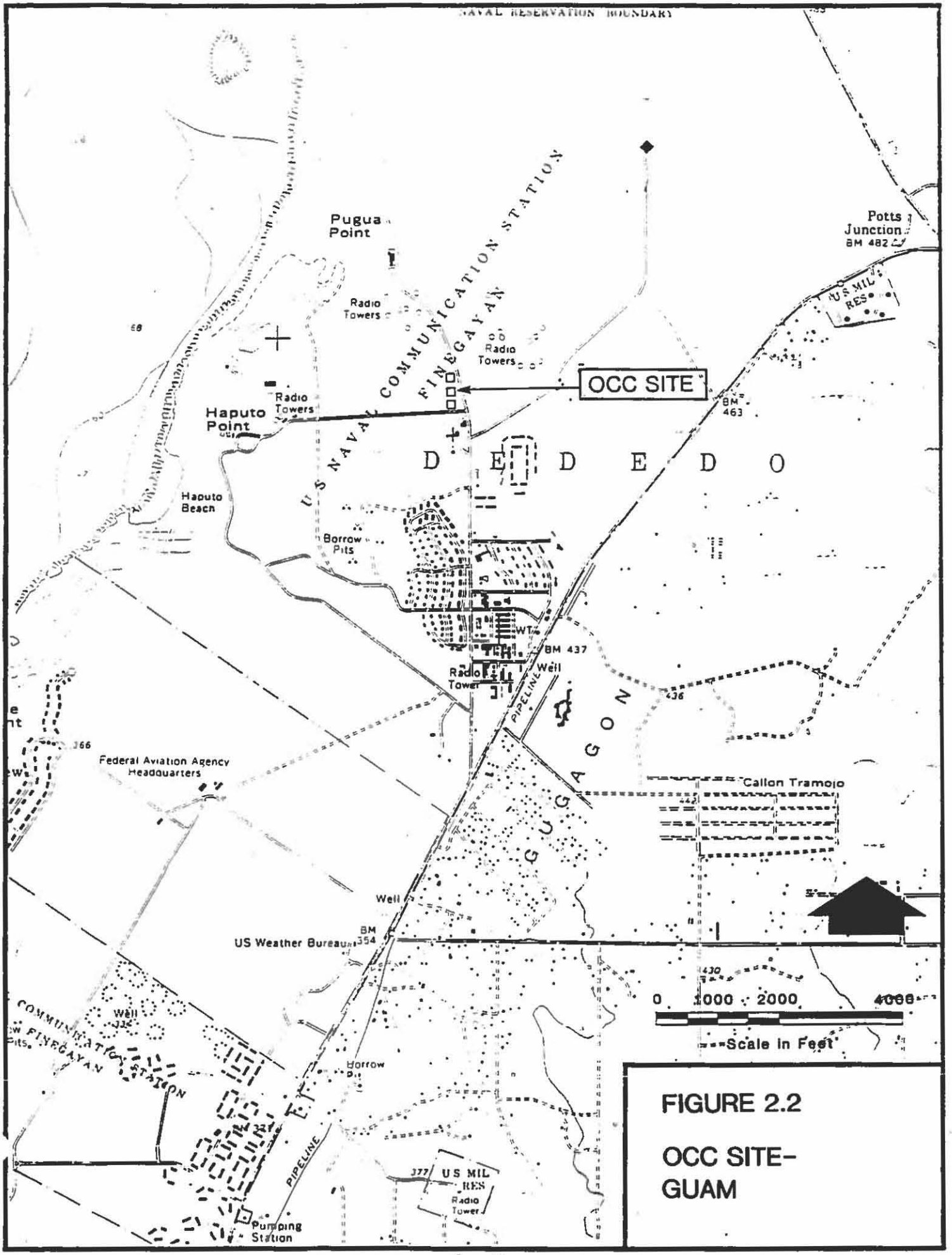


FIGURE 2.2

OCC SITE-
GUAM

2.2.1 Project Site Selection

A number of analyses have been conducted by the U.S. Navy to determine the project site for the receiver shown in Figure 2.1. These analyses have included examination of the following factors:

- Operational siting requirements;
- Technical siting requirements; and
- Physical siting requirements.

The site selection process is further described in Section 4.1.

The northern site was not selected as it would have required vegetation removal of 172 acres as opposed to 110 acres for the Runway site. The Harmon Annex site was not selected as the area has been declared excess by the Department of Defense and has been identified as a parcel for return to local ownership. Further, future development of the surrounding areas and the potential for electromagnetic interference with operation of the receiver made use of the Harmon Annex undesirable. The Dandan site was not selected as it would have increased military lands on Guam.

2.3 RECEIVER ANTENNA DESCRIPTION

The receiver antenna array will consist of 372 pairs of aluminum monopole antennas (a total of 744 poles) each about 18 FT high and 6 inches in diameter. The antenna poles will be bolted to ceramic base plates mounted on direct-buried concrete foundations. The monopole antennas will not be anchored with guy wires. The pairs of antenna poles will be sited about 23 LF apart. The total length of the RCVR antenna array is approximately 8,600 LF. Each monopole antenna will be capable of withstanding wind speeds of 140 knots. See Figure 2.3.

The 800 LF width dimension of the receiver antenna will contain a 568 LF wide reflecting area in front of the ground screen, a 132 LF wide ground screen located within the antenna poles and a 100 LF clear area behind the ground screen.

The ground screen for the receiver will consist of a 44 LF wide area of bare wires and an 88 LF wide area of insulated wires laid on the ground surface and anchored with hand driven anchor rods. The antenna array and ground screen will not be fenced.

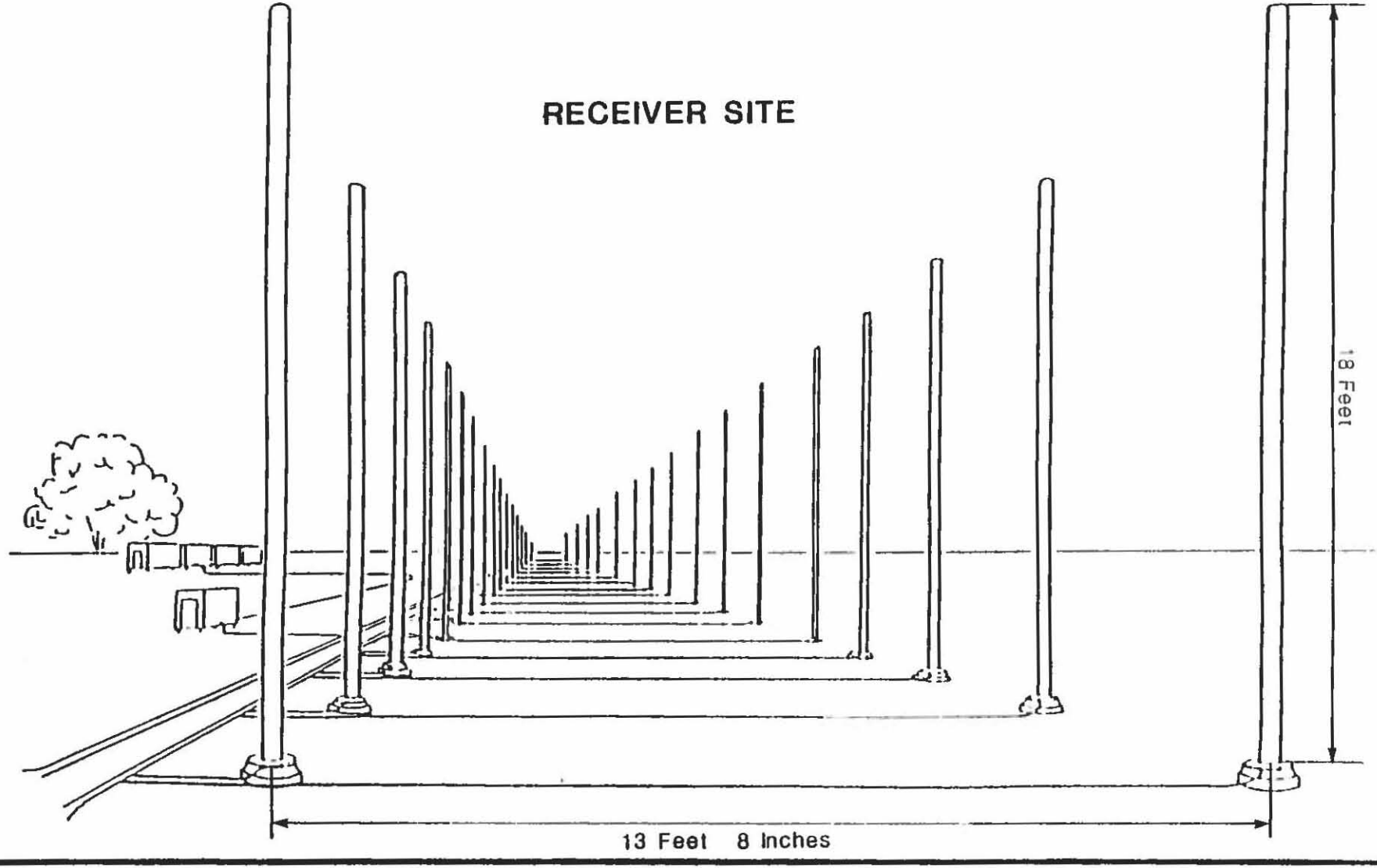


FIGURE 2.3

PICTORIAL VIEW RECEIVER SITE

2.3.1 Receiver Support Facilities

Facilities will be required to operate the RCVRs and provide support for the assigned personnel. The support facilities for each receiver site include:

- One 60-FT high QVI antenna;
- Three operational vans;
- Thirteen receiver equipment shelters;
- One 1,200 SF emergency generator building to house a 400 KW, 13.8 KV generator;
- One 1,200 SF operations and maintenance building;
- Underground communications and utilities systems;
- One 4,000 gallon above-ground fuel storage tanks contained within an impervious containment area;

The OCC will also require the following support facilities:

- Sixteen operational vans;
- One 8,400 SF van support building;
- One uniterruptable power supply (UPS) van;
- One 1,200 SF emergency generator building to house a 400 KW generator;

All of these support facilities will be owned by the U.S. Navy. All power for operation of the receiver would be supplied from existing U.S. Navy power plants on Guam or purchased from GOVGUAM.

2.4 RECEIVER OPERATING CHARACTERISTICS

The receiver will receive and process energy backscattered from the surveillance area illuminated by the transmitter for both target detection and propagation management purposes. The OCC functions to evaluate and control the operation of the radar through the use of ionospheric information and spectrum monitor data.

2.5 RECEIVER CONSTRUCTION

Construction of the receiver, OCC, and support facilities on Guam would be contracted to civilian companies under normal contracting procedures established for this type of project. Military personnel are not expected to be used for project construction. The contractor would be responsible for transporting all equipment, material, and supplies to the project sites. The contractor would also be responsible for submitting necessary plans and for securing required permits and authorizations from the responsible agencies on Guam and for coordinating all construction activities with the U.S. Navy.

Construction of the receiver would require removal of all vegetation from approximately 110 acres. The antenna reflecting area is 8,600 LF long by 800 LF wide. In addition, the antenna reflecting area requires a 25 LF clear area in front and back and about 100 LF on each end (total

dimensions to be cleared 8,700 LF by 850 LF). A small area 200 LF by 500 LF is necessary for the support facilities.

No clearing of trees in front of this area will be required as part of the construction activity. The U.S. Navy has determined that an acceptable level of performance can be achieved without clearing of trees outside of the designated area. Topographic data is still required in order to establish finish array elevations and to confirm existing terrain elevations. However, based on preliminary topographic data available for the Runway site for Project P-223 on Northwest Field, excavation in front of the antenna reflecting area will not be required.

Vegetation would be removed from the project sites and replaced with slow, low-growth vegetation or other suitable ground cover after grading to meet the technical requirements for construction of the receiver. The vegetation from the project site would be disposed of by on-site burning within a secure area surrounded by exposed bare mineral soil, appropriate fire breaks and other necessary safety precautions. All necessary precautions required to prevent accidental fires would be taken before burning. Necessary permits would be obtained by the contractor prior to burning. The construction contractor will be required to ensure compliance with permit requirements and safe practices. Material not readily burnable would be disposed of by burial, on-site or at an approved landfill.

The construction contractor will be directed by the U.S. Navy to allow the removed vegetation to be sufficiently cured to prevent excessive smoke during burning operations. Disposal of vegetation for firewood or for craft use may be considered, if there is sufficient demand and appropriate security and Government liability measures can be satisfied for public access.

All project-related debris will be disposed of in accordance with the procedure approved for the construction contract. No material will be placed into adjacent areas or pushed over nearby cliffs.

Borrow material required to construct the receiver will be obtained from existing borrow sites located on military controlled lands on northern Guam. Once the site has been cleared and prepared, the construction contractor would also be responsible for establishing the slow, low-growth vegetation or other suitable ground cover. However, only a general maintenance concept can be identified at this time. The construction contractor will devise a plan, for review and acceptance by the U.S. Navy and GOVGUAM agencies, that will address the establishment and maintenance of ground cover for those portions of the receiver site that are to remain free of encroachment by woody stemmed plants and trees. Specific details for ground cover and/or follow-on maintenance will be prescribed by the operations contractor.

2.6 RECEIVER OPERATIONAL DATA

The receiver and OCC will be operated by military and civilian contractor personnel on a 24-hours-per-day, 7-days-a-week-basis. A total of approximately 72 military personnel and 44 civilian contractor personnel will be permanently located on Guam to operate the receiver and OCC. Based on current statistics for Navy personnel on Guam, about 41 of the military personnel will be accompanied by dependents. The remaining 31 military personnel will be unaccompanied. The U.S. Navy personnel will be assigned to the Fleet Surveillance Support Command.

Initially, civilian operating personnel for the receiver are expected to be provided by the prime contractor, Raytheon Corporation. Non-technical personnel are anticipated to be hired from Guam or other areas in the western Pacific. Although local personnel will be considered for all positions, due to the training required, the scope of local hiring for technical operating positions is not known at this time. A total of approximately 44 civilian personnel will be required to operate the receiver and OCC.

The military personnel will be assigned to family and bachelor housing facilities in accordance with existing military housing assignment policies. The latest family housing survey for Guam indicates there is sufficient family housing within a one-hour driving time of any of the proposed receiver site. Thus, construction of additional family housing is not anticipated for the ROTHR projects.

3.0 ASSESSMENT OF THE IMPACTS TO ENFORCEABLE POLICIES

The project site is located within Northwest Field in northern Guam, within lands currently controlled by the U.S. Air Force. However, notwithstanding the exclusion of Federal lands, the GOVGUAM Coastal Management Program (GCMP), the project is subject to review as it has the potential to have a direct effect on the coastal zone.

The GCMP policies are listed below with a summary of the consistency of the proposed project to each policy, including "spillover" effects:

DEVELOPMENT POLICIES (DP)

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

DISCUSSION:

The proposed project site is on Northwest Field. This location is not within a seashore reserve. Access to the beach areas will be consistent with existing Department of Defense (DOD) policies for access to Northwest Field.

DP 2 Urban Development:
Uses permitted only within Commercial, Multi-Family, Industrial and Resort-Hotel zones; and uses requiring high levels of support facilities shall be concentrated within urban districts as outlined on the Land-Use Districting Map.

DISCUSSION:

The proposed receiver and its associated support facilities will be located within Northwest Field, an area currently used for Department of Defense (DOD) purposes. The OCC and its associated support facilities will be located within NAVCAMS WESTPAC, Finegayan, an existing DOD installation. The receiver, OCC, and all support facilities will be provided by the U.S. Navy. The proposed project will be consistent with the existing uses at these installations.

DP 3 Rural Development:
Rural districts shall be designated in which only low density residential and agricultural uses will be acceptable. Minimum lot size for these uses should be one-half acre until adequate infrastructure, including functional sewering, is provided.

DISCUSSION:

The policy is not applicable to the proposed project.

DP 4 Major Facility Siting:
In evaluating the consistency of proposed major facilities with the goals, policies and standards of the Comprehensive Development and Coastal Management Plans, the territory shall recognize the national interest in the siting of such facilities, including those associated with electric power production and transmission, petroleum refining and transmission, port and air installations, solid waste disposal, sewage treatment and major reservoir sites.

DISCUSSION:

The proposed project has a defense mission that serves the interest of national security of the United States. The DOD has determined for cost reasons that the ROTHR system is necessary for national defense. It is an early warning and battle group coordination system that is beneficial to the U.S. and its allies. An approved Mission Essential Statement (MENS) is the formal basis for the ROTHR program. The MENS is a result of a major study of the Nation's surveillance and command and control needs performed during the first half of the 1980's. Its implementation is governed by a classified Decision Coordination Paper which is regularly reviewed and confirmed at the highest levels of the DOD. The most recent review was conducted in November 1989 when the ROTHR program received its first approval for production.

The project site has been selected after analysis of alternative locations on islands in the western Pacific, within the Commonwealth of the Northern Mariana Islands (CNMI) including the islands of Saipan, Tinian, Rota, and Anathan, and throughout Guam. (See Section 4.1) The project site is within an established DOD installations which have been designated for defense purposes. Construction of the ROTHR receiver within the Northwest Field and the OCC within NAVCAMS WESTPAC is consistent with other DOD uses already existing within these areas.

DP 5 Hazardous Areas:
Identified hazardous lands including flood plains, erosion-prone areas, air installation crash and sound zones and major fault lines shall be developed only to the extent that such development does not pose unreasonable risks to the health, safety, or welfare of the people of Guam, and complies with land-use regulations.

DISCUSSION:

The proposed project site in Northwest Field is not within a flood plain. Soil on the project site are Guam Urban land soil complex which includes Guam cobbly clay loam. Permeability of the soil is moderately rapid and runoff slow. The hazard of water erosion slight.

The Pugua Fault, a major fault in northwestern Guam, lies south of the proposed site and extends offshore. The project will be designed to comply with applicable DOD requirements for structures located in this area of Guam. Any hazard from an earthquake will be confined to the project site.

Northwest Field, an Air Force installation, has been classified as inactive since 1949. Subsequently, aircraft operations have occasionally occurred on the southern runway, most of these being related to training exercises. To minimize removal of vegetation, the proposed project would remove the northern runway then clear and grade the site to meet operational requirements. The southern runway would not be affected by the proposed construction and would meet DOD airfield criteria for aircraft operations.

No accident potential zones (APZs) have been established by the U.S. Air Force as a result of the low level of aircraft operations on Northwest Field. The proposed receiver would not result in an increased hazard from aircraft operations at Northwest Field.

DP 6 Housing:
The government shall encourage efficient design of residential areas, restrict such development in areas highly susceptible to natural and man-made hazards, and recognize the limitations of the island's resources to support historical patterns residential development.

DISCUSSION:

This policy is not applicable to the proposed project.

DP 7 Transportation:
The Territory shall develop an efficient and safe transportation system while limiting adverse environmental impacts on primary aquifers, beaches, estuaries, and other coastal resources.

DISCUSSION:

This policy is not applicable to the proposed project.

DP 8 Erosion and Siltation:
Development shall be limited in areas of 15% or greater slopes by requiring strict compliance with erosion, sedimentation, and land-use district guidelines, as well as other related land-use standards for such areas.

DISCUSSION:

The receiver project site is located on Northwest Field which was developed into an airfield during World War II. At that time, Northwest Field, including the project site, was cleared and graded to meet the requirements of an airfield, including construction of two runways, taxiways, and aircraft parking aprons. Consequently, the project site has slopes of less than 15 percent. Since permeability of the soils on the project site is moderately rapid and runoff slow, erosion is not anticipated to be a problem under these conditions. All grading done at the receiver project site will be in compliance with applicable grading requirements established by GOVGUAM.

RESOURCE POLICIES:

RP 1 Air Quality:
All activities and uses shall comply with all air pollution regulations and all appropriate Federal quality standards in order to ensure the maintenance of Guam's relatively high air quality.

DISCUSSION:

Construction Period
There will be short-term impacts from dust during the clearing and grading of the project site. Mitigation measures during construction such as watering of the area will be used to minimize effects on surrounding areas.

Equipment used during these operations would create impacts from exhaust emissions. However, these impacts would be short-term and would not constitute a major adverse effect to the air quality of Guam.

Air quality would be affected from the burning of vegetation during the clearing operation. However, as previously discussed, the U.S. Navy will instruct the construction contractor to let the removed material dry as much as possible prior to burning. This should minimize adverse effects to air quality from the vegetation burning.

Operational Period
Air quality could be affected from use of the emergency generators which will be required for the receiver and operation control center (OCC). Use of these generators cannot be predicted. However, under assumptions of usage for 30 days per year, the amount level of emissions would not be significant, or only about 0.25 tons/year for nitrogen oxides. This level of pollutant emissions would not be considered a major stationary source of as defined by the Clean Air Act. As a comparison, the Clean Air Act defines a "major stationary source" as any stationary source which has the potential to emit 250 tons or more of any pollutant.

RP 2 Water Quality:
Safe drinking water shall be assured and aquatic recreation sites shall be protected through the regulation of uses and discharges that pose a pollution threat to Guam's waters particularly in estuarine, reef and aquifer areas.

DISCUSSION:

The receiver project site is located over the northern lens area of Guam, the major drinking water resource of the island. This drinking water resource will be protected from adverse impacts from accidental spills or leaks by a containment area constructed around and beneath any fuel tanks used in conjunction with the emergency generators.

The antennas and support equipment used by the receivers will not contain any hazardous or toxic substances which could affect groundwater resources. Any hazardous or toxic wastes generated at the receiver or OCC sites will be disposed according to existing procedures established on Guam for disposal of these materials.

Similarly, solid waste generated in conjunction with operation of the receiver and OCC will be disposed according to procedures used by the U.S. Navy for disposal of this type of material on Guam.

RP 3 Fragile Areas:
Development in the following types of fragile areas shall be regulated to protect their unique character: historic and archaeologic sites, wildlife habitats, pristine marine and terrestrial communities, limestone forests, and mangrove stands and other wetlands.

DISCUSSION:

Habitat Removal
Construction of the receiver would require removal of vegetation and grading the project site to meet design and operational requirements. This clearing would be confined to the approximate area of the receiver. No clearing of vegetation or cutting of trees outside of the designated area would be required. Topographic data is still required to establish finish array elevations and to confirm existing terrain elevations at the project site. However, based on available preliminary topographic data, excavation or removal of trees and other vegetation in front of the reflecting area of the receiver antenna will not be required.

The staging area for the construction contractor will be outside of the designated project site on existing paved areas of Northwest Field. No additional clearing will be required for the construction staging area.

Native Bird Habitat

Construction of the antenna arrays and ground screens would result in loss of secondary growth limestone forest which is used for habitat by endangered and other bird species found in northern Guam. The Runway site on Northwest Field was selected to reduce the amount of vegetation clearing that will be necessary.

The decline of the native bird population on Guam has caused the USFWS to propose much of northern as essential habitat, a designation used in recovery plans to identify important habitat areas and to show areas where habitat should be preserved for reintroduction of endangered forest birds and bats. Essential habitat is not defined in the Endangered Species Act and not afforded the Federal protection established for critical habitat. Notwithstanding this distinction, extensive loss of habitat could adversely affect the ability of any of the endangered species to continue to exist in the wild or to be re-introduced at a later date, should the brown tree snake be controlled.

Although information about the habitat requirements of birds in Guam is not well established, limited information suggests that the kingfisher and Mariana Crow occur at their highest densities in undisturbed mature forest. This is the type of forest was not identified on the Runway site.

There are a number of reasons for the decline of the various species of native forest birds, including decreases in undisturbed native forest and predation by the brown tree snake. Of these two reasons, predation by the brown tree snake has been shown by GOVGUAM to be the overriding cause of the decreased populations of native forest birds. The expanding range of the brown tree snake has matched the pattern of decline of many of the native forest birds.

Available information suggests that the northern plateau and coastline of Guam were last areas to experience the spread of the brown tree snake population on the island. Snakes are now found in Northwest Field and Andersen Air Force Base (AAFB). Predation by the snake on the eggs and young is believed to be the most significant reason for the endangered status of the crow and kingfisher.

The decline in population of the Mariana fruit bat is thought to be from a combination of snake predation and illegal hunting. Most recent surveys (1988) indicate a population of less than 500 to 600 individuals are on Guam. Poaching of this species remains a significant reason for their decline. Bats are prized as a fiesta food, and illegal hunting is lucrative.

An agreement between the U.S. Air Force and the U.S. Navy will be completed to determine the exact boundaries in which hunting will be restricted. The Navy will have the responsibility for maintaining security for each antenna area. This security would be in addition to the current measures maintained by Andersen Air Force Base personnel. The increased security should help to decrease instances of illegal hunting of fruit bats in the areas of the antenna arrays.

The biological survey of the Runway site conducted in February 1989 detected 12 individual Mariana crows, a Federal and GOVGUAM listed endangered species. The Mariana fruit bat, also Federal and GOVGUAM listed as endangered, was not detected in the survey. No other Federal or GOVGUAM listed or candidate endangered or threatened species were detected on the project site during the survey. The complete survey is in the Draft EIS Appendix E.

As required by the Endangered Species Act, the U.S. Navy undertook consultation with the U.S. Department of Interior Fish and Wildlife Service (USFWS) to determine the effect of the project on the endangered species on Guam. In September 1989, the USFWS issued a draft biological opinion which concluded that no critical habitat has been designated or proposed on Guam and the construction and operation of receiver at the Runway site on Guam will not be likely to jeopardize the continued existence of the Guam Micronesian kingfisher, Mariana crow, or Mariana fruit bat. In December 1989, the USFWS issued the final biological opinion with the same conclusions set forth in the September 1989 draft document. The USFWS final biological opinion is shown in Section 4.2.

The opinion noted that the Runway site for Project P-223 is under consideration for designation as critical habitat and that if a rule proposing to designate critical habitat is published, the U.S. Navy will be required to confer with the USFWS. In view of this, the U.S. Navy initiated a request to the USFWS to provide assistance in developing conservation recommendations in addition to those already provided in the biological opinion. The additional conservation recommendations sought are ones which could reduce or eliminate the impact to habitat which may be proposed as critical habitat. See Section 4.2.

National Historic Landmark

Portions of Northwest Field, including the northern runway, have been nominated as a National Historic Landmark by the Department of the Interior National Park Service. Based on discussions between the U.S. Navy and the Guam Historic Preservation Office regarding the nature of Northwest Field historic values and the impact of the ROTHR project, it was concluded that the primary value of Northwest Field was the interpretive value of archival documents. Northwest Field has not been identified with a specific significant activity such as the atomic bomb at North Field on Tinian.

Based on this assessment, a mitigative program will be implemented which will entail: (1) the collection of additional archival documents regarding the identification and locations of facilities and activities at Northwest Field; (2) photographic documentation of existing runways, taxiways, hardstands, and other existing airfield remnants; (3) the deposition of copies of archival documents and photographs into suitable repositories for curation and future interpretation or research. These repositories will include the War in the Pacific National Historical Park and the GOVGUAM library. A Memorandum of Agreement (MOA) to ensure the implementation of these mitigation measures is presently being prepared for signature by the Guam Historic Preservation Officer, the War in the Pacific National Historical Park, Andersen Air Force Base, the U.S. Navy

and the Advisory Council on Historic Preservation.

The project site does contain mangrove stands, wetlands or archaeologic sites.

RP 4 Living Marine Resources:
All living resources within the territorial waters on Guam, particularly corals and fish, shall be protected from over-harvesting and, in the case of marine mammals, from any taking whatsoever.

DISCUSSION:

This policy is not applicable to the proposed project.

RP 5 Visual Quality:
Preservation and enhancement of, and respect for the island's scenic resources shall be encouraged through increased enforcement of and compliance with sign, litter, zoning, subdivision, building and related land-use laws; visually objectionable uses shall be located to the maximum extent practicable so as not to degrade significantly views from scenic overlooks, highways, and trails.

DISCUSSION:

The receiver project site is located within established DOD facilities and not visible from public roads or residential areas. The site is located in an area not accessible to the public without permission. Thus, construction of the receiver would not degrade public views from nearby locations.

RP 6 Recreational Areas:
The Government of Guam shall encourage development of varied types of recreation facilities located and maintained as to be compatible with the surrounding environment and land uses; adequately serve community centers and urban areas, and protect beaches and such passive recreational areas as wildlife and marine conservation areas, scenic overlooks, parks and historic sites.

DISCUSSION:

Portions of Northwest Field, including the Runway site, have been used for recreational hunting under a permit procedure established by the AAFB and NAVCAMS WESTPAC. Although specific information about the Runway site is not available, data show that Northwest Field is a popular hunting area. Upon completion of construction, the area occupied by the receiver antenna and ground screen will be closed to all types of hunting. Limitation of hunting in these areas will decrease the available hunting areas on Guam.

RP 7 Public Access:
The public's right of unrestricted access shall be ensured to all non-federally-owned beach areas and all Territorial recreation areas, parks, scenic overlooks, designated conservation areas and other public lands; and agreements shall be encouraged with the owners of private and Federal property for the provision of reasonable access to, and use of, resources of public nature located on such land.

DISCUSSION:

The Runway site is located on an existing military installation not open to the public. There will be no change in this policy as a result of the project.

RP 8 Agricultural Lands:
Critical agricultural lands shall be preserved and maintained for agricultural use.

DISCUSSION:

There are no agricultural lands within the project site.

4.0 DATA AND SUPPORTING INFORMATION

4.1 REVIEW/EVALUATION OF ALTERNATIVE SITES

9 April 1990

REVIEW/EVALUATION OF ALTERNATIVE SITES

I. PURPOSE

The purpose of this review is to compare the siting alternatives for the ROTHR transmitters and receivers discussed in the Draft Environmental Impact Statement (DEIS), other site suggestions received during the comment period for the DEIS; and to identify which of the various sites satisfy the technical requirements for ROTHR operational feasibility.

II. SCOPE OF REVIEW

This review addresses all suggested locations for the ROTHR installation on Guam and Tinian for satisfaction of the technical siting requirements for accomplishing the ROTHR function. Other islands in the Mariana Islands are not evaluated for the reasons discussed in the DEIS. The ROTHR site requirements including size, physical obstruction, line of sight and terrain features required for satisfactory operations are first explained. Then the ROTHR alternative schemes for each location are evaluated against the criteria.

III. ROTHR SEPARATION REQUIREMENT

This requirement refers to the separation of the transmitter from it's designated receiver. The desired distance is 50 to 100 miles. This separation is necessary for the ROTHR to operate continuously, sending and receiving, referred to as bistatic operation. Since Guam is only 30 miles long, the 50 mile minimum requirement precludes both the transmitter and the receiver from being located on Guam. Similarly, the maximum 100 miles would be the extent that the transmitter should be distant from the receiver.

Islands combinations considered for the ROTHR in Section 2.5.1 of the DEIS are summarized as follows:

Island Combination	Separation Distance
Guam-Tinian	105
Guam-Rota	43
Guam-Saipan	118
Guam-Anatahan	190
Tinian-Saipan	10
Tinian-Rota	60
Tinian-Anatahan	85
Rota-Anatahan	145
Rota-Saipan	70
Saipan-Anatahan	75
Babelthaup-Peleliu	38

As shown above, only the combinations of Tinian/Rota, Tinian/Anatahan, Rota/Saipan and Saipan/Anatahan would meet the criteria. Combinations which included Anatahan were eliminated since the four mile long volcanic crater island has no sizeable level land to place a transmitter or receiver. Since the Guam/Tinian distance is only 105 miles and the Guam/Saipan 118 miles,

these combinations were included in the acceptable island combinations as well as the Guam/Rota which was 43 miles. The combinations for further evaluations are the following:

Guam-Tinian
Guam-Saipan
Guam-Rota
Tinian-Rota
Rota-Saipan

It should be noted that Saipan/Rota and Guam/Saipan were not included in the DEIS because there was no large level area on Saipan for the land requirement of the transmitter or receiver except for the area between Suicide cliff and Banzai cliff at the northern end of Saipan.

IV. SITING CRITERIA (GENERAL)

1. Communication Facilities

Criteria for communication sites such as the Navy's communication station at Finegayan (receiving) and Barrigada (transmitting) are established to ensure that sites are compatible for transmit and receive operations. The criteria at receive sites are critical since electromagnetic or radio frequency interference created near the receive site can make distinguishing incoming signals difficult. The reference used for site planning is attachment 1, Communications Distance Separation, from the Navy's facilities planning manual "P-80, Facility Planning Criteria for Navy and Marine Corps Shore Installations". The ROTHR transmitter and receiver also operate on the same concept as the communication site except that it receives it's own signals.

There has been miscommunication between the information stated in the DEIS about the 15 mile isolation and the 2 mile RFI free zone. The 15 mile isolation distance refers to high power transmitter stations such as the Navy's NAVCAMS WESTPAC communication transmitters at Barrigada, Guam. These high power transmitters emit radio energy that could interfere with military communication receivers operating in the vicinity. This is the reason that the NAVCAMS WESTPAC receivers are located to the north at Finegayan and away from Barrigada.

The Radio Free Zones of 1 and 2 miles mentioned in the DEIS refer to low level interference that would affect the ROTHR receiving capability. This specific requirement was established to provide a criteria for acceptable land use development near a ROTHR receiver site. It is important to note that the requirement for RFI free zones is established in the general planning criteria of attachment 1. Some of the similar requirements are listed as follows for easy reference:

High, Medium, and Low Frequency Receiver Site from:

Main highways	3000 feet
Over head power lines (over 100 KV)	2 miles
Habitable areas	1 mile
Light industry	3 miles
Heavy industry	5 miles
Primary power plants	5 miles

2. Ammunition Facilities

Certain military installations have ammunition or other ordnance either in storage, maintenance, transshipment or aboard ships/aircraft. Specific safe distances have been established by the Department of Defense for which all facilities housing personnel (occupied structures) must meet. The term used is Explosive Safety Quantity Distance or ESQD. ROTHR facilities, especially those that house personnel, must be sited outside of the ESQD. Additionally, ordnance susceptible to electromagnetic radiation must be kept a safe distance from the source of radiation, such as the ROTHR transmitters. Electrical overload of the firing or detonating mechanism can cause malfunction or even premature ignition. Military bases with ordnance activities include Andersen AFB, Naval Magazine, NAS Agana, Naval Station, and the ammunition wharf at Apra Harbor.

V. ROTHR TRANSMITTER SITE CRITERIA

The transmitter site criteria are shown in the ROTHR Antenna Site Criteria of attachment 2. The criteria will be discussed under the category of size, levelness, and clearance.

1. Size

The transmitter area is shaped like a trapezoid with the width of the base 1300 feet where the antennas are located and the width at the far out antenna field about 5,000 feet. The area of the antenna field is 217 acres. The camp for personnel facilities and the power plant would require about 10 acres for a total of 227 acres.

2. Levelness

Ground levelness ensures that the outgoing signal is not interrupted as it must be sent low to the horizon for maximum distance into the target area. Ground roughness for the first 1,000 feet, or the ground screen area, is $\pm$ 6 inches. From 1,000 feet to 3,000 feet, the roughness allowance increases from $\pm$ 15 inches to $\pm$ 30 inches. Ground roughness behind the antenna varies from 12 inches to 48 inches.

3. Clearance

Beyond the forward edge of the ground screen, there should be no obstacle protruding above a 1 degree upward slope. This slope extends for 3,000 feet where the criteria is then based on a 2 degree slope from the ground screen. This requirement is necessary to ensure no disruption of the low angle signals that attain the maximum range into the target area.

4. Special Requirement of ROTHR Transmitters

The Department of Defense has directed that Over the Horizon high frequency backscatter transmitter radars, such as the ROTHR, must be located 100 miles from CDAA (Circularly Disposed Antenna Array) operations. A CDAA, also known as the Wullenweber facility, is located at NAVCAMS WESTPAC communications receiver area at northern Guam. This 100 mile separation requirement precludes the ROTHR transmitter from being sited on Guam or Rota. However this review will cover the sites on Guam for record purpose since this separation information was not stated in the DEIS.

VI. ANALYSIS OF TRANSMITTER SITES

1. Guam Sites (See sketch 1.)

a. Northwest Field. There is adequate land to locate all three ROTHR transmitters. However Navy communications receiver antennas are located in the area and would be severly impacted by the ROTHR transmission.

b. South Finegayan/Former FAA. This location can fit three ROTHR transmitters. However this location is only three miles from the NAVCAMS WESTPAC receiver antennas and the ROTHR transmission would severely impact the communication receiving operations.

c. Harmon Annex. This location can fit three ROTHR transmitters. However this location is only five miles from the NAVCAMS WESTPAC receiver antennas and the ROTHR transmission would severely impact the communication receiving operations.

d. Barrigada. This location can fit three ROTHR transmitters. However Mt. Barrigada will block portions of the P-223 and the P-002 look direction. Also ordnance operations at NAS Agana will be affected by the electromagnetic radiation.

e. NAS Agana. This location can fit three ROTHR transmitters. However there are no vacant land as discussed in the siting for the receiver. Additionally, ordnance operations at NAS will be affected by the electromagetic radiation.

f. Nimitz Hill/Lonfit. This location can fit two transmitters on the Navy property. Three transmitters could be sited in the area if extended into adjacent private property. This area is hilly and the transmitter would have to be built on the mountain ridges to maintain line of sight. Construction would be difficult to attain the required clearance.

g. Orote Point. This location can fit three ROTHR transmitters. However the ROTHR transmitters would not be compatible with the ordnance operations at the new ammunition wharf at Adotgan Point and would require closing of the only ammunition port on Guam. Additionally, manned facilities cannot be sited within the ESQD arc from the ammunition wharf, which covers all the unused and open areas of Orote Peninsula.

h. NAVMAG. Locating a high power transmitter in this area is not allowed due to the unsafe condition created by the ordnance maintenance and storage conducted at the magazine facility. Additionally, manned facilities such as the ROTHR vans and support buildings are not allowed to be built within the ESQD arc from the ordnance storage facilities.

i. Dandan. This location can fit three ROTHR transmitters. The area within the Dandan estate is reasonably level.

j. Bubulao. This location can fit three ROTHR transmitter. However this location is very hilly and construction would be difficult to attain the required line of sight clearance over the next mountain in the foreground.

k. Pulantat. The location can fit three ROTHR transmitters. However Mt. Alutom and Mt. Macajna would partially block the line of sight, and the hilly terrain makes construction difficult to attain clearance over the next mountain in the foreground.

l. Andersen South/Marbo Annex. This location can fit three transmitters. However this location is only five miles from the NAVCAMS WESTPAC receiver antennas and the ROTHR transmission would severely impact the communication receiving operations.

2. Tinian Sites

a. Northern sites. This area can fit three ROTHR transmitters for three alignments as shown in sketch 2. The land is level with no terrain obstructions in front of the antennas.

b. Northern sites out of the National Historic Landmark. Only two ROTHR transmitters can be sited in the level area back from the shore line as shown in sketch 3. It should be noted that a transmitter cannot be in the rear of another ROTHR transmitter due to residual back reflection of the radiated energy which would impact the transmission signals.

c. Eastern site. This location is on a plateau which can fit one ROTHR transmitter. The area is bordered on three sides by steep slopes which restrict the alignment to P-002 as shown in sketch 4.

d. Western site. This location is on gently sloping terrain and can fit three ROTHR transmitters. However the P-002 line of sight would be partially blocked by Mt. Lasso. Therefore only the P-223 and P-225 would be feasible from this location as shown in sketch 5.

3. Saipan Site

The only level and vacant area that can fit the ROTHR transmitter is on the northern end of the island. This area, called Banadera, is located between two significant World War II historical sites on Saipan. On the north is Banzai cliff and on the west, Suicide cliff. Both are major tourist attractions. Three transmitters can be sited, but Suicide cliff on the west partially obstructs the P-225 line of sight as shown in sketch 6. The size of the area would also limit the siting to one transmitter, either P-223 or P-002, since the shape of the parcel would have one either in the rear or in the front of the other as shown in sketch 6, which is not operationally acceptable.

VII. ROTHR RECEIVER SITE CRITERIA

The receiver site criteria are shown in the ROTHR Antenna Site Criteria of attachment 2 and will be discussed under the category of size, levelness, and clearance.

1. Size

a. Length. The length of the antenna array is 8574 feet, which consist of 372 antenna poles spaced 23 feet apart, about the length of the runway at Guam International Airport and the Saipan International Airport.

There will be two rows of antenna poles for a total of 744 poles. The length of the antenna array gives the system the reception capability to cover the low to high frequency wave range, with the advantage of utilizing different frequencies to find and differentiate between targets and false targets caused by the atmospheric conditions between the ROTHR site and the coverage area beyond the horizon.

b. Width. The width of the receiver site is 1000 feet as shown in attachment 2. It consist of a 135 feet ground screen which includes the two rows of antennas, 535 feet of reflecting area in front of the antenna ground screen, and 300 feet of reflecting area behind the ground screen. This width is necessary to ensure the accurate reception of the returning signal from the target area.

2. Levelness

a. Ground levelness ensures that the returning signals are not distorted when they reflect off the ground at the receiving antennas. The deviation acceptable under the ground screen is the strictest at $\pm$ 1 inch within 20 feet of the antenna. The total area covered by the 8,574 feet long by 1000 feet wide footprint must be within specified levelness. The most difficult requirement is the allowable deflection of the antenna pole which is 1 inch from a straight line extending 8,574 feet, from the first antenna pole to the 372nd pole. This means that each antenna cannot be 1 inch higher or lower than the straight line between the first and last antenna pole more than 1 1/2 mile away.

3. Clearance. This requirement refers to obstacles in the line of sight starting from the forward edge of the ground screen. For the first 3,000 feet, there should be no obstacles protruding above a 1 degree upward slope from the front edge of the ground screen. From 3,000 feet forward, there should be no obstacle protruding above a 2 degree upward slope from the ground screen. This means for example that at 1,000 feet in front of the ground screen, there should be no building, hill or wooded forest 17 feet higher than the ground elevation at the ground screen. At 3,000 feet it would be 52 feet, and at one mile it would be 184 feet. This clearance is necessary to prevent blockage or distortion of the returning radio signals so precise information of the target area is received.

VIII. ANALYSIS OF RECEIVER SITES

1. Guam Sites are the only ones actively considered because of the reasons specified in Section V. These sites are:

a. Northwest Field and NAVCAMS Finegayan. Sketch 7 shows the alternative sites that were in the DEIS. The area is generally level.

The sites in this area meet the criteria for ROTHR since this area is already the communication receive or quiet area. There are some restrictions that must be met to avoid interference with existing operations. These include the Navy Security Group operations at the Wullenweber Antenna facility and the Air Force Satellite communications facility at Northwest Field.

Located at the northwest and the northeast coast, snuggled between the Navy and Air Force lands are two private properties which are currently undeveloped. These two estates utilize military roads for access through Air Force lands. The Artero estate uses the perimeter road that routes within one mile of the Wullenweber facility and the NAVCAMS WESTPAC receiver antennas. Existing military operations and the proposed ROTHR project will not prevent the development of the Artero and Castro property located below the cliff line based on development plans disclosed to date.

b. South Finegayan/Former FAA. This area is generally level but is minimal in length. It can fit one ROTHR of the P-225 alignment as shown in sketch 8. Existing residential housings are located within one mile in front of the receiver. A two story FAA headquarters building is located in the center of the area and will protrude into the ROTHR line of sight.

c. Harmon Annex. This area is large but can fit only one ROTHR of P-223 or P-225 alignment. The third alignment, P-002, would cross Route 3, a major highway as shown on sketch 9. At the west boundary is the Navy Tanguisson power plant, less than one mile from the center of the Harmon Annex. Power distribution line run through the western part of the area which would be in front of the ROTHR's look direction. Also located in the parcel is the GOVGUAM sewage treatment plant. The plant and high ground is not expected to protrude into the ROTHR line of sight. The land is generally flat but has depressions in the mid-eastern section of the area.

d. Barrigada. This area can fit one ROTHR of three alignments as shown in sketch 10. However the following items preclude satisfactory ROTHR operation:

(1) Existing Navy communication transmitters on this parcel will interfere with the ROTHR receive capability.

(2) Mount Barrigada, which borders the parcel on the north, blocks the look direction of P-223 and P-002.

(3) Route 16, a major highway, borders the western side and would interfere with the ROTHR receive capability. Civilian development exists on the western boundary which is a possible source of RF interference.

e. NAS Agana. The air station runways are also used by the Guam International Airport. The air station, including the runways, has the land area for one ROTHR of the P-225 alignment as shown on sketch 11. The site is not logical for locating a ROTHR because the receiver would completely overlay the runway and permanently close the airport. Other factors adversely affecting the ROTHR operation are the highway and existing developed commercial industries surrounding the air station.

f. Nimitz Hill/Lonfit. The military lands at Nimitz Hill do not have the land area for even one ROTHR as shown in sketch 12. The alignments shown extend into private lands. However, since the private lands are undeveloped, the area would be ideal for the ROTHR except for the mountainous terrain with elevation difference of 300 feet. To site a ROTHR in this type of terrain, the 8,600 feet long antenna plane would have to be constructed on the mountain ridges to attain a clear line of sight over the next mountain. The enormity of filling in valleys of 100-300 feet makes this location infeasible.

g. Orote Point. This site can fit just one ROTHR for the P-002 alignment as shown in sketch 13. The P-223 and P-225 alignments would extend either into the ocean or into Apra Harbor. The P-002 alignment would be on generally vacant land. This vacant appearance is due to the area being within the ESQD arc from the new ammunition wharf at Adotgan Point located on the north side of Orote Peninsula. All inhabited buildings, such as the ROTHR vans and support building, not associated with ordnance operations cannot be sited on the Peninsula as explained in Section IV. Therefore, this location is not acceptable since the ROTHR vans must be sited in the center of the antenna array.

h. NAVMAG. The ammunition storage area can fit two alignments as shown in sketch 14. However, this area is encumbered by the ESQD arcs from the ordnance storage operations and therefore this area is not acceptable for safety reasons. Additionally, the area is hilly with mountains blocking the western and northern directions which makes the location unacceptable for ROTHR operations.

i. Dandan. This site can fit three ROTHRs for three alignments as shown in sketch 15. The site is fairly level in the center section of the Dandan estate but is hilly on the north, west and south boundaries. The location is ideal since the adjoining areas are undeveloped and with little or no significant vehicular traffic. To accommodate three ROTHR receivers, the three receivers would be off the middle section of the Dandan estate and partially into the hilly area as shown in sketch 15. In 1989, there has been interest by land developers to acquire lands at Dandan and vicinity for construction of resort complex with hotels, condominium and golf courses. The effect of electromagnetic interference to ROTHR cannot be ascertained at this time.

j. Bubulao. This site could fit three ROTHRs for three alignments as shown in sketch 16. The area is away from urban development that could affect the ROTHR receive operations. This area is northwest of Dandan and in the hilly central area of southern Guam. For this same reason the ROTHR receiver would have to be built nearly on the top of hills and span across the valleys in order to maintain line of sight over the mountains in front. Therefore this area is not considered feasible for the ROTHR receiver due to the hilly terrain. Additionally, construction at this site would affect Ugum River and it's tributaries.

k. Pulantat. This site could fit three ROTHRs for three alignments as shown in sketch 17. The location is away from urban development which could affect the ROTHR operations but is extremely hilly. Additionally the west direction is blocked by Mt. Alutom and the northwest by Mt. Macajna.

Only the P-002 direction is clear of mountains in the front but the hilly terrain makes construction at this location difficult to attain the required clearance.

l. Andersen South/Marbo Area. This site can fit the three ROTHR alignments as shown in sketch 18. However all alignments would be affected by the vehicular traffic on the major highway on the north boundary and the highway on the south which routes through the south portion of the area. Mount Barrigada, located two miles west, would block portions of the line of sight for the P-225 alignment. This location is not operationally acceptable due to electromagnetic interference from heavy vehicular traffic.

IX. Summary

All locations presented are summarized with the effect of the siting criterion to the proposed ROTHR system(s) and/or to existing operations as follows: (0) no affect, (1) some limitation, (2) significant limitation and (3) major problem

RECEIVER ALTERNATIVES

Location	Siting Criteria				
	Size	Levelness	Clearance	RFI	Exp Safety
Northwest Field	0	0	0	0	1
South Finegayan	1	0	1	1	0
Harmon Annex	1	0	0	1	0
Barrigada	1	0	2	3	0
NAS	2	0	0	3	0
Nimitz Hill	1	3	1	0	0
Orote Point	2	0	0	0	3
NAVMAG	0	2	2	0	3
Dandan	0	1	0	0	0
Bubulao	0	3	1	0	0
Pulantat	0	3	2	0	0
Andersen South	0	0	1	3	0

TRANSMITTER ALTERNATIVES

Location	Siting Criteria				
	Size	Levelness	Clearance	RFI	Exp Safety
Northwest Field	0	0	0	3	3
South Finegayan	0	0	0	3	0
Harmon Annex	0	0	0	3	0
Barrigada	0	0	2	0	3
NAS	2	0	0	0	3
Nimitz Hill	0	3	1	0	0
Orote Point	0	0	0	0	3
NAVMAG	0	2	2	0	3
Dandan	0	1	0	0	0
Bubulao	0	3	1	0	2
Pulantat	0	3	2	0	0
Andersen South	0	0	1	3	0
Tinian Northern	0	0	0	0	0
Tinian Eastern	2	1	0	0	0
Tinian Western	0	0	1	0	0

As shown by the foregoing narrative and tabular comparisons, placing the transmitter on Northern Tinian and the receiver at Northwest Field on Guam, while not meeting all stated criteria, (e.g. 100 mile maximum separation) represents the best available solution, within the limits posed by technical requirements.

TABLE 131
COMMUNICATIONS DISTANCE SEPARATIONS

Minimum isolation distances for communications sites have been established by NAVELEXSYSCOM as follows:

HIGH, MEDIUM AND LOW FREQUENCY RECEIVER SITE FROM:

HIGH POWER, VERY LOW FREQUENCY (VLF) TRANSMITTER STATIONS.....25 MILES

HIGH POWER, LOW FREQUENCY (LF) AND HIGH FREQUENCY (HF) TRANSMITTER STATIONS.....15 MILES

TRANSMITTER STATIONS NOT UNDER NAVY CONTROL (FIELD INTENSITIES ALSO GOVERN-SEE NAVELEX 0101,103).....5 MILES

RUNWAYS AND GLIDE PATHS
- AERONAUTICAL RECEIVERS.....1,500 FEET
- GENERAL COMMUNICATIONS RECEIVERS..... 5 MILES

TELETYPE AND OTHER ELECTROMECHANICAL SYSTEMS
- LOW LEVEL OPERATIONS.....NO MINIMUM
- HIGH LEVEL OPERATIONS IN SHIELDED ROOM.....NO MINIMUM
- HIGH LEVEL OPERATIONS IN UNSHIELDED ROOM-LARGE INSTALLATION (COMMUNICATIONS CENTER)...2 MILES FROM NEAREST ANTENNA
  -SMALL INSTALLATION (1 TO 6 INSTRUMENTS).....200 FEET FROM NEAREST ANTENNA

MAIN HIGHWAYS FROM NEAREST ANTENNA (MAXIMUM HOURLY TRAFFIC COUNT OVER 1200).....3,000 FEET

OVERHEAD HIGH TENSION POWER LINES AND RECEIVING STATION FEEDERS-(LESS THAN 100KV)....1,000 FEET FROM NEAREST ANTENNA
-(OVER 100KV).....2 MILES FROM NEAREST ANTENNA

HABITABLE AREAS (BEYOND LIMITS OF RESTRICTION).....1 MILE

AREAS CAPABLE OF INDUSTRIALIZATION (BEYOND LIMITS OF RESTRICTION)
- LIGHT INDUSTRY.....3 MILES
- HEAVY INDUSTRY.....5 MILES

RADAR INSTALLATIONS.....SEE NAVELEX 0100,103 TABLE 4-1

PRIMARY POWER PLANTS.....5 MILES

HIGH, MEDIUM AND LOW FREQUENCY TRANSMITTER SITE FROM:

TRANSMITTER STATIONS NOT UNDER NAVY CONTROL.....3 MILES

RUNWAYS AND GLIDE PATHS FOR AERONAUTICAL TRANSMITTING AT AIR STATIONS.....1,500 FEET

MAIN HIGHWAYS.....1,000 FEET

HABITABLE AREAS (FROM NEAREST ANTENNA)
- HF TRANSMITTER.....0.5 MILE
- LF/MF TRANSMITTER.....1 MILE

OVERHEAD HIGH TENSION POWER LINES (FROM TRANSMITTER STATION FEEDERS).....1,000 FEET

REMOTE VHF/UHF TRANSMITTER BUILDING FROM:

OPERATIONS BUILDING AND CONTROL TOWER.....1,000 FEET

VHF/UHF RECEIVER BUILDING AND HOUSING AREA.....1,500 FEET

REMOTE VHF/UHF RECEIVER SITE FROM:

VHF/UHF TRANSMITTER SITE.....1,500 FEET

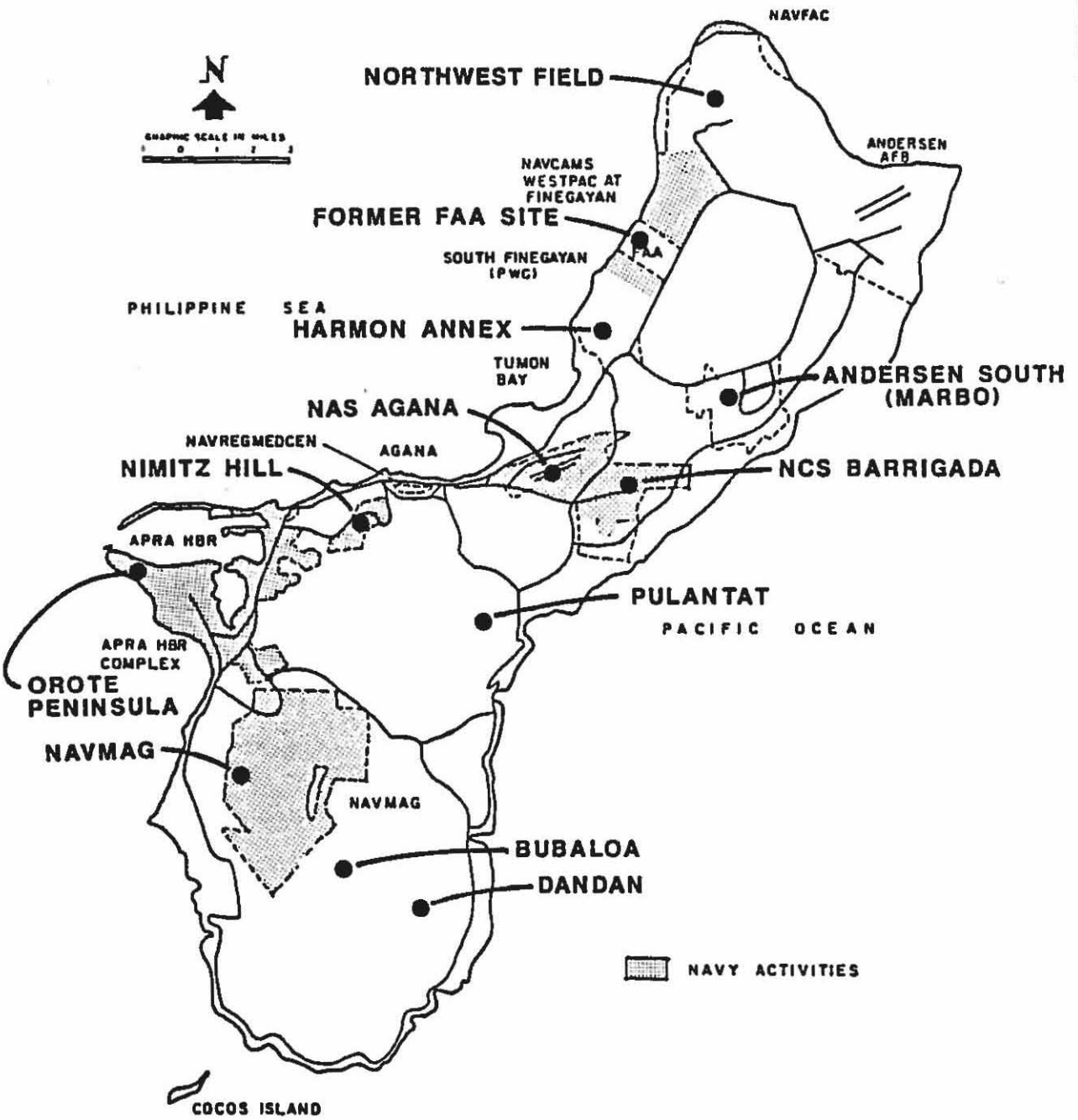
HIGHWAYS, INDUSTRIAL AND HOUSING AREAS.....1,000 FEET

RADAR INSTALLATIONS.....1,500 FEET

WULLENWEBER ANTENNA FACILITY

NO OBSTRUCTION SHOULD PROTRUDE ABOVE A THREE DEGREE ANGLE OF ELEVATION MEASURED FROM THE BASE OF THE HIGH BAND ANTENNA ELEMENTS.

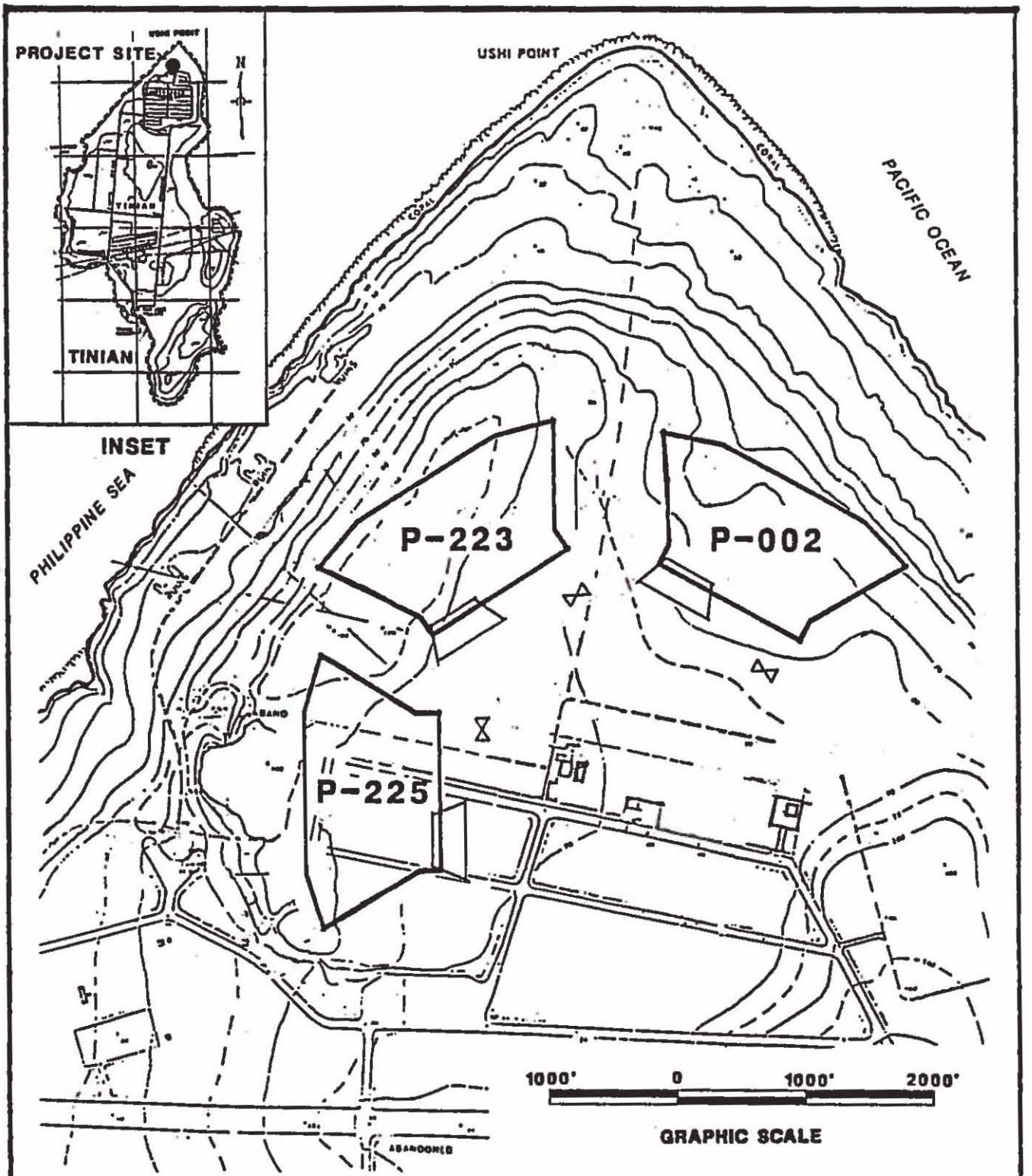
SEPARATION DISTANCES FROM POSSIBLE SOURCES OF INTERFERENCE ARE SIMILAR AS FOR OTHER HIGH, MEDIUM, AND LOW FREQUENCY RADIO RECEIVER SITES. FOR SPECIFIC GUIDANCE, SEE NAVELEX SHORE CRITERIA SECURITY GROUP STATIONS 0101,108.



GUAM

ALTERNATE ROTHR TRANSMITTER SITES

SKETCH

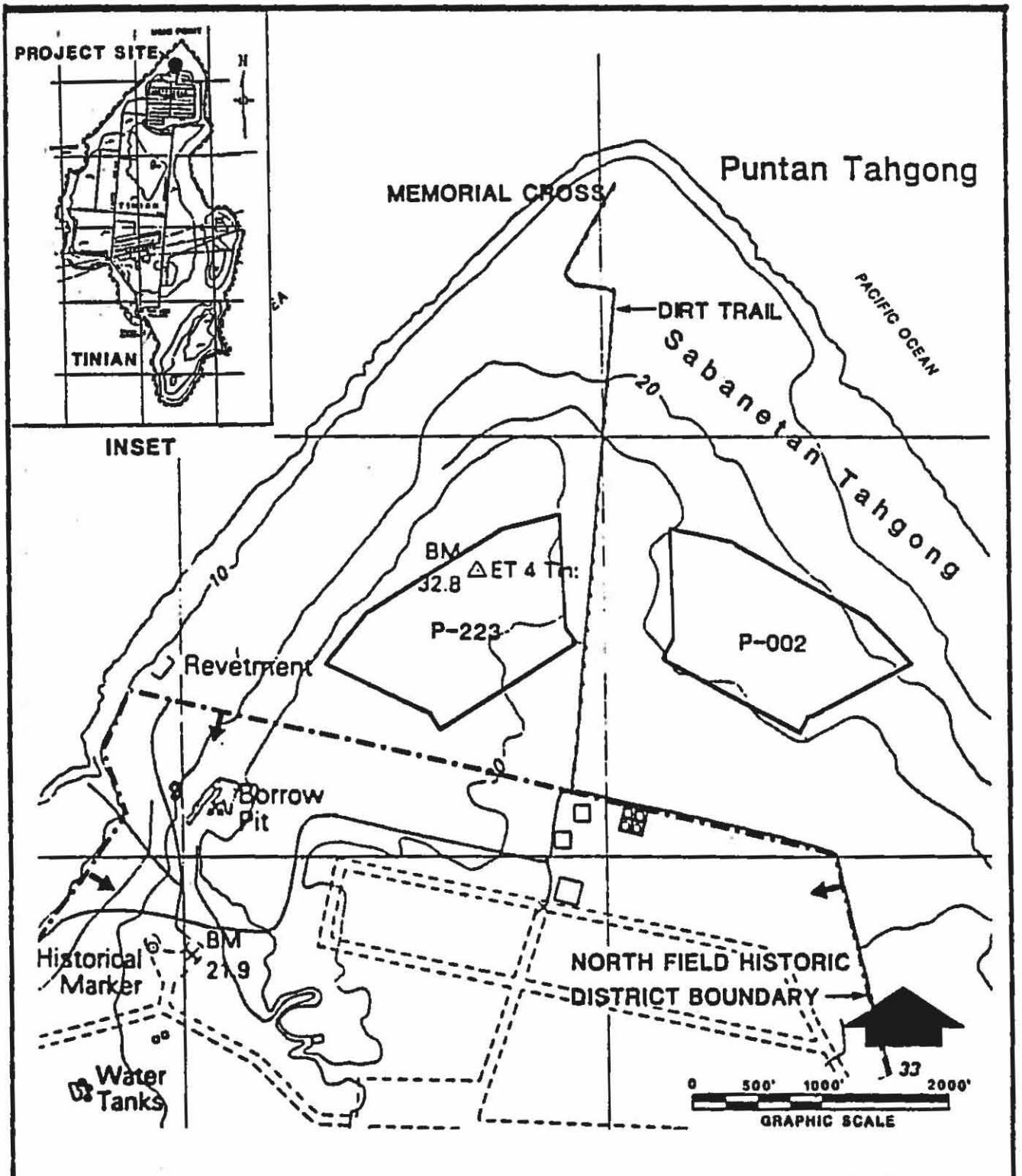


TINIAN

NORTHERN SITE

LOCATION FOR ROTHR TRANSMITTER

SKETCH 2

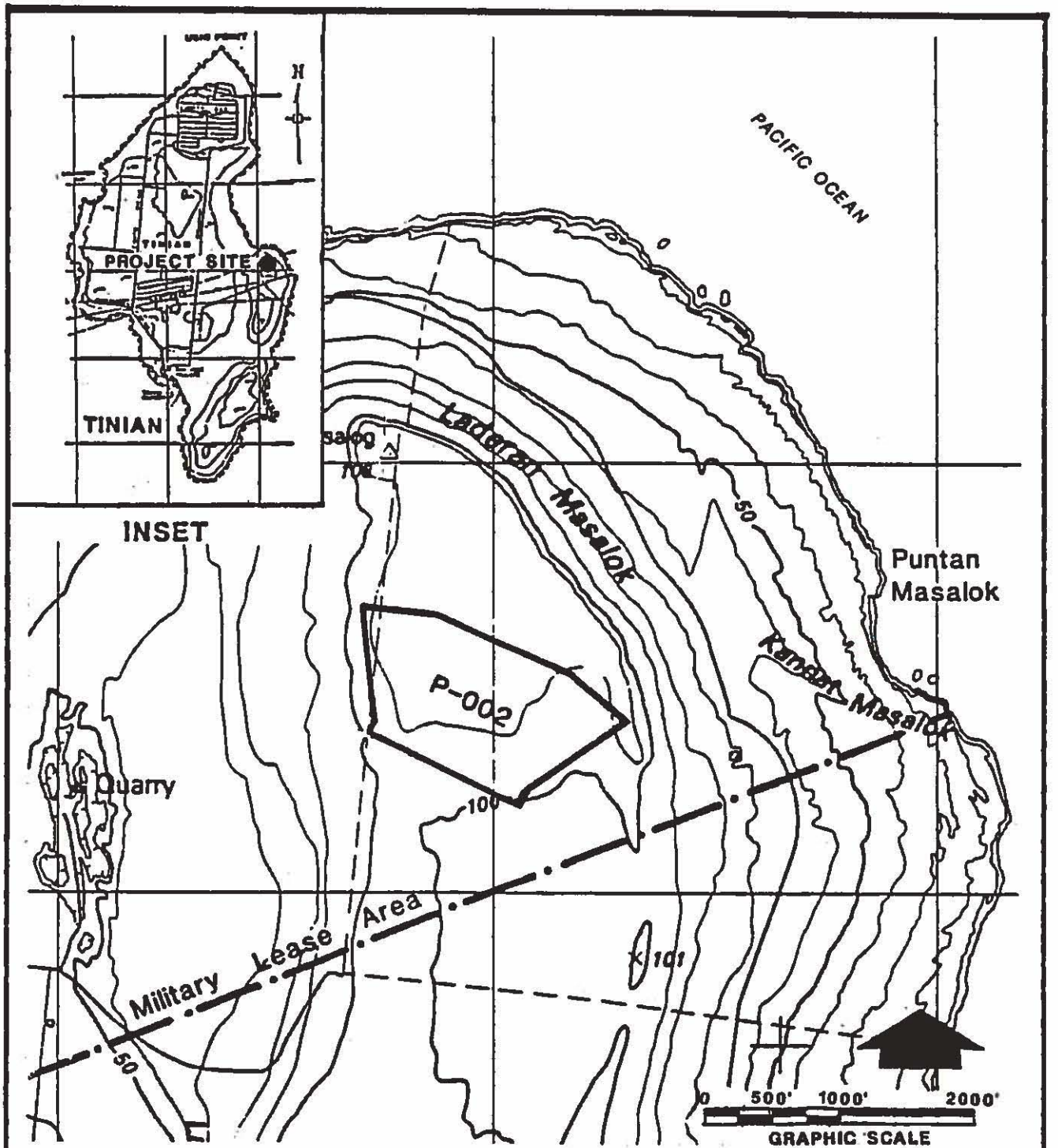


TINIAN

NORTHERN SITE

LOCATION FOR ROTHR TRANSMITTER OUT OF HISTORIC DISTRICT BOUNDARY

SKETCH 3

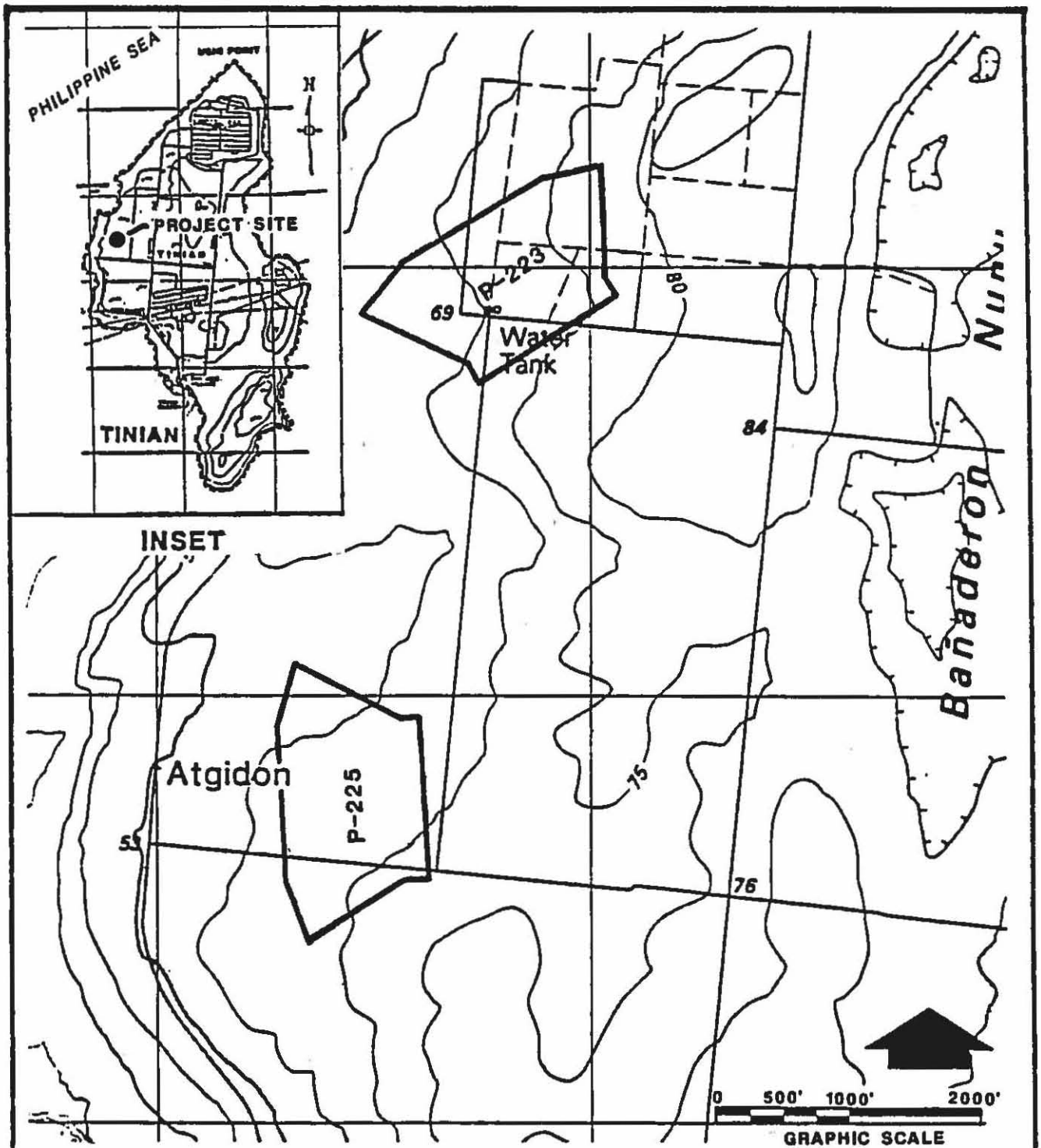


TINIAN

EASTERN SITE

LOCATION FOR ROTHR TRANSMITTER

SKETCH 4

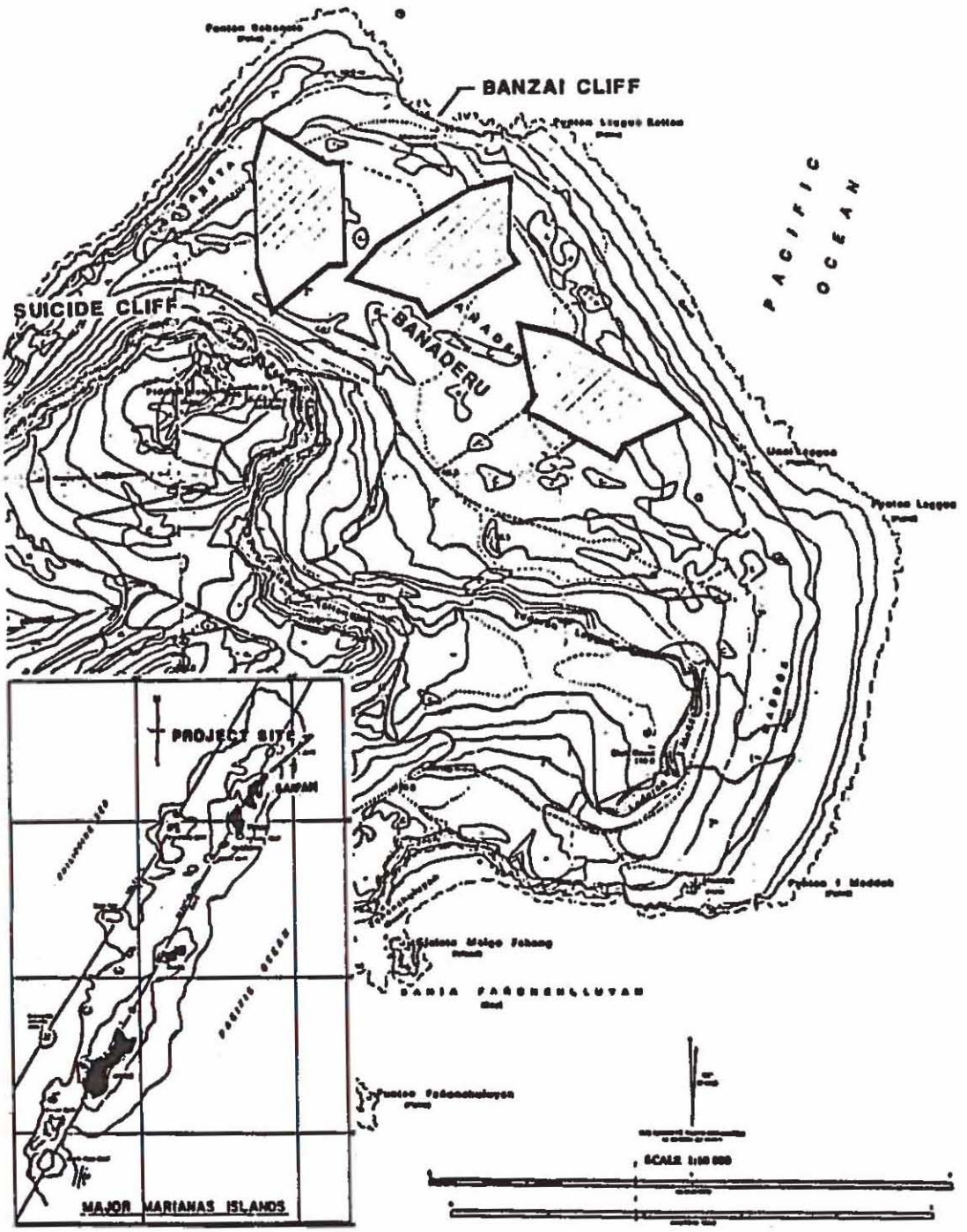


TINIAN

WESTERN SITE

LOCATION FOR ROTHR TRANSMITTER

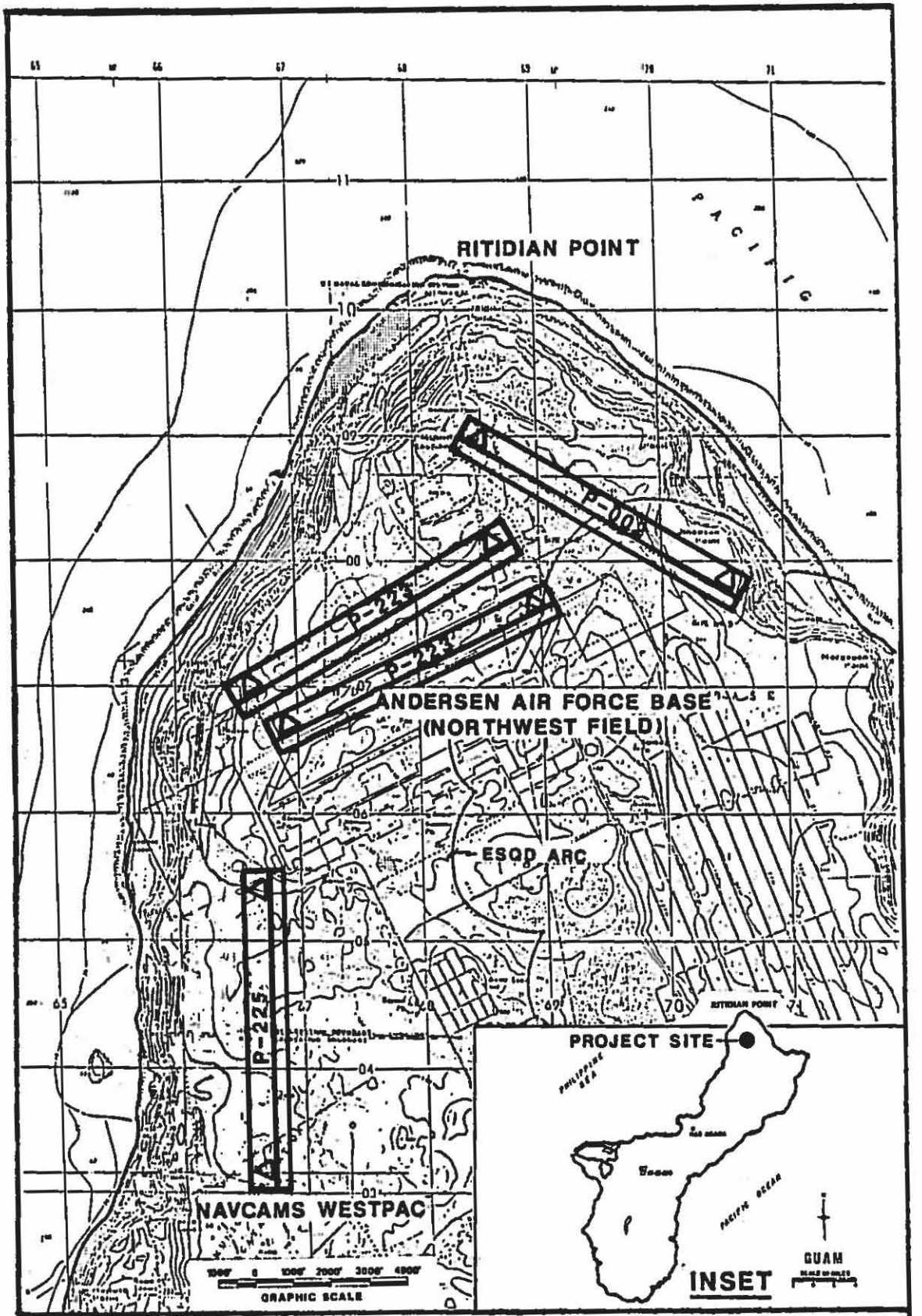
SKETCH



SAIPAN

LOCATION FOR ROTHR TRANSMITTER

SKETCH

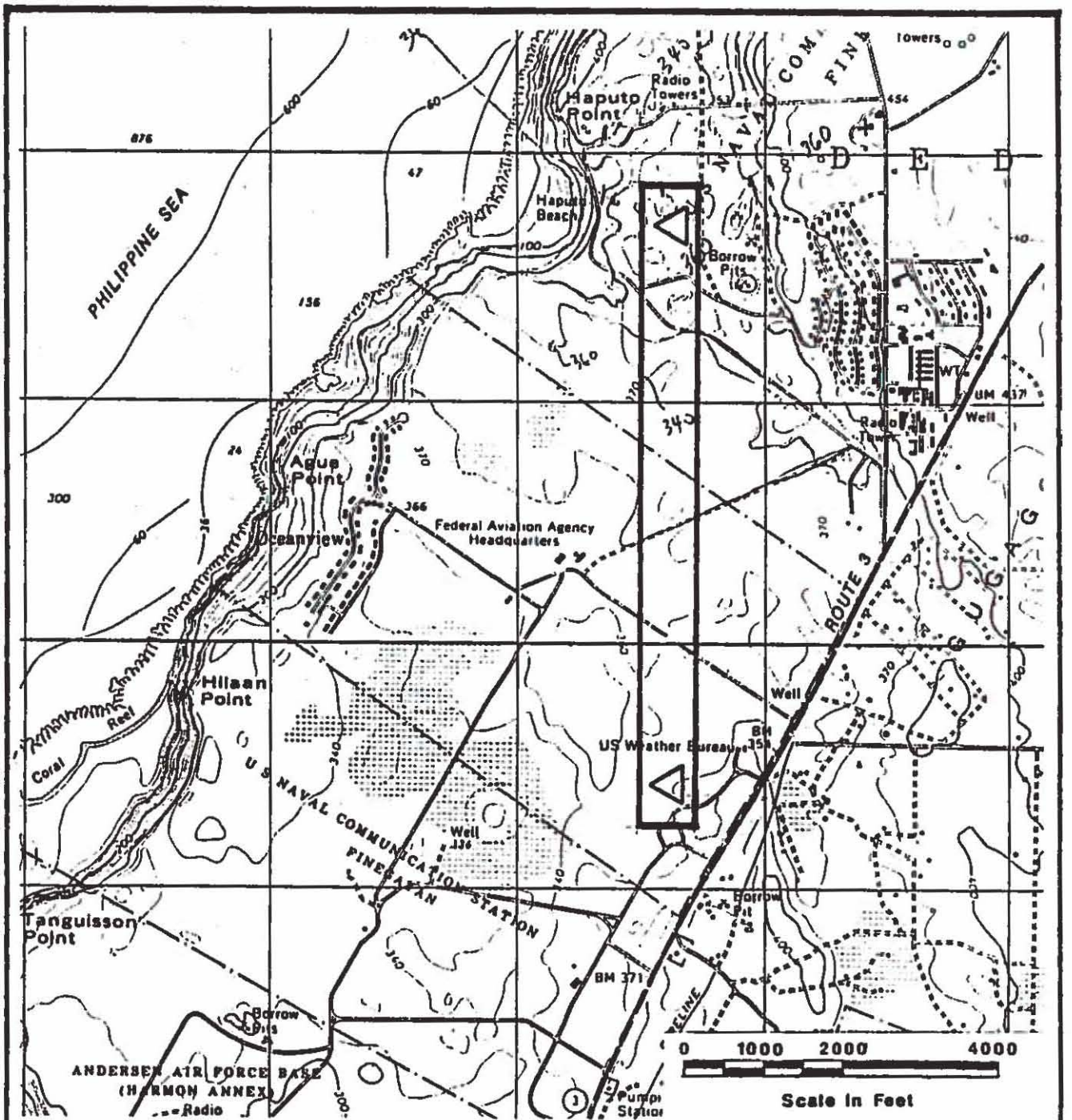


GUAM

NORTHWEST FIELD

LOCATION FOR ROTHR RECEIVER

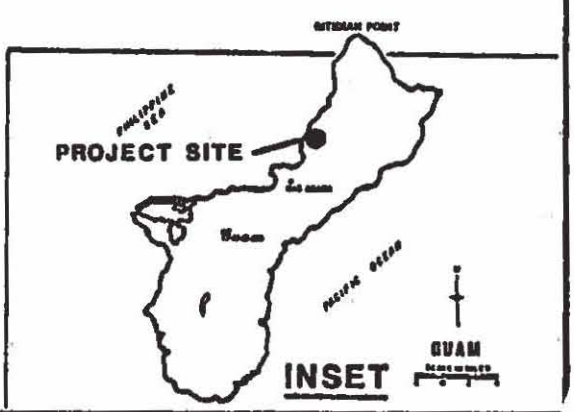
SKETCH 7



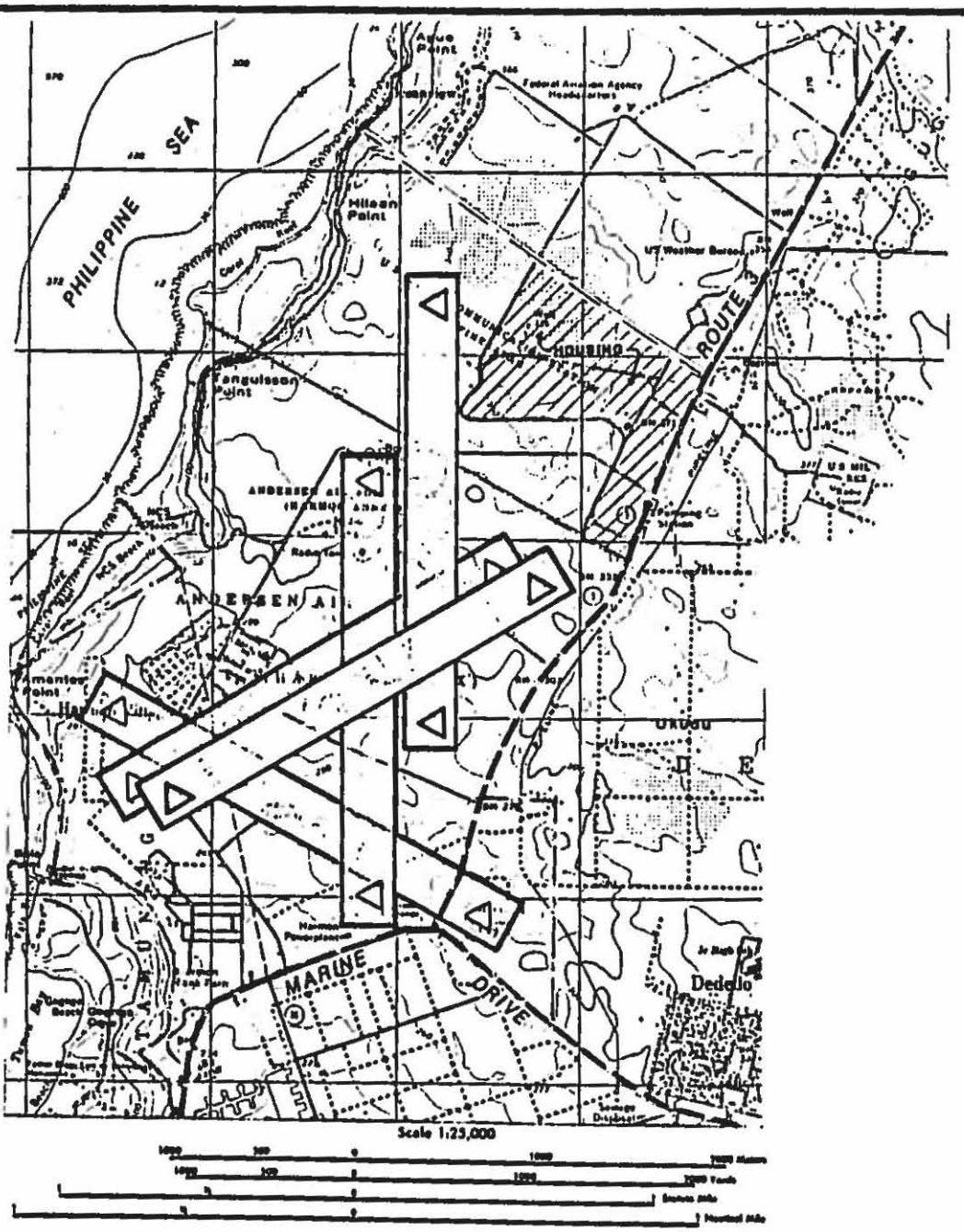
GUAM

SOUTH FINEGAYAN

LOCATION FOR ROTHR RECEIVER



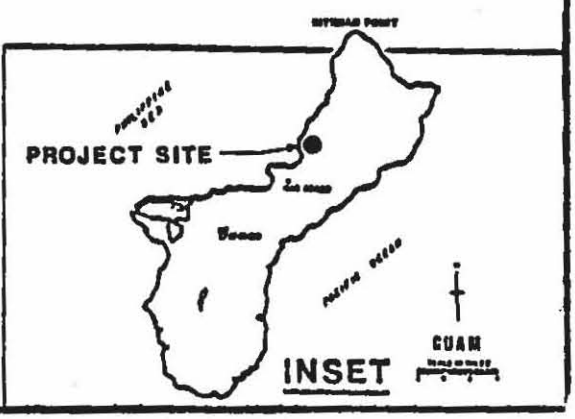
SKETCH I



GUAM

HARMON ANNEX

LOCATION FOR ROTHR RECEIVER



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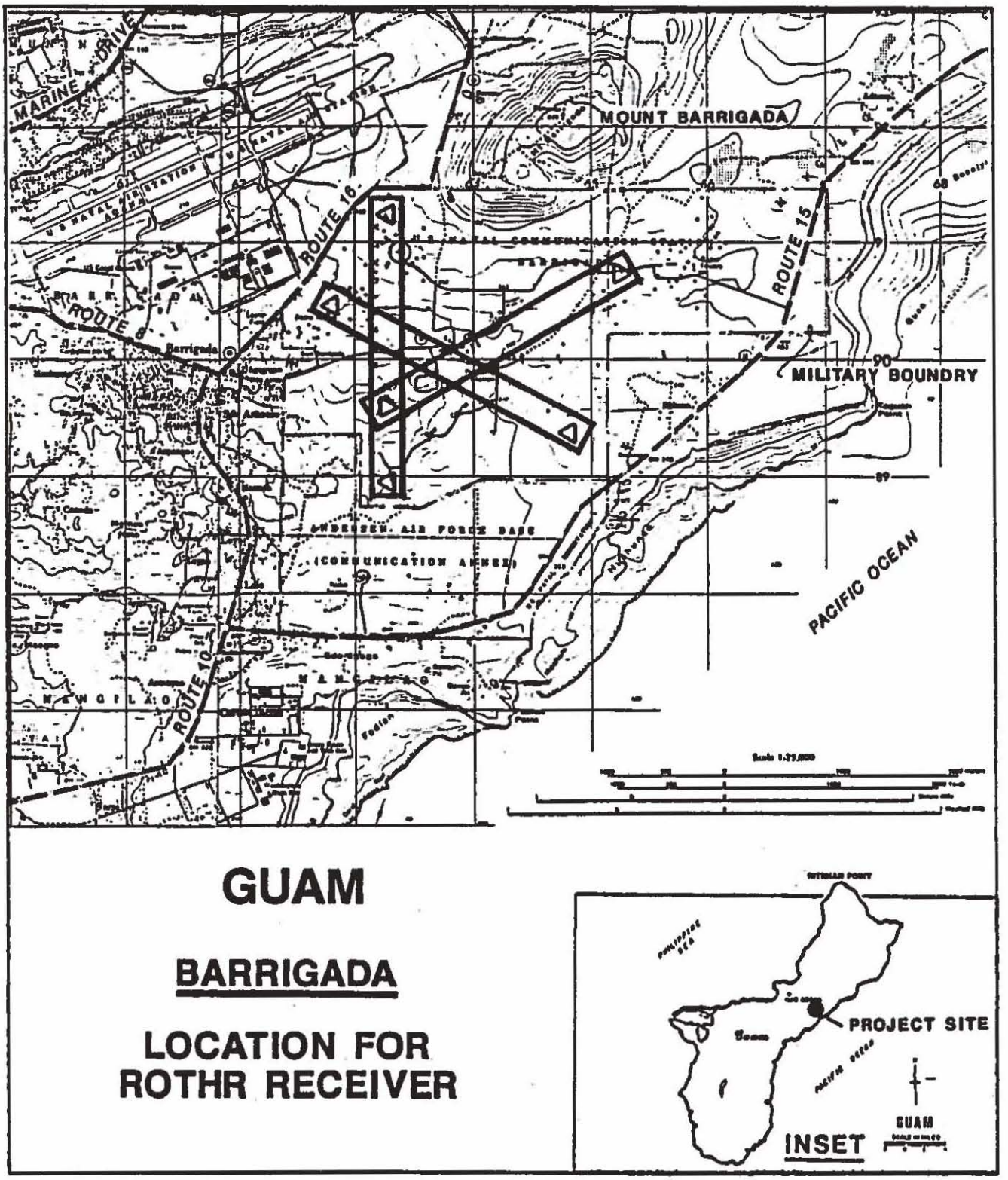
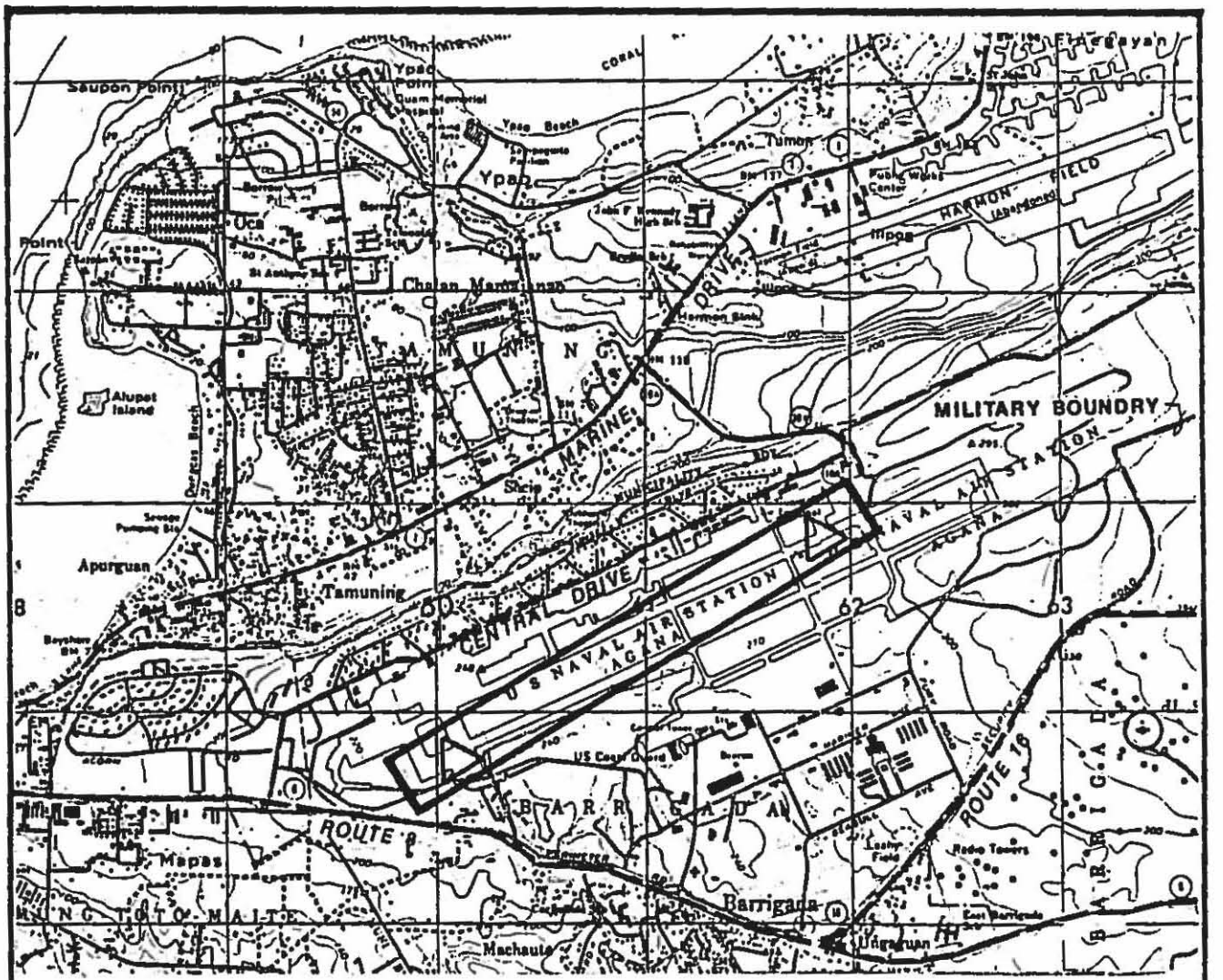

MARINE DRIVE
MOUNT BARRIGADA
ROUTE 16
ROUTE 15
ROUTE 8
ROUTE 10
MILITARY BOUNDRY
PACIFIC OCEAN
ANDERSEN AIR FORCE BASE
COMMUNICATION ANNEX
Barrigada
GUAM
BARRIGADA
LOCATION FOR
ROTHR RECEIVER
PROJECT SITE
INSET

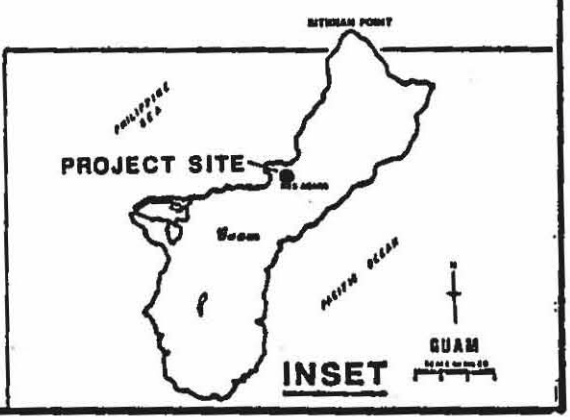
SKETCH 10



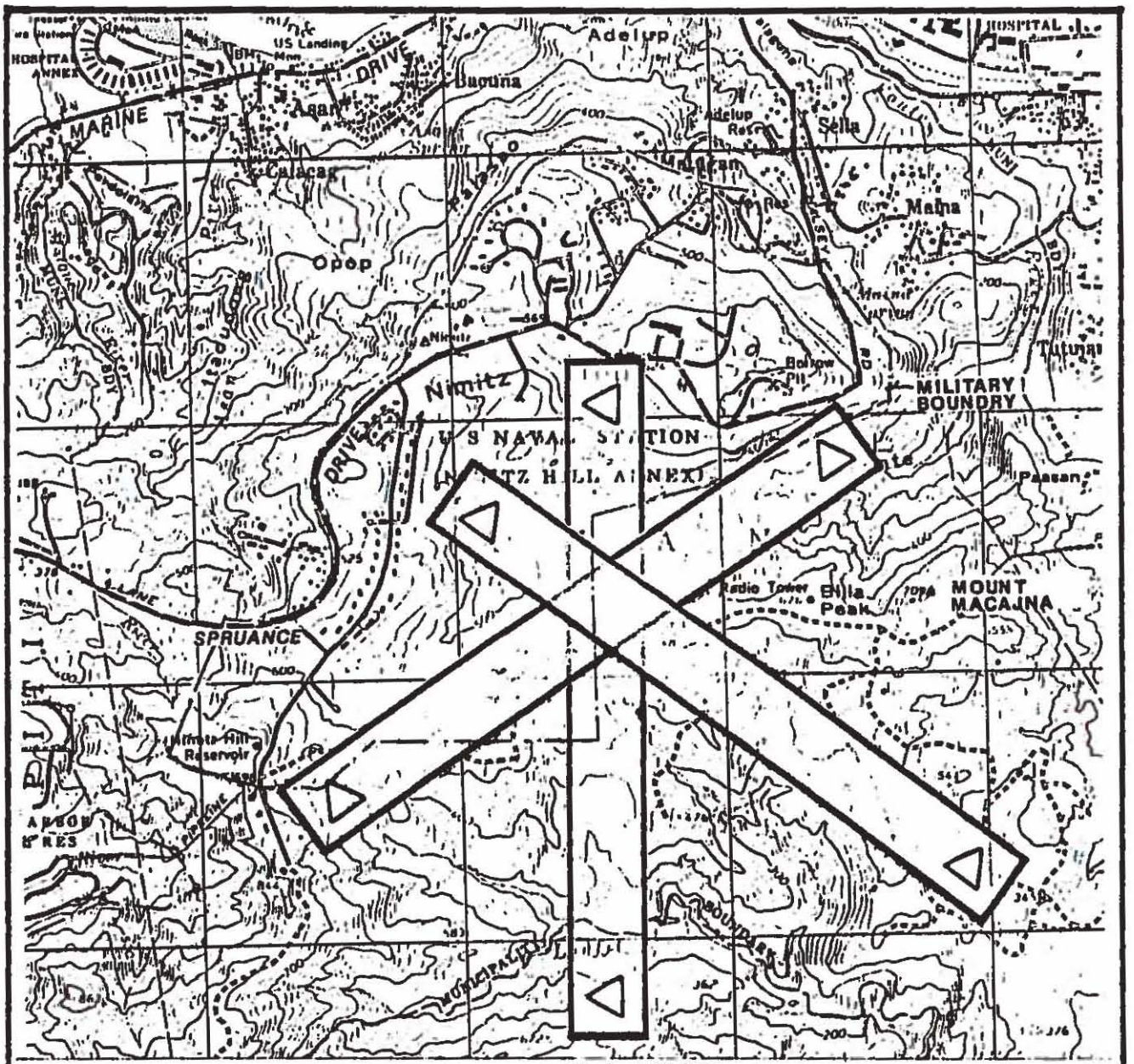
GUAM

NAS AGANA

LOCATION FOR ROTHR RECEIVER



SKETCH 11



Scale 1:25,000

1000 500 0 1000 2000 Meters

1000 500 0 1000 2000 Yards

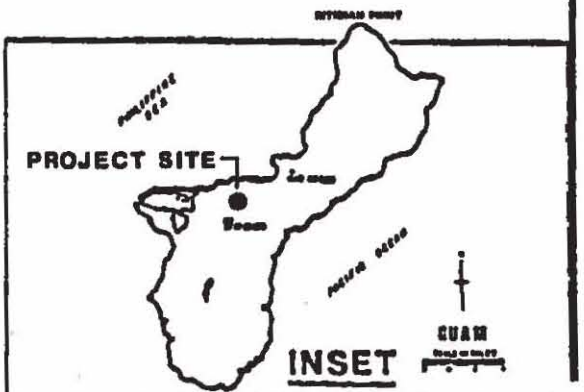
1 ½ 0 1 Statute Mile

1 ½ 0 1 Nautical Mile

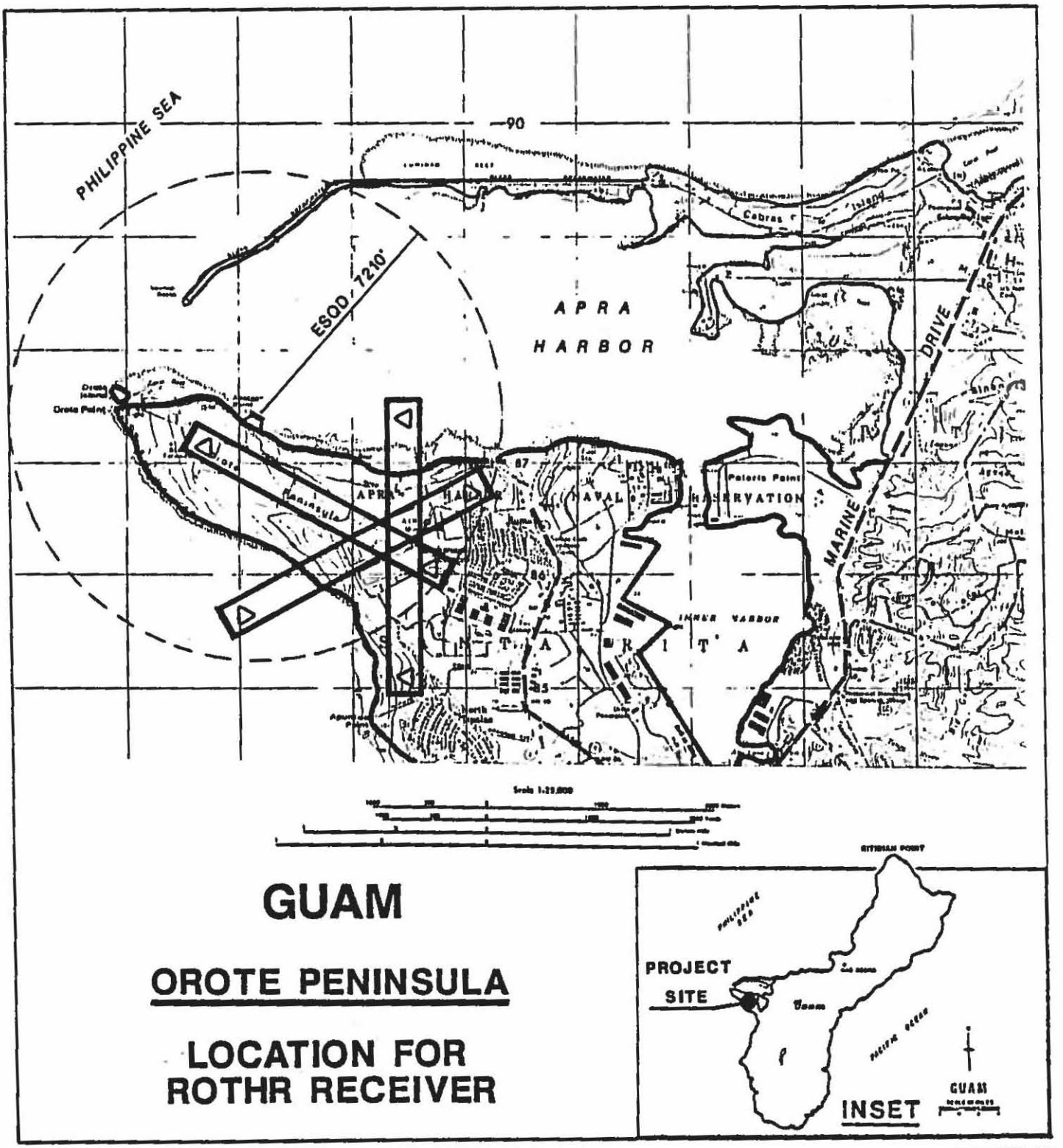
GUAM

NIMITZ HILL ANNEX/LONFIT

LOCATION FOR ROTHR RECEIVER



SKETCH

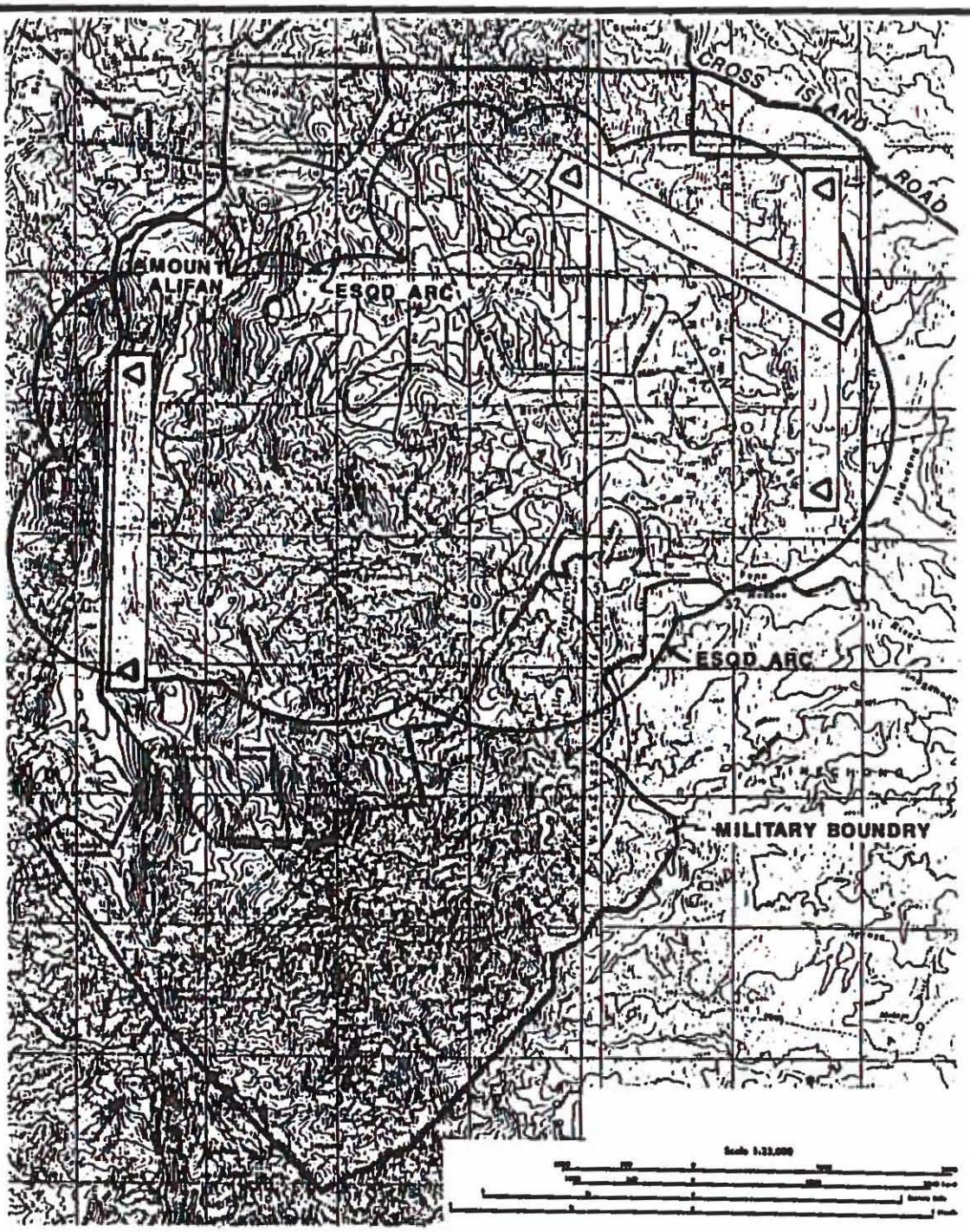


GUAM

OROTE PENINSULA

LOCATION FOR ROTHR RECEIVER

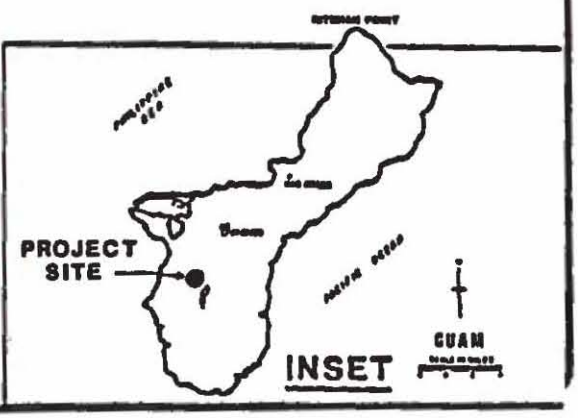
SKETCH 13



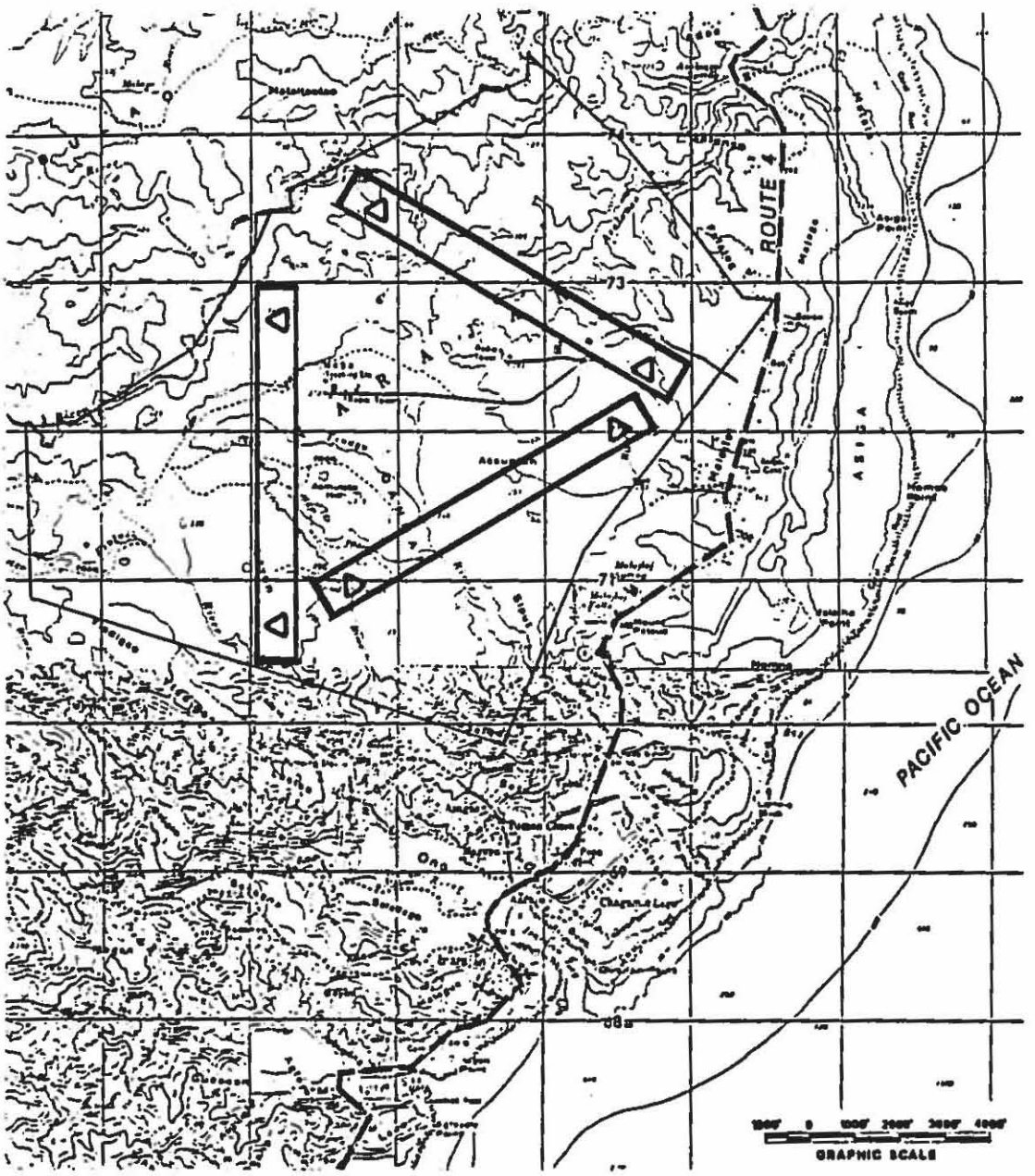
GUAM

NAVAL MAGAZINE

LOCATION FOR ROTHR RECEIVER



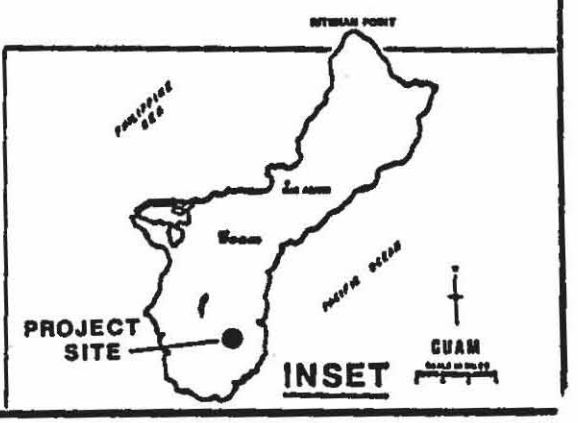
SKETCH 1



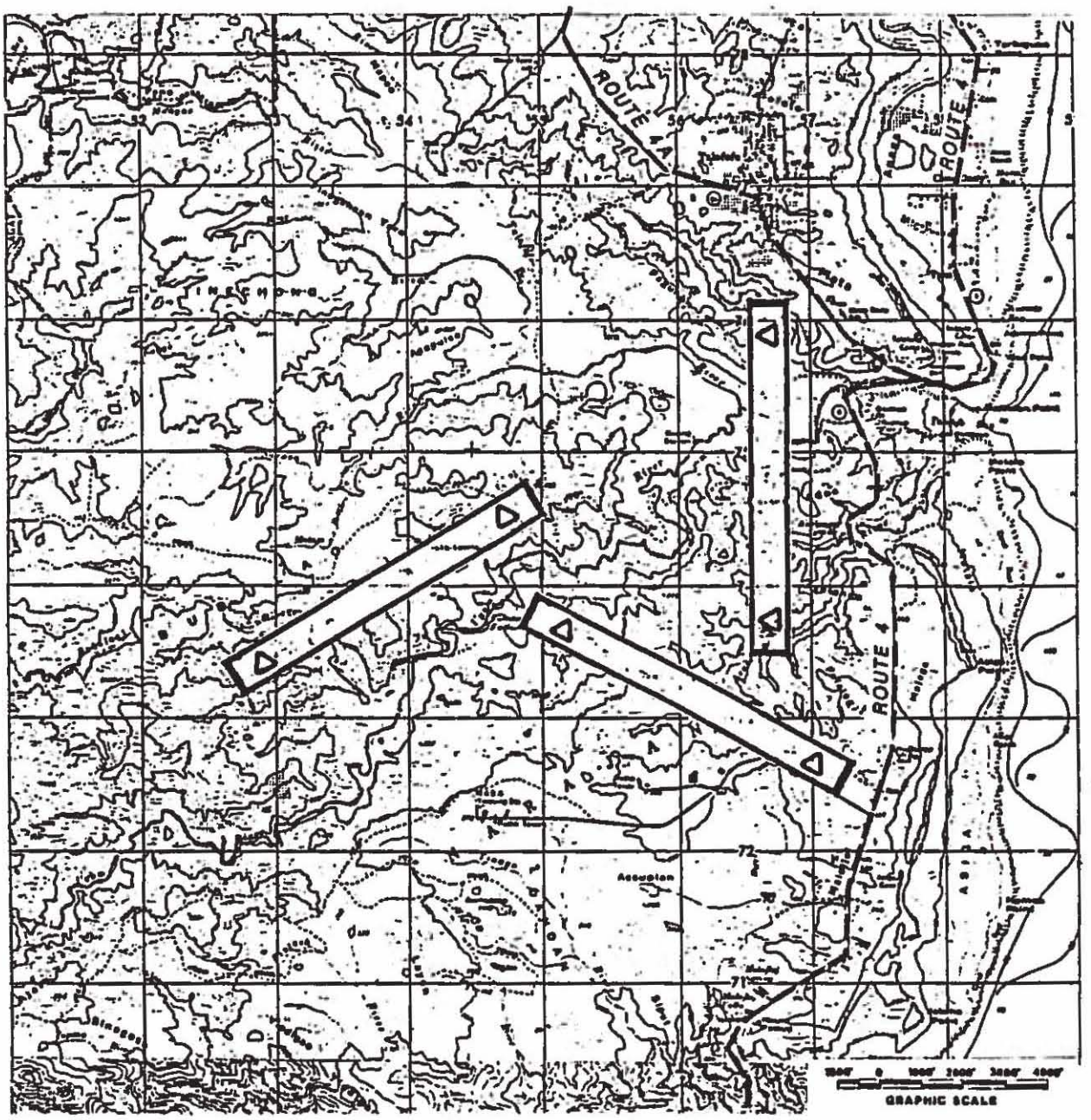
GUAM

DANDAN

LOCATION FOR ROTHR RECEIVER



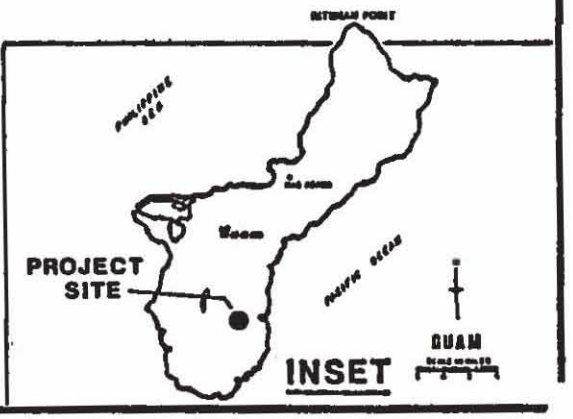
SKETCH 1



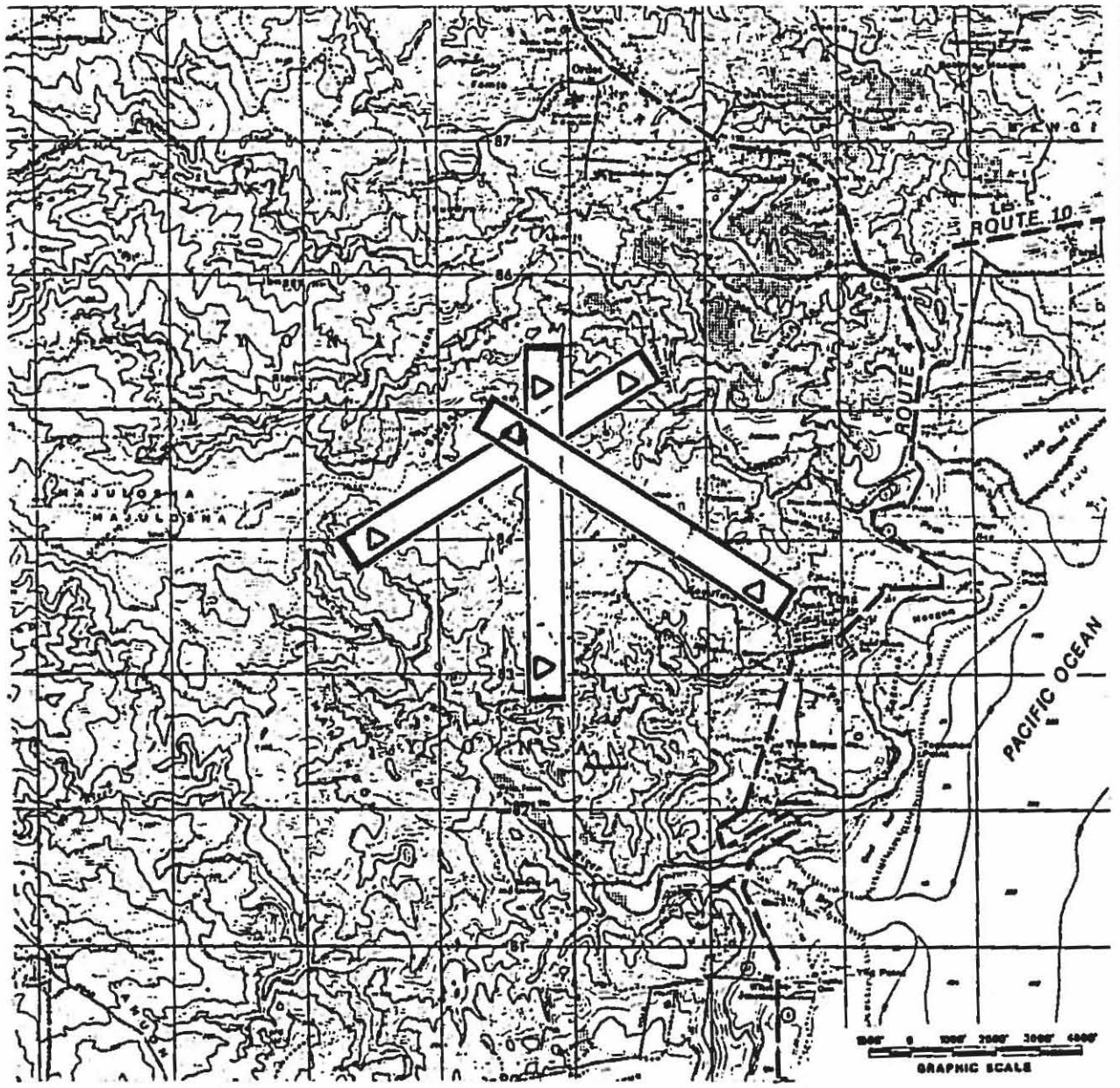
GUAM

BUBULAO

LOCATION FOR ROTHR RECEIVER



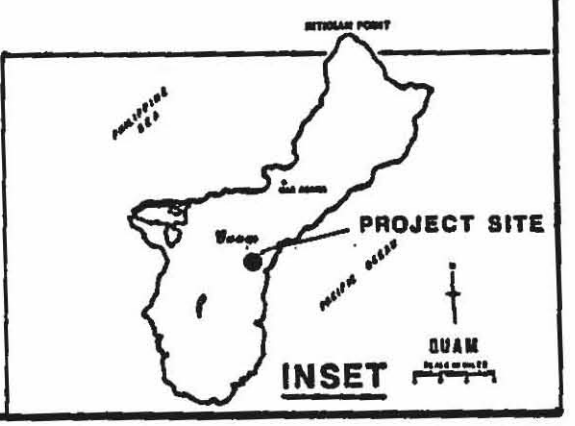
SKETCH



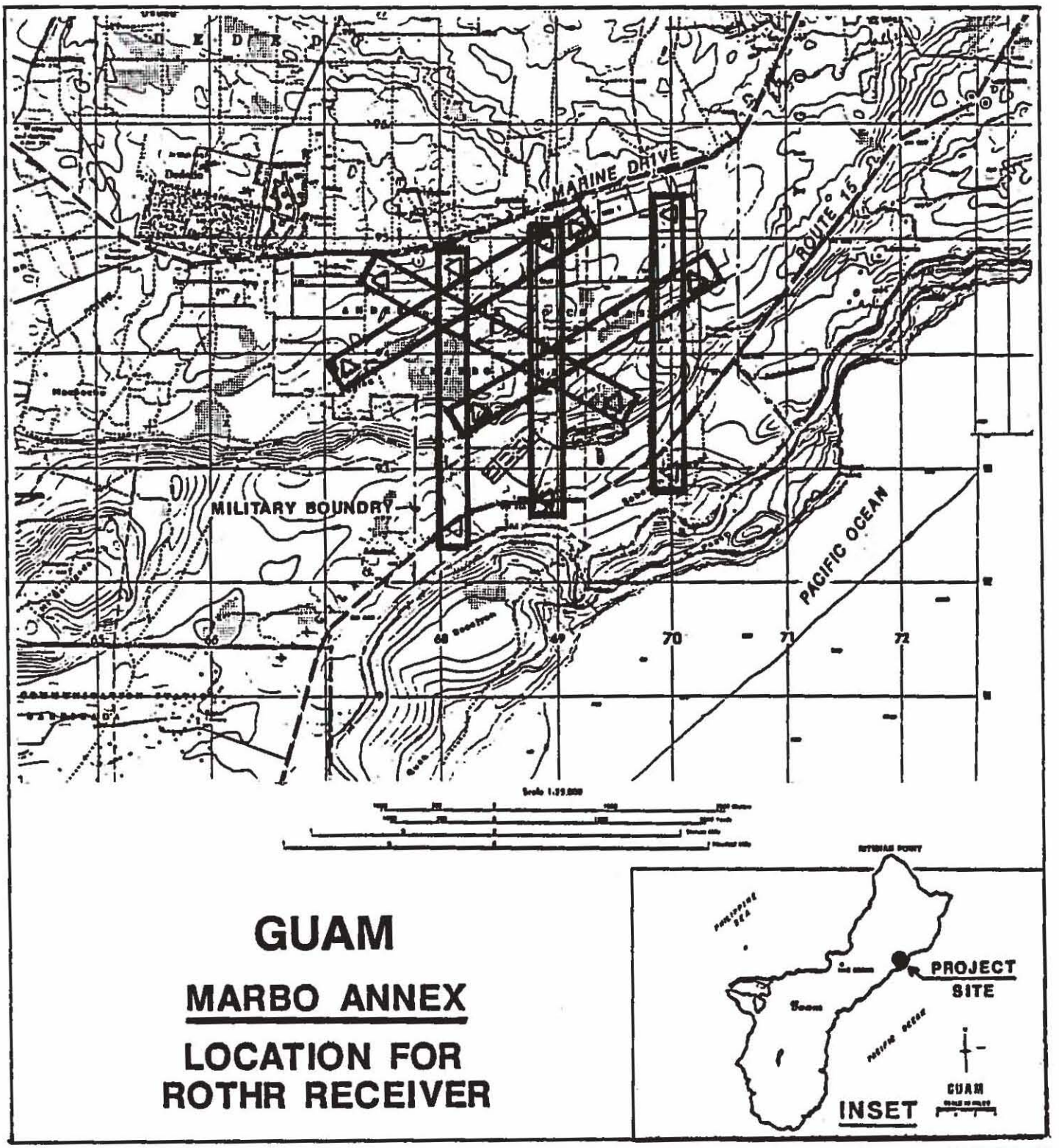
GUAM

PULANTAT

LOCATION FOR ROTHR RECEIVER



SKETCH 17

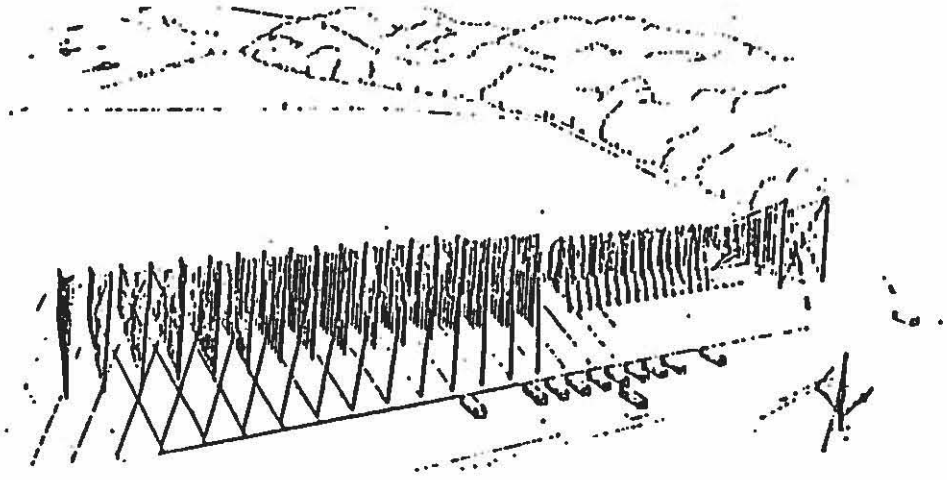


GUAM

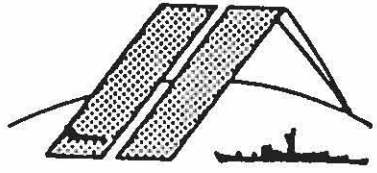
MARBO ANNEX

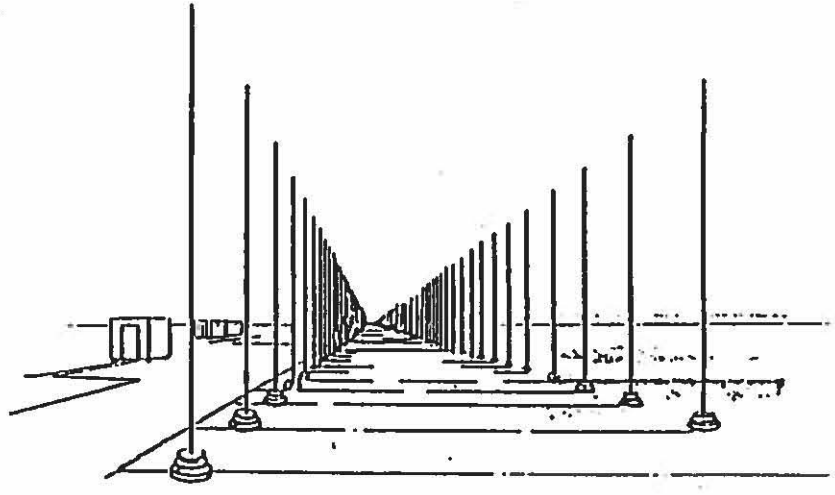
LOCATION FOR ROTHR RECEIVER

SKETCH 18



ROTHR ANTENNA SITE CRITERIA



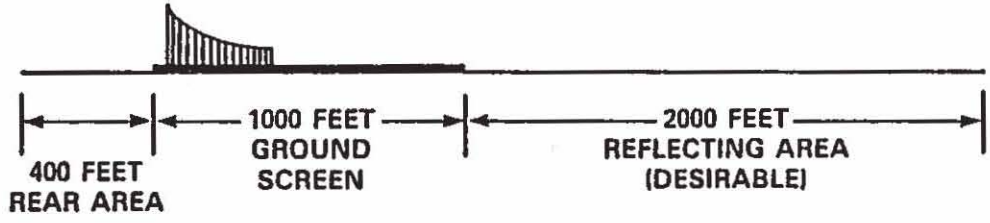


ATTACHMENT 2

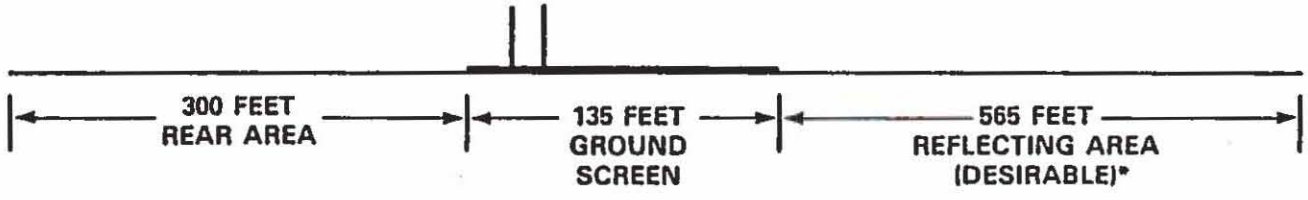
RU-0385-A255

GROUND SCREEN AND ADJACENT AREAS

a. TRANSMIT SITE



b. RECEIVE SITE

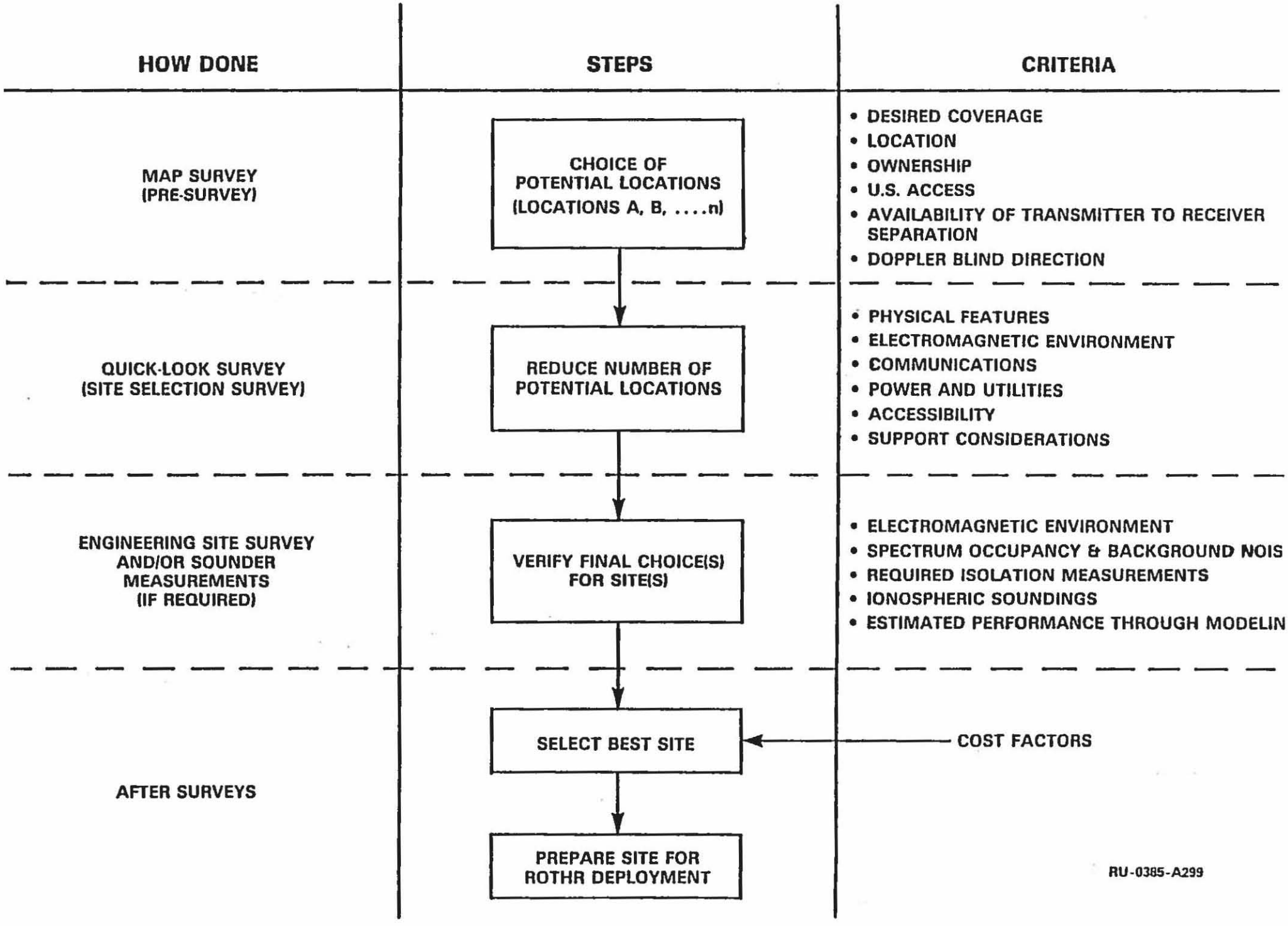


* NOTE: WHERE PARAMETER CANNOT BE MET, ADDITIONAL ANALYSIS WILL BE REQUIRED

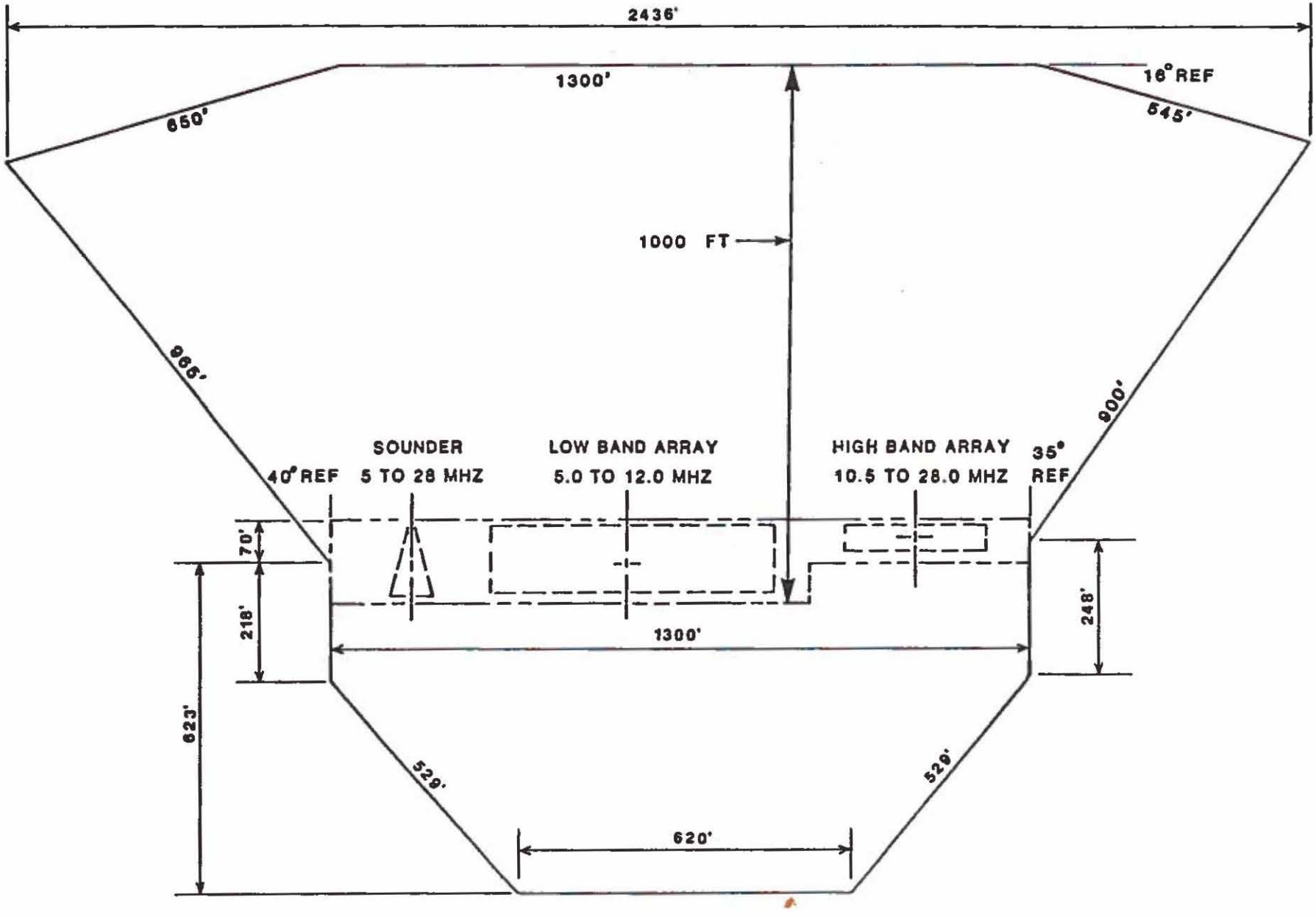
FIGURE 1

RU-0385-A247

DECISION FLOW FOR SITE SELECTION



ROTHR TRANSMIT SITE DIMENSIONS



ANTENNA SITE CRITERIA

TRANSMIT SITE

A. SIDE TILT OF GROUND PLANE:
   5 DEGREES MAXIMUM

B. MAXIMUM DEFLECTION OF POLES FROM STRAIGHT LINE:
   ±1 INCH (FRONT POLE POSITIONING)

C. GROUND SCREEN ROUGHNESS, AREA COVERED BY GROUND SCREEN
   ±6 INCHES

D. TERRAIN ROUGHNESS AREAS, BEYOND GROUND SCREEN
   2000 FEET BEYOND GROUND SCREEN, FORWARD; SEE FIGURES 1a & 5
   400 FEET BEYOND GROUND SCREEN, BEHIND; SEE FIGURES 1a & 7

E. FORWARD CLEARANCE BEYOND REFLECTING AREA:
   CLOSE-IN OBSTACLES: SEE FIGURE 2a
   FAR-OUT OBSTACLES: SEE FIGURE 3a

F. REAR CLEARANCE REQUIRED:
   REQUIREMENTS ARE SITE-SPECIFIC AND ARE TO BE DETERMINED FOR EACH SITE

G. FRONT-TO-BACK TILT:
   MAXIMUM FORWARD TILT: SEE FIGURE 4
   NO BACKWARD TILT

ANTENNA SITE CRITERIA

RECEIVE SITE

A. SIDE TILT OF GROUND PLANE:
   5 DEGREES MAXIMUM

B. MAXIMUM DEFLECTION OF POLE FROM STRAIGHT LINE:
   ±1 INCH (POLE POSITIONING)

C. GROUND SCREEN ROUGHNESS, AREA COVERED BY GROUND SCREEN
   ±1 INCH WITHIN 20 FEET OF ANTENNA ELEMENTS
   ±6 INCHES ELSEWHERE OVER THE GROUND SCREEN

D. TERRAIN ROUGHNESS, AREAS BEYOND GROUND SCREEN
   565 FEET BEYOND GROUND SCREEN, FORWARD; SEE FIGURES 1b & 6
   300 FEET BEYOND GROUND SCREEN, BEHIND; SEE FIGURES 1b & 8

E. FORWARD CLEARANCE BEYOND REFLECTING AREA:
   CLOSE-IN OBSTACLES: SEE FIGURE 2b
   FAR-OUT OBSTACLES: SEE FIGURE 3b

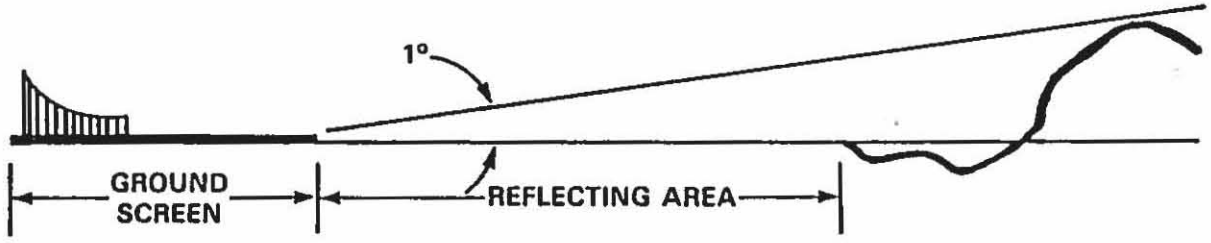
F. REAR CLEARANCE REQUIRED:
   REQUIREMENTS ARE SITE-SPECIFIC AND ARE TO BE DETERMINED FOR EACH SITE

G. FRONT-TO-BACK TILT:
   MAXIMUM FORWARD TILT: SEE FIGURE 4
   NO BACKWARD TILT

FORWARD CLEARANCE REQUIRED

(CLOSE-IN OBSTACLES)

a. TRANSMIT SITE



b. RECEIVE SITE

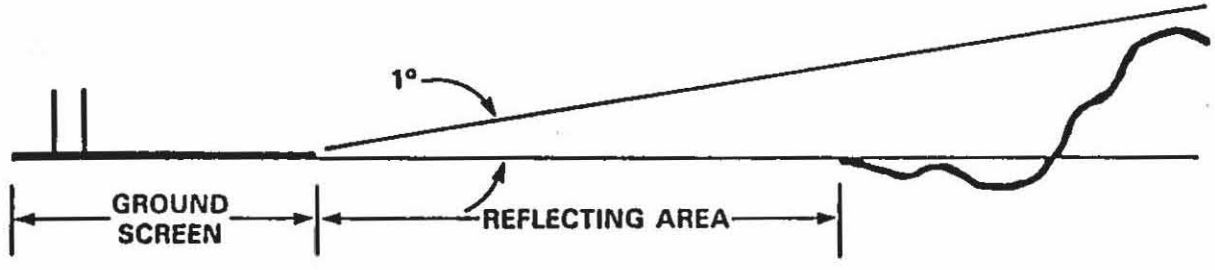


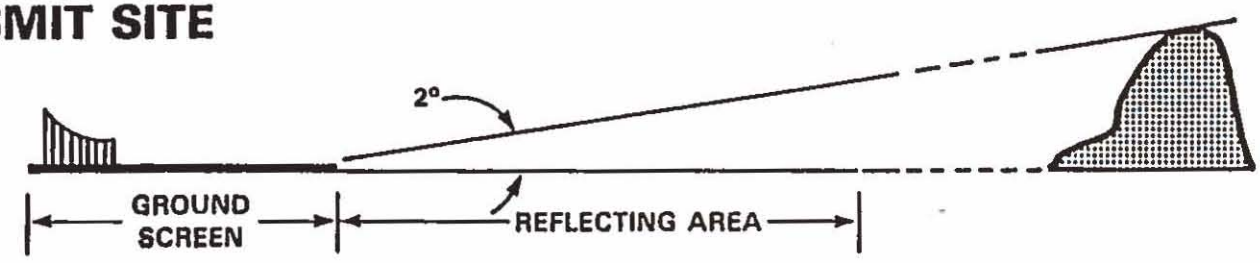
FIGURE 2

RU-0385-A248

FORWARD CLEARANCE REQUIRED

(FAR-OUT OBSTACLES)

a. TRANSMIT SITE



b. RECEIVE SITE

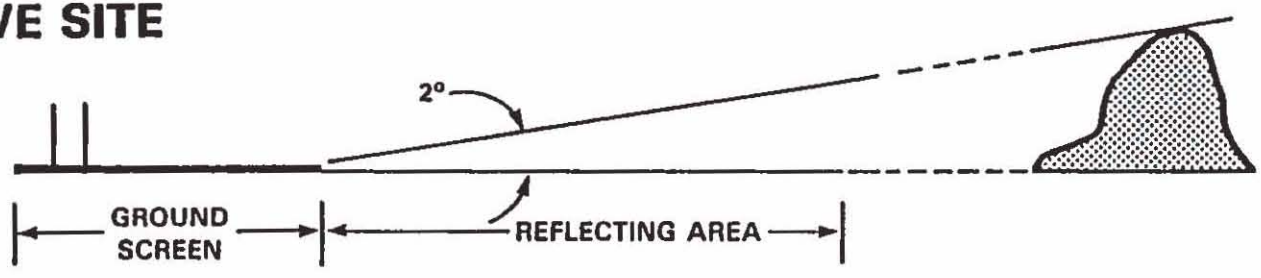
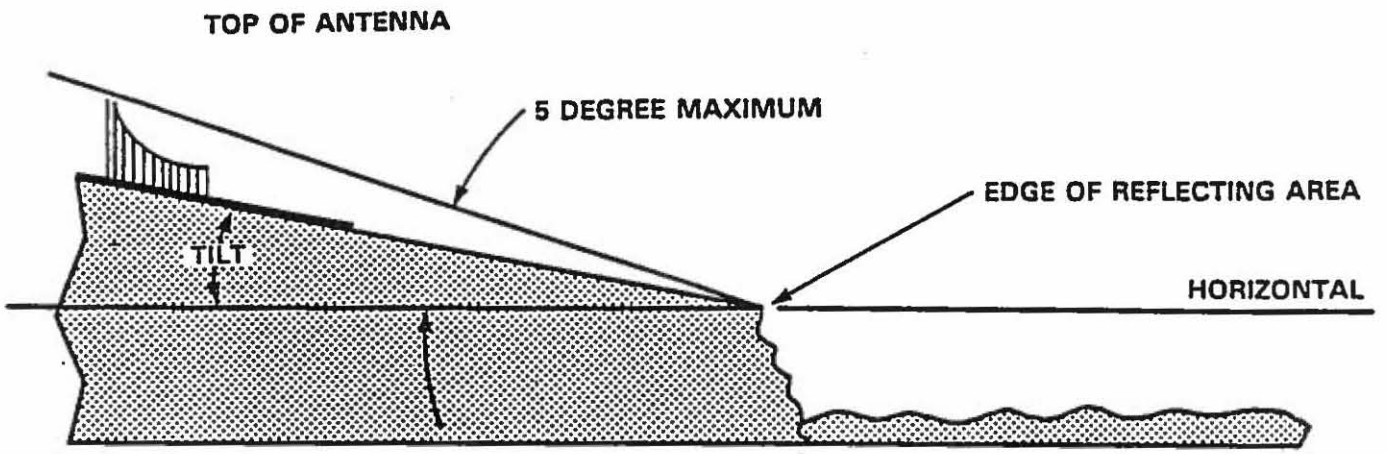


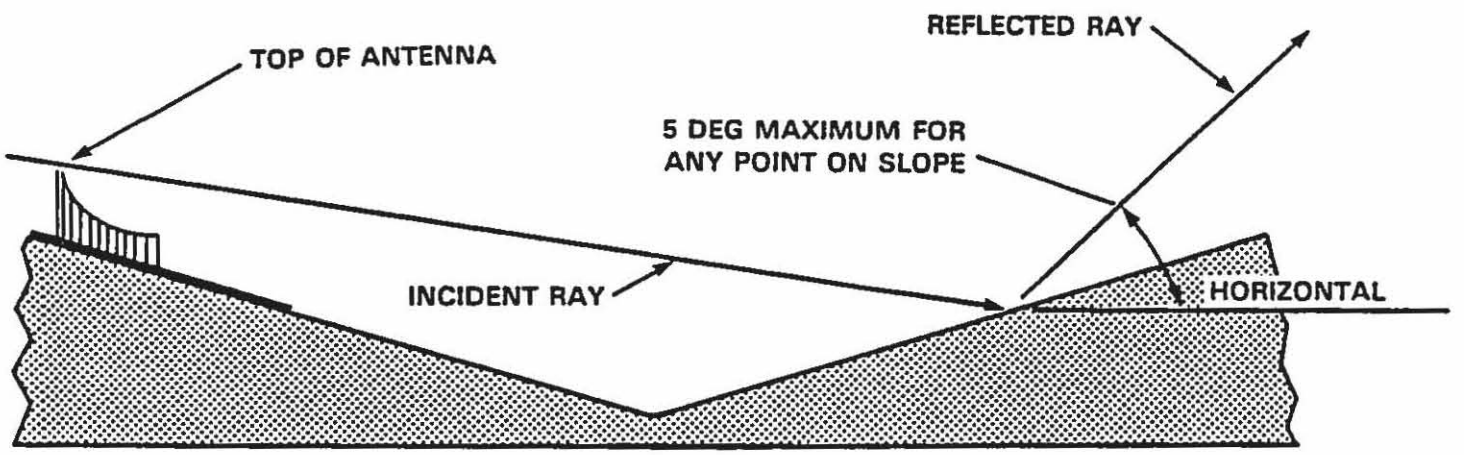
FIGURE 3

RU-0385-A249



TO AVOID DIRECT RAY MULTIPATH PATTERN DEGRADATION BELOW 5 DEGREES FOR SITES NEAR THE OCEAN, THE GROUND TILT AND ANTENNA GEOMETRY MUST BE AS INDICATED IN THE FIGURE ABOVE.

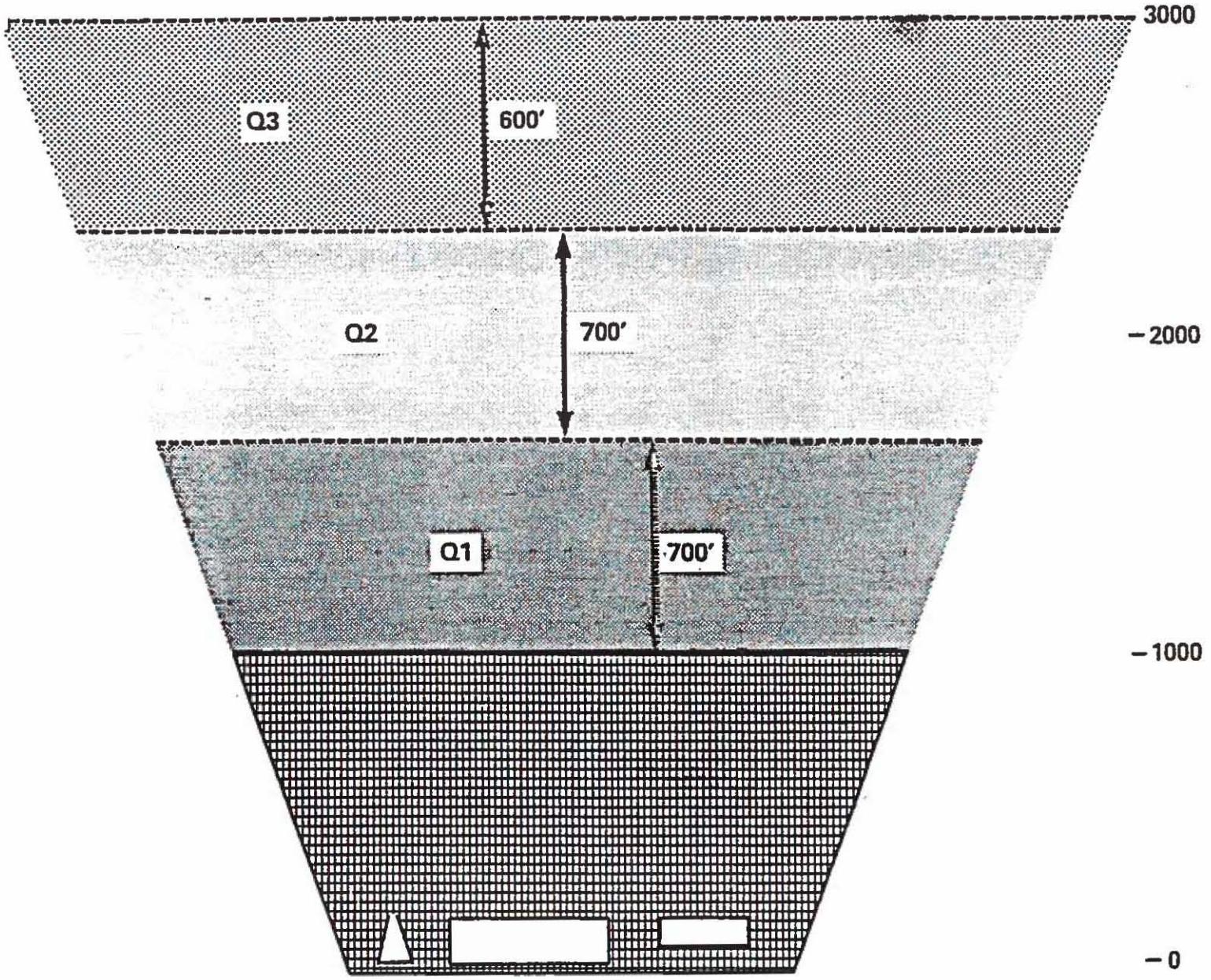
FIGURE 4a



TO AVOID DIRECT RAY MULTIPATH PATTERN DEGRADATION BELOW 5 DEGREES FOR SITES NEAR UPWARD-TILTED GROUND, THE SITE GEOMETRY MUST BE AS INDICATED IN THE FIGURE ABOVE.

FIGURE 4b

RU-0385-A250



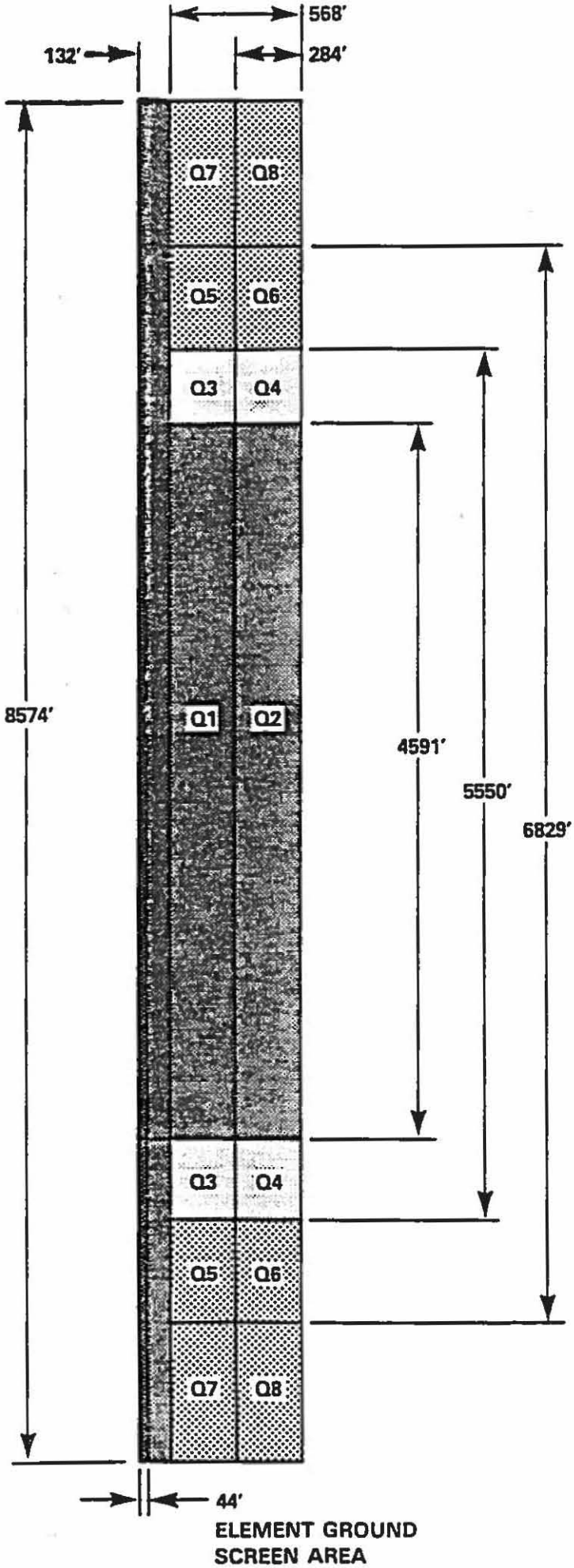
Q1: EARTH FLAT TO WITHIN ±15 INCHES
Q2: EARTH FLAT TO WITHIN ±20 INCHES
Q3: EARTH FLAT TO WITHIN ±30 INCHES

TRANSMIT SITE

SURFACE CONDITIONS FOR REFLECTING AREA FORWARD OF GROUND SCREEN

FIGURE 5

RU-0385-A251



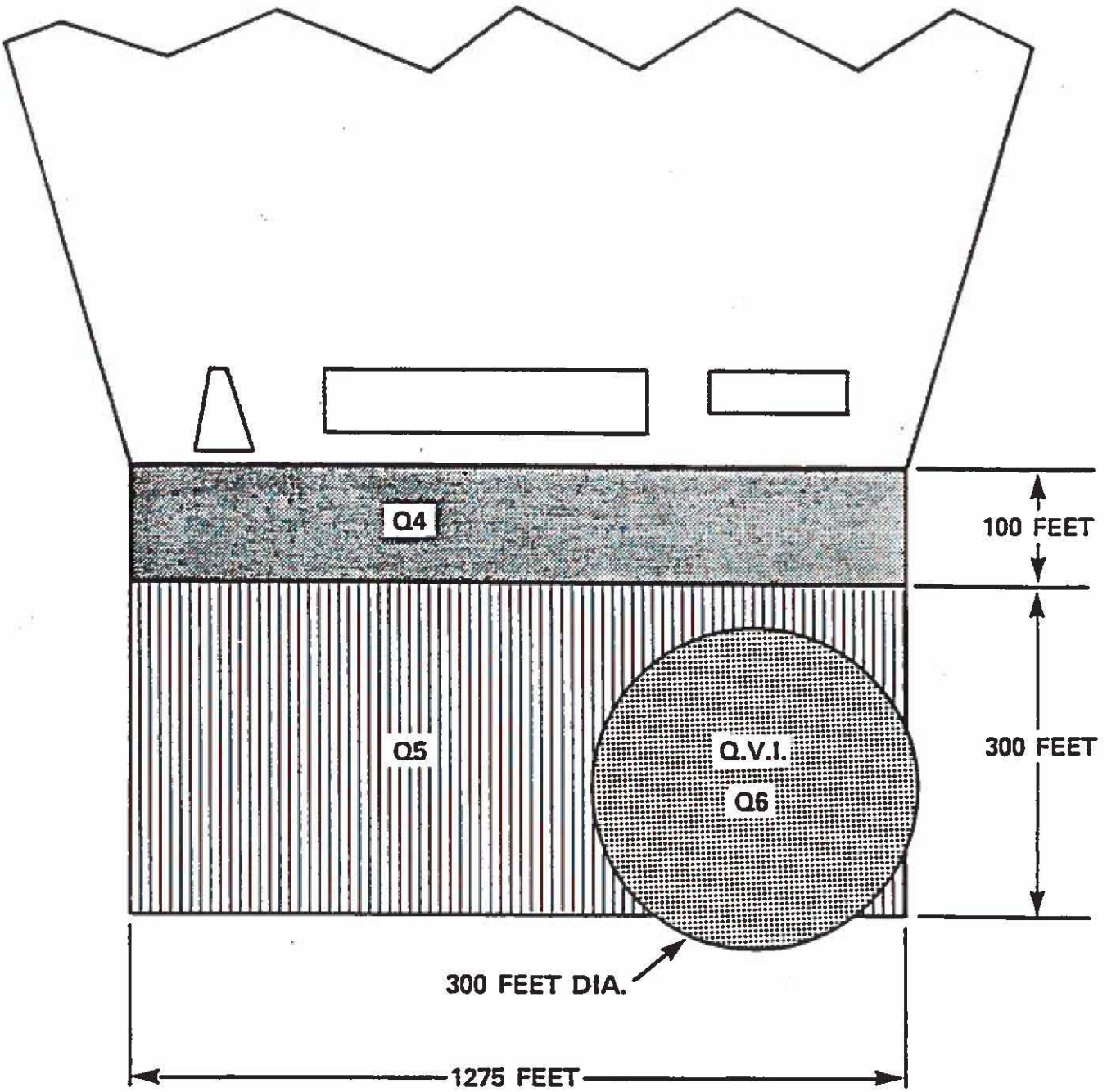
ZONE	GROUND CONDITIONS
Q1	SMOOTH WITHIN ±24 INCHES
Q2	SMOOTH WITHIN ±48 INCHES
Q3	SMOOTH WITHIN ±30 INCHES
Q4	SMOOTH WITHIN ±54 INCHES
Q5	SMOOTH WITHIN ±36 INCHES
Q6	SMOOTH WITHIN ±66 INCHES
Q7	SMOOTH WITHIN ±42 INCHES
Q8	SMOOTH WITHIN ±84 INCHES

RECEIVE SITE

SURFACE CONDITIONS FOR REFLECTING AREA FORWARD OF GROUND SCREEN

FIGURE 6

RU-0385-A252



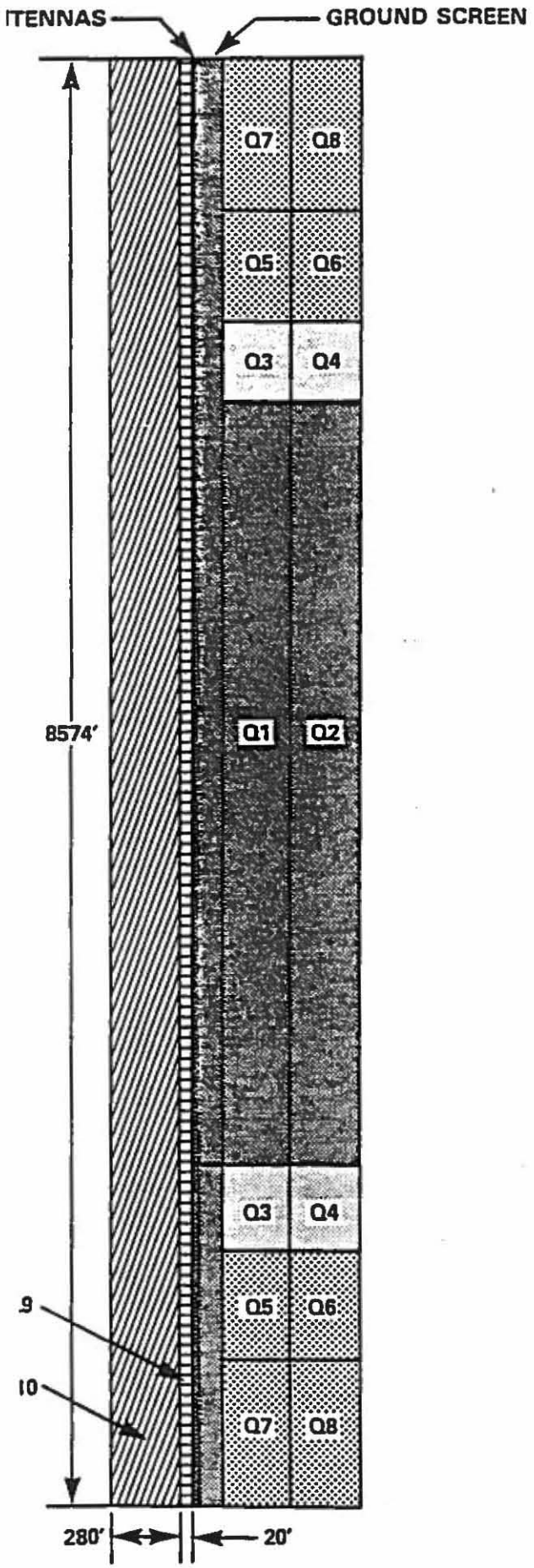
Q4: EARTH FLAT TO WITHIN ±12 INCHES
Q5: EARTH FLAT TO WITHIN ±48 INCHES
Q6: EARTH FLAT TO WITHIN ± 6 INCHES

TRANSMIT SITE

SURFACE CONDITIONS FOR AREA BEHIND GROUND SCREEN

FIGURE 7

RU-0385-A2F



ZONE	GROUND CONDITIONS
Q9	SMOOTH WITHIN ±12 INCHES
Q10	SMOOTH WITHIN ±48 INCHES

RECEIVE SITE

SURFACE CONDITIONS FOR AREA BEHIND GROUND SCREEN

FIGURE 8

RU-0385-

4.2 FINAL BIOLOGICAL OPINION PROJECT P-223

United States Department of the Interior

FISH AND WILDLIFE SERVICE
PACIFIC ISLANDS OFFICE
P.O. BOX 50167
HONOLULU, HAWAII 96850

10 DEC 1989

Mr. J. L. Busekrus
Head, Facilities Planning Department
Pacific Division, Naval Facilities
Engineering Command
Pearl Harbor, Hawaii 96860-7300

Reference: 11015.4G1
Ser 24B:TS/5758

Subject: Interagency Endangered Species Consultation 1-2-88-F-51R Construction and Operation of Relocatable Over-The-Horizon Radar on Tinian, Commonwealth of the Northern Mariana Islands and Guam; Navy Designation P-223.

Dear Mr. Busekrus:

This further responds to Mr. Hironaka's December 9, 1987 request for reinitiation of formal consultation 1-2-87-F-051 as directed by Section 7 (Interagency Cooperation) of the Endangered Species Act (Act). Unless future new information requires the reinitiation of consultation, this letter constitutes our final biological opinion on the project.

Under consideration are the possible impacts of the Navy's proposed Relocatable Over-The-Horizon Radar (ROTHR) Project P-223 (P-223) on endangered and threatened species. The project has two major components: (1) construction and operation of a radar transmitter on the island of Tinian, Commonwealth of the Northern Mariana Islands (Commonwealth), and (2) construction and operation of a radar receiver antenna field located on Guam. This pair of facilities will function as a unit. They will survey, by radar, a specific 60-degree arc of air and surface space, monitoring the movement of airborne and surface craft within that area. Information gathered on such movements will be coordinated with other radar and observation reports to give a clearer picture of the types of craft or vessels, their trajectory, speed, and other data.

This opinion addresses possible impacts of P-223 on five listed species:

On Tinian:

Mariana common moorhen (Gallinula chloropus guami - endangered
Tinian monarch (Monarcha takatsukasae) - threatened

On Guam:

Guam Micronesian kingfisher (Halcyon cinnamomina cinnamomina) - endangered
Mariana crow (Corvus kubaryi) - endangered
Mariana fruit bat (Pteropus mariannus mariannus) - endangered

No critical habitat has been designated or proposed to be designated on either island. An administrative record of this consultation and related documents are maintained in this office.

Biological Opinion

It is our biological opinion that the construction and operation of P-223 at the transmitter site on Tinian identified in Figure 3.2 of the Draft Environmental Impact Statement for Electronic Installations in the Western Pacific of July 1989 (Draft Statement) as the "Northern Site" and the construction and operation of P-223 at the receiver site on Guam identified in Figure 3.6 of the Draft Statement as the "Runway Site" will not be likely to jeopardize the continued existence of any listed species. This includes the Mariana crow, Mariana fruit bat, Guam Micronesian kingfisher, Mariana common moorhen, and Monarch flycatcher.

Background Information and Scope of This Consultation

-The Navy initiated consultation on project P-223 on June 23, 1987. That consultation was completed and our September 15, 1987 biological opinion (1-2-87-F-051) concluded that the P-223 project would not be likely to jeopardize the continued existence of any listed species.

Letters from both the Acting Director, Guam Department of Agriculture (October 28, 1987) and the Chief of the Commonwealth's Division of Fish and Wildlife (Commonwealth Division) (November 30, 1987) provided comments on our biological opinion. They recommended our reconsideration of our conclusions based on a reanalysis of the data considered in that opinion coupled with newer biological information. Additionally, one of the conservation recommendations provided in our September 15, 1988 biological opinion was for the Navy, in cooperation with the Guam Division of Aquatic and Wildlife Resources (Guam Division) and this Service, to attempt to capture any Micronesian kingfishers which may be in the proposed project site for use in an existing captive propagation program. The Navy was unable to accomplish this recommendation; the Guam Division was unable to provide support for the field work involved, and, more importantly, more recent surveys for the kingfisher had failed to find any in the project area.

-On December 9, 1987 the Navy reinitiated consultation to address (1) new information pertinent to the impact of the project on listed species, and (2) the possible impact of the Navy's not being able to carry out one of the conservation recommendations provided in our September 15, 1987 letter.

-Our February 25, 1988 letter to you concurred with your February 23, 1988 request that the conclusion of formal consultation be postponed pending the completion of, at that time, future, biological surveys of the project areas.

Subsequently, the Navy conducted additional biological surveys on Guam. It was hoped that the surveys would provide more up-to-date information for assessing (1) the use of the proposed project area on Guam by kingfishers, crows, and bats, and (2) the abundance of brown tree snakes in that area, and how their abundance there relative to other nearby locations may or may not make the project area especially suited for the survival and recovery of the listed species. Ornithological and herpetological surveys were completed, and results of each were sent to us on May 23, 1988 and June 1, 1988 respectively.

-As the Navy was proceeding toward the completion of an environmental impact statement which would further discuss the results of the biological surveys and, possibly, present new information regarding impacts to listed species, we proposed in our August 8, 1988 letter to you that the consultation be continued until completion of the draft impact statement. You concurred with this recommendation on September 7, 1988.

-We received a copy of your Draft Environmental Impact Statement For Electronic Installations On Tinian And Guam, 100% Submittal of October 1988 (100% Draft) on November 15, 1988. The 100% Draft included the Draft Supplemental Environmental Impact Statement (EIS) For Electronic Installations Western Mariana Islands Milcon Project P-223 (Draft Supplement).

In part due to changes in the alignment and positioning of the P-223 receiver field which would be expected to alter the impact of the project on listed species, the Navy decided to complete the Draft Statement and allow us to consider information in the document in our consultation. The Draft Statement was printed in July 1989, and we received a copy on July 14, 1989. Your letter of July 18, 1989 requested that we complete the consultation and provide you with our final biological opinion. Your letter was specific in requesting that we address the impacts of the northern site for the transmitter on Tinian and the runway site for the receiver on Guam only and not other possible alternative locations or alignments.

Description of the Proposed Action

A detailed description of the action is provided in the Draft Statement. The proposed project is to construct and operate Project P-223, which consists of one transmitter on the island of Tinian, Commonwealth of the Northern Mariana Islands (the Commonwealth) and one receiver and Operation Control Center (to be located near the receiver) on the island of Guam.

On Tinian:

Tinian is the second largest island in the Commonwealth, lying about 3 miles south-southwest of Saipan and about 100 miles northeast of Guam. It is approximately 12.5 miles long by 6 miles wide and has a total land area of about 25,000 acres. The transmitter would be located on the northern portion of the island within lands currently leased by the military. The site lies north of the North Field runways and is referred to as the Northern Site. A map of the area from pages 3-3 and 3-4 of the Draft Statement are enclosed (Enclosure 1).

The transmitter portion of the project will require the clearing, grading, and installation of facilities on 58 acres of Tinian. The transmitter will require the erection of 68 vertical towers and poles. As described on page i of the Draft Statement, the low band antenna portion of the transmitter will consist of 16 125-foot high towers and 16 45-foot high support poles sited 35 feet apart. The total length of the low band antenna array is 525 feet. The high band portion of the transmitter will consist of 16 71-foot high towers and 16 16.5-foot support poles spaced 17.5 feet apart. The total length of the high band antenna field is 262.5 feet. Each transmitter will consist of 16 transmitter units, each capable of transmitting with power of 5 to 20 kilowatts. The antenna array and ground screen will be fenced with a wire fence on four sides.

On Guam:

Guam is the southernmost and largest of the Mariana Islands. It is approximately 30 miles long and varies from approximately 4 to 12 miles wide. It has a land area of about 212 square miles (135,680 acres).

The receiver is proposed to be located on a portion of Northwest Field at Andersen Air Force Base, Guam (Enclosure 2, from pages 3-8 and 3-9 of the Draft Statement). Several possible locations of the rectangular receiver area are considered in the Draft Statement; you have asked us to consider only the location referred to as the "runway site" in our analysis of possible impacts to listed species in this consultation. (Note: Your selection of any of the other alternative sites may require reinitiation of consultation to address possible impacts to listed species of development on those properties.)

As described on page 2-8 of the Draft Statement, the receiver will consist of 372 pairs of aluminum pole antennas, each about 18 feet high and 6 inches in diameter. The antenna poles will be bolted to concrete anchor bases; guy wires will not be used. The total length of the antenna array will be 8,600 feet. The width of the field will be approximately 800 feet. Other facilities to be constructed or sited include 4 operational vans, 13 receiver equipment shelters, a van support building, an emergency generator building, and an above-ground fuel storage tank.

The receiver on Guam will require 172 acres of land for the installation. In areas of this site not already free of vegetation, clearing will be required.

The area of land required for P-223 has decreased since our September 15, 1987 biological opinion. At that time, the Navy estimated that P-223 would require 104 acres on Tinian and 500 acres on Guam. (The original estimate for Guam included 200 acres of clear-cut and leveled land plus approximately 300 additional acres of land which would be required to be trimmed to restrict vegetation height. Such trimming is no longer needed outside of the 172 acres now required.) The Runway Site on Guam was not considered as an alternative in our 1987 analysis. It overlies, in part, an existing airstrip. As little or no vegetation grows on the paved area, the area of vegetation required to be cleared for this site is further reduced. You have estimated that the area of vegetation now required to be cleared for the receiver (at the Runway Site) is approximately 110 acres, as opposed to the 500 acres originally proposed to be cleared.

The Draft Statement addresses the construction of three pairs of radar transmitters and receivers; these are referred to as P-223, P-225, and P-002. You have made it clear in the Draft Statement and other documents and correspondence (such as the Space Warfare Systems Command message to you of August 11, 1987 and your letters to us of August 25, 1987 and July 8, 1988) that, for the purposes of this consultation and other reasons, the projects are "stand-alone," independently operating systems. The Draft Statement states that co-location of the three systems is not an operational necessity, and that the construction of one or two of the pairs does not require the construction of all three to be of benefit to the overall Relocatable Over-the-Horizon Radar system. As such, we have agreed to consider the impact of P-223 as a separate project, and will not address possible impacts of P-225 or P-002 in this consultation.

However, the Navy will be required to initiate formal Section 7, Endangered Species Act, consultation in the future on P-225 and P-002 should it be determined that either project may affect listed species or designated critical habitat. Similarly, the Navy may be required to "confer" with the Service should either project be likely to jeopardize the continued existence of any species proposed for listing as endangered or threatened or should the project likely result in the destruction or adverse modification of any area proposed for critical habitat designation (50 CFR subsection 402.10). As a result of such future consultations and/or conferences, modifications to those projects may be required or suggested which may decrease the financial or operational efficiency of the overall Over-the-Horizon array. As you are aware, areas of Guam including portions of Andersen Air Force Base are currently under consideration for critical habitat designation. It is likely that a formal proposal will be published in the Federal Register to designate these lands as critical habitat for several of Guam's endangered forest birds and bats.

Members of this Service have visited both the Northwest Field, Guam site at Andersen Air Force Base and the northern Tinian site specifically for this consultation.

Effects of the Proposed Action on Listed Species

On Tinian:

There are four types of impacts which have been considered as possibly affecting listed birds on Tinian: 1) clearing 58 acres of land predominantly vegetated by tangentangen (Leucaena leucocephala); 2) radiation from the transmitter; 3) the accidental introduction of the brown tree snake from Guam; and 4) collisions with transmitter antennas or their supporting cables by listed birds.

1. Clearing 58 acres will have little effect on moorhens because they do not depend on that type of habitat for feeding, roosting, or other habits. They may fly over the proposed project area, but there are no reports of their having landed there. Moorhens congregate in wetland areas. The Hagoi wetland, the largest on Tinian, would not be affected by the project.

Although tangentangen forest provides the primary habitat for the Tinian monarch, the clearing will remove less than 1% of the tangentangen island-wide. While the loss of the 58 acres will adversely affect the monarch by decreasing the amount of available nesting and feeding habitat, it would not be sufficient to jeopardize their continued existence. Surveys conducted as part of project planning estimated a monarch density that would predict a population of about 24 birds in the 58 acres to be cleared. Surveys conducted by this Service in 1982 (Micronesian Forest Bird Survey, 1982: Saipan, Tinian, Agiguan, and Rota, 1986) estimated that there were 11,733 monarchs in approximately the northern third of the island, with an island- wide population estimated at 40,000. We have no evidence which would suggest that densities have decreased since 1982, although the overall population may have declined slightly due to some clearing of forests. The loss estimated due to the clearing of the project area constitutes only a small fraction of one percent of the island's population of 40,000. Should all of the birds

residing in the area to be cleared die as a result of the stress of displacement and should their nests, if any, be destroyed as a result of the clearing of 58 acres, the impact on the total population would be extremely small (a loss of probably less than 0.1% of the total population).

((Note: The Draft Statement presents a figure of 58 acres needed to be cleared on Tinian for the transmitter. In more recent discussions with members of your staff, a slightly larger area (perhaps an additional acre) may be required to allow for the planting of trees as recommended in the Incidental Take statement of this letter.)

2. A discussion of the possible impact of radiation on listed species is presented in the Draft Supplement and the Draft Statement. They conclude that the proposed transmitter's radiation will not have any adverse effect on birds. Our discussions with some of those familiar with the radiation and its possible impact on wildlife (Larry Adams, Naval Security Group Activity, Chesapeake, Virginia and Mr. Ching of your staff) lead us to the same conclusion. The wave length and intensity of transmission do not pose a threat to animals with a very small body weight, such as the Tinian monarch, or those with a slightly greater mass, such as the moorhen. Radiation would be hazardous to animals of larger mass (e.g., humans).

3. The threat of an introduction of brown tree snakes to Tinian was discussed in our previous opinion, and the devastating impact of such an introduction to the island's wildlife cannot be over-stressed. Native species, especially birds, which have evolved on islands free of predators have generally not evolved the survival adaptations needed to survive such introductions. The stark example provided by the extinction of much of Guam's native avifauna over a very short number of years by the predator, the ineffectiveness of our currently known measures to control the snake once it has become established, and the snake's ability to spread to other islands via exported cargo emphasize the potential for serious and damaging biological consequences. Almost any shipment from Guam has the potential to spread the snake; cargo flown or barged to Tinian as part of the P-223 project is no exception.

The Draft Statement has addressed this threat on pages 5-47 to 5-49 (Enclosure 3). The construction contractor(s) and the operations contractor of the transmitter project will be required to prepare a snake inspection protocol to prevent the accidental introduction of the snake to Tinian. This protocol will be modeled after a plan previously approved by the Commonwealth of the Northern Marianas Islands and will meet requirements which may be set by them. Such a plan will be modeled after the snake prevention protocol developed by Black Micro Construction Company. This protocol was followed during the construction of the Air Force's PACBAR III construction project on Saipan. The protocol is comprehensive and incorporates recommendations made by this Service. While it is impossible to guarantee that adherence to the Commonwealth's and the Black Micro Construction Company's snake control measures will prevent the accidental introduction and establishment of the secretive snake, we believe it will substantially decrease the chances for such occurrences.

4. The project calls for numerous towers, poles, and anchoring wires distributed over the 58-acre area; 16 antenna towers will be 125 feet tall. The density of towers, poles, and support structures poses a physical hazard to birds; they could fly into the structures and be injured or killed.

We would not expect monarchs to collide with either the antennas or their supporting cables; they are diurnal, keen sighted, and would be expected to be able to avoid the wires should they fly into the area.

The previously cited Micronesian Forest Bird Survey, 1982 surveyed the Hagoi area of Tinian for the Mariana common moorhen. The Hagoi wetland appears to be the only location on Tinian where moorhen congregate, and estimates of their numbers there at any one time have ranged from zero to 120. Moorhen are routinely observed on Lake Susupe, on Saipan, and their numbers there also fluctuate. The 1982 survey estimated their numbers at Susupe to be between 90 and 120. The bird is also found on Guam, where its population is estimated to be between 100 and 200 (Federal Register, August 27, 1984, page 33883), but it is not believed that the birds fly between Guam and the Commonwealth islands.

Susupe lies approximately seven miles northeast of Hagoi across open ocean. Although data demonstrating that the moorhens fly between Saipan and Tinian are not available, it is possible that such flights may occur. The number counted at Hagoi has been as low as zero and as high as over 100, and it has been speculated that the birds are on Saipan when not at Hagoi; (such survey data are confounded by the often secretive nature of the moorhen, often making them difficult to detect). Movement between the islands may be in reaction to differing water conditions (low or high water levels) at Susupe and Hagoi. There is no indication of any regular, short-term migration measured in periods of days, weeks, or even months. It is more likely that movements may be sporadic or seasonal, although this, too, is unconfirmed.

Although no moorhens were observed within or near the P-223 site during ornithological surveys for the project, the site lies near a straight line between Hagoi and Susupe. If the birds do fly between the two wetlands, their flight may cross through an area about 1/4 mile from the proposed transmitter site. This area is located approximately 1.5 miles north of Hagoi. Should such flights actually pass through the antenna field at low elevations in the dim light conditions of early morning, evening, or at night, moorhens may collide with the antennas or their guy-wires.

The following factors were considered during our analysis of the potential for collisions at the transmitter site jeopardizing the continued existence of the Mariana moorhen:

a. Should birds be flying from Hagoi to Susupe, their flight path would very likely be near the P-223 transmitter site. A straight line between the northwestern extremes of the two wetlands passes approximately 1/4 mile to the southeast of the closest point of the antenna field. We have no information on the exact path(s) the birds may take during such a flight as there have not been any reports of observations of moorhens flying between Saipan and Tinian. No information is available which would show how many birds may participate in any one such flight (i.e., solitary fliers or flocks).

However, we recognize that should the birds fly through the area during evening, night, or early morning hours (the times such movement would be expected), there is only a small chance that they would be observed. No data exist on the specific flight characteristics of the Mariana common moorhen, but the Florida gallinule, another subspecies of Gallinula chloropus, has been described as a powerful flier when flying from one pond to another, flying at a "reasonable height" with a direct and fairly swift flight (Bent 1926).

For the purposes of this consultation, we are assuming that some moorhens may occasionally fly near or directly over the antenna site and that they adjust the speed and height of their flying in response to weather, terrain, and visible obstacles.

b. The 58-acre site which will be cleared by the P-223 project contains no wetlands and is not used by the moorhens. Likewise, the 1.5 miles of tangentangen thickets and clearings between the project site and Hagoi is not used by the bird. They have not been reported on the ground at or near the site; knowledge of the habits of moorhen suggests that they generally remain in, or very near to, wetlands. As such, there is no known feature of the P-223 site which would be especially attractive or useful to the birds.

c. Similar antenna arrays, transmission lines, and towers are found in other areas where Mariana common moorhens, other moorhen subspecies, or other larger waterbirds (ducks and geese) fly. We contacted personnel at the Navy's Chesapeake, Virginia over-the-horizon radar facility regarding the impact of that facility on waterbirds there and members of this Service's Anchorage, Alaska Regional Office regarding the Air Force's radar antenna field in Amchitka, Alaska. Both of these facilities have large antenna arrays similar to that proposed for Tinian. Neither had any history of bird-radar antenna collisions. At Chesapeake, the antennas are located in areas of high concentrations of ducks and geese and public hunting is conducted nearby. On Saipan and Tinian, we know of no moorhens injured or killed as a result of their flying into antennas, towers, guy wires, or similar structures. On Guam, a moorhen was found dead under a roadside transmission line with head and neck injuries which could have resulted from collision with the wires. Another moorhen was found dead on Guam with injuries most likely resulting from its flying into a building. We recognize that all moorhens injured through such collisions may not be found, reported, and recorded for our consideration.

From this information, we have concluded that a possibility does exist that moorhens traveling through a dark antenna field on northern Tinian at night or during other times of decreased visibility may strike the antennas or guy wires and sustain possibly fatal injuries. This is based on the dusk, dawn, and night-flying habits of the bird, the proximity of the antenna site to a possible route they may take between Susupe and Hagoi, and the evidence that the bird has struck permanent structures.

Measures serving to decrease the chances for such collisions are provided in the Draft Statement. It proposes the development of "shielding obstacles," such as tall trees. This is suggested in the Fish and Wildlife Service's 1978 publication Impacts of Transmission Lines on Birds in Flight.

The publication states:

"If wires can be screened by trees, billboards, or other man-made structures, it is quite likely collisions can be reduced or prevented. Many bird species are reluctant to fly under objects, and ducks in particular begin gaining altitude well ahead of an obstacle in their path. These flight path barriers could probably be effective even if much lower in height than conductors or if some distance from the right-of-way, provided they are located optimally along the flight path of the birds."

Two potential problems exist with the use of existing trees or fences on Tinian for screens. First, if the tangentangen forest around the antenna field is of uniform height, there is no incentive provided which would cause the birds to gain altitude as they approach the much higher transmitter antennas. Tangentangen trees in the vicinity of the P-223 transmitter site may reach 20 to 30 feet. Trees higher than the predominant vegetation would be required for the birds to climb in altitude so as to avoid the taller antennas. Second, many types of tall fencing would most likely not be able to withstand the typhoon winds experienced in the Marianas Islands (wind speeds have exceeded 180 miles per hour in recent typhoons).

Methods for reducing the chances for antenna collisions were discussed with Mr. Thomas Egeland of your staff and Mr. James Chun, P-223 project manager, via telephone on December 15, 1988. The maintenance of existing tall trees surrounding the installation would help to decrease the chances for bird strikes. It was agreed that should there be any injury or mortality of moorhens due to collision with the antennas, wires, or other structures, then much higher shielding would be grown or erected. (Note: similar project modifications serving to decrease the chances for birds flying into the transmitter are given in the Draft Statement, page 5-49.) Taller tree species, such as ironwoods (Casuarina equisetifolia), grow on northern Tinian and elsewhere in the Mariana Islands, reach considerable height (possibly 80 feet), and are strong enough to survive most typhoons. A row or several rows of these perpendicular to the suspected flight path of the moorhens along the antenna field would encourage them to gain altitude and fly over, rather than through, the field. Chun and Egeland indicated that the project would agree to plant such trees and encourage their growth through watering and fertilizing. The specifics of monitoring moorhen injury or mortality and measures which must be taken are given in the Incidental Take section of this letter.

Additional mitigation of the possibility of bird strikes is offered in the project design by lighting the antennas and support wires at night, improving their visibility. The Draft Statement recognizes that light can also attract and confuse some birds. Some night-flying migratory birds may be attracted to lights on overcast nights, possibly mistaking the lights for stars (Avery, et. al. 1976). The judicious use of lights, employing strobes or other mechanisms which are not as attractive to birds, will be helpful in aiding moorhens to avoid collisions. Certain minimum lighting standards are required by the Federal Aviation Agency.

The project will also improve the visibility of the antennas by marking them with permanent, highly visible strips, tape, or flagging. This technique is widely used elsewhere and has been shown to be effective in reducing the incidence of birds hitting wires, poles, and similar obstacles.

Based on the information available regarding the project's location, design, and size and what we know of the population and other characteristics of the moorhens in the area, we have concluded that although chances exist for a moorhen to fly into the antenna area, neither see nor avoid the structures, and strike the structures and be injured, such a chain of occurrences would most likely be rare. Further, we have considered that should evidence of a moorhen being injured or killed by collision with the structures exist, the Navy will take additional measures to screen the area and will alter the lighting or otherwise make the wires more visible to the birds.

Moorhens are found in some wetland areas on Guam, Tinian, Saipan, and Pagan. The main threat to the health of their population is the loss of wetland habitat, and, to the best of our knowledge, collision with obstacles has not been a significant factor in their decline. As such, our conclusion is that the transmitter facility will not jeopardize the continued existence of the Mariana common moorhen through collision hazard.

The Commonwealth Division requested that impacts to the Vanikoro swiftlet also be considered in this opinion; it is listed as endangered and is found in the Commonwealth. However, only one individual swiftlet has been reported as being observed on Tinian during this decade (in 1985), and nesting has never been reported. We would not expect the project to affect this species.

On Guam:

The receiver is passive and does not emit any significant radiation or other products which may affect any listed species on Guam. The pole antennas are relatively short (18 feet high and 6 inches in diameter), and are not expected to pose any hazard to any wildlife species either. There will be no ongoing disturbance of the area once construction is completed except for maintenance activities, vehicle movement to and from the facility, and other minor noises (as compared to the disturbances generated by other types of human activities, such as manufacturing, housing, and airport operations). As such, we would expect there to be minimal impact on listed species as a result of the operation of P-223. Bats, crows, and kingfishers would not be expected to be deterred from feeding or nesting near the facility as they may be near areas of more intensive human disturbances.

As stated previously, however, the project requires a 172-acre rectangle of land with little or no vegetation taller than short or mowed grasses and similar small plants. This requirement is needed to enhance antenna reception. Originally proposed to be located in a totally forested area at Northwest Field, the Runway Site now under consideration would be positioned over an existing, but infrequently used, concrete-paved runway and a vegetated area lying between that runway and a parallel paved taxiway to the north (see Enclosure 2). Because no vegetation grows on the paved areas, the vegetation required to be cleared by the project is reduced by the area of the pavement. One hundred and ten acres of vegetated cover will be lost due to the clearing. All three listed species either use or have recently used this vegetated area for feeding or other activities, possibly including nesting. The value of this habitat to be lost to the survival and recovery of the bat, crow, and kingfisher is our main concern in evaluating the impact of the project on these species.

The "Botanical Survey Report For Northwest Field Project P-223, Runway Site, Guam" (Botanical Survey Report), prepared in March 1989 for the Draft Statement described the vegetation of the Runway Site as being "of low stature, extremely mixed with some species locally abundant. Generally, they (the forests) are. . . hard to characterize by reference to dominant or even universally characteristic species." The site contains mixed second-growth scrub, ironwood, and grassy scrub vegetation. Gagu trees (Casuarina, ironwoods) are also found in the 20-25-foot deep borrow pit located on the eastern end of the Runway site. A small grove of coconut trees was found near the center of the site near the eastern boundary. There were no emergent trees (those that protrude prominently through the canopy) in the area.

1. Mariana crow:

The Mariana crow is endemic to Guam and the island of Rota, Commonwealth of the Northern Mariana Islands. While the population of the bird on Rota appears to be stable and numbers about 1,000 (Glass, et. al. 1988), their numbers on Guam have dropped drastically over the past decade. In the June 1989 report "Current Status of the Mariana Crow, Corvus kubaryi, on Guam" (Beck 1989), it states that there are less than 50 left on that island. The report further states:

"At the end of World War II, the crow was common on Guam over the entire island in forested areas and coconut plantations except in areas of human habitation. Since the early 1950's, however, the crow has been declining in range due primarily to predation by the brown tree snake which was apparently introduced to Guam in the late 1940's. The last sightings of the crow in southern Guam were made in the mid-1960's and they have been absent from central Guam since the mid-1970's. At present, crows on Guam are found only in extreme northern Guam..."

"Their numbers are continuing to decline."

Crows can be seen flying in the Northwest Field and in the Conventional Weapons Storage Area (Weapons Area) of Andersen, including the area proposed to be cleared for the P-223 Runway Site project. The April 1988 bird survey of the 172-acre site identified approximately seven Mariana crows; a February 1989 survey identified 10 - 12 individual birds. Although no nesting in the Runway Site was observed, the crows feed on plants and insects which are found throughout forested areas of northern Guam, including the proposed P-223 site.

The Guam Division's December 14, 1987 letter to us reported the discovery of an intact Mariana crow nest in an area then under consideration for placement of P-223 (to the north of the Runway Site currently proposed). The nest had apparently been constructed relatively recently prior to that date and had apparently been blown out of a tree during a wind storm. No adult crows, young, or eggs associated with the nest were reported at that time. Up to eight crows have been seen north of the Runway Site area at one time, and nesting attempts in that area north of the Runway Site are documented. In their February 23, 1988 letter to us, the Guam Division reported another

active crow nest with incubation taking place in the northeastern part of what was then under consideration for P-223. (That area is not included in the Runway Site). Another nest was reported in the Weapons Area.

Enclosures 4 and 5 show crow sighting and nesting locations in relation to the P-223 Runway Site.

On October 27, 1988, Robert Anderson, Acting Chief of the Guam Division, reported the observation of two pairs of crows exhibiting nesting activity in the Weapons Area. On December 15, 1988, Anderson and Beck (Guam Division) reported "several active crow nests" in the area north of the Runway Site. These two nests had been "snake-proofed" by placing a sticky substance around the trunk of the nest trees to discourage snakes from climbing them; by clearing brush and surrounding trees which touch the nest tree to prevent snakes from reaching nests from adjacent vegetation; and by trapping snakes in the nest tree itself. To date, the Guam Division has tried this technique with three active nests. One nest was lost due to unknown predator(s) during incubation; a second was lost to unknown causes after six weeks of incubating and brooding of young; and a third nest successfully fledged a single young which was subsequently lost to predation after it left the protected nest tree (Beck 1989). It is assumed the young crow left the nest and glided to the ground, where it was more vulnerable to predation by snakes or monitor lizards.

Extensive field observations conducted by the Guam Division have found no evidence of successful production and survival of any young crows on Guam since 1985. There have been two unconfirmed observations of fledgling crows in northern Guam, one at Northwest Field and one at Pati Point (Guam Division's letter to the Service of November 3, 1988). The location(s) of the nest(s) producing the two fledglings is not known.

On December 20, 1988, Anderson estimated that approximately one-half of the observed crow nests occur in the Weapons Area and one-half in Northwest Field. The Guam Division is continuing their survey of northern Guam to ascertain crow distribution and the location of active nest sites. Their preliminary results indicate that the primary range of the species on Guam appears to be Northwest Field and the Weapons Area. In a December 15, 1988 telephone conversation with this office, Beck stated that the area then under consideration for P-223 (the area north of the currently proposed Runway Site) is the "center of the crows' distribution on Guam." In addition, a few crows range across Tarague Basin to Pati Point.

Of special importance to our analysis of the impact of the loss of the vegetation in the Runway Site is the characterization of the species of plants to be lost. Beck (1989) reports "Research has shown the crows prefer one species of emergent tree, Eleaocaprus (sic) sphaericus, for nesting and over 90% of the crow nests found on Guam have occurred in this species." The March 1989 Botanical Survey Report states that "such trees as dug-dug or breadfruit (Atrocarpus mariannensis Trec) and yoga (Elaeocarpus joga Merr.), which are so common and which have become so huge in other limestone forests of northern Guam, are almost entirely missing on this site. One of each was spotted and both were less than 10 m (meters) in height. In short, there are no emergent trees in this area as yet." (Note: E. sphaericus and E. joga refer to the same taxa on Guam.)

2. Guam Micronesian kingfisher:

Although no systematic survey has been conducted on northern Guam for this species since 1981, both anecdotal and confirmed reports of Guam Micronesian kingfishers document the dramatic decline in the number of the birds during the past decade. The 1984 U. S. Fish and Wildlife Service report Distribution and Abundance of the Forest Birds of Guam: Results of a 1981 Survey estimated the island-wide population of kingfishers to be 3,022. The report states, "The kingfisher remains one of the most widely distributed of all native species, and presently occupies about 40% of its 1950's range."

More recent field work and site-specific surveys conducted by the Guam Division, the New York Zoological Society, the contractors who prepared the Draft Statement, and others now indicate that the Northwest Field area of Andersen Air Force Base may contain the last remaining kingfisher(s) on Guam. From the 1981 population of slightly over 3,000, the number had dropped in 1987 to possibly less than 10. That number has continued to decline. In their October 28, 1987 letter to us concerning P-223, the Guam Division concluded that, "data suggests that a small population of kingfishers still survives only on Northwest Field primarily at the (then) P-223 site." (Note: the P-223 site at that time was located north of the P-223 Runway Site now under consideration.) There were possibly three kingfishers in the former P-223 area at the time of that report. The last confirmed sighting of a kingfisher on Guam was made in August of 1987. An unconfirmed sighting of one kingfisher was made in May 1988, and the June 1988 survey detected the call of one kingfisher in the same general area, about one mile from the closest border of the Runway Site.

While no conclusive survey has been conducted on the number or location of remaining kingfishers, the trend in population described by their decrease in numbers from 3,022 in 1981 to perhaps one bird in 1988 demonstrates the peril of this species in the wild.

In an effort to save the species from extinction, the Guam Division has developed a captive breeding program for the kingfisher. A cooperative breeding effort was initiated among the Guam Division and several mainland U.S. zoos. Twenty-nine kingfishers were captured from the wild, many have bred successfully, and there are now over 50 captive birds. It is hoped that a larger stock of birds produced in captivity will eventually be able to be released back into the wild in Guam once the brown tree snake has been eliminated or controlled.

Our September 1987 biological opinion on the P-223 project explained that the decline in kingfishers was due to predation by the introduced brown tree snake; there are parallels in the decline of the snake's other vertebrate prey. The loss of kingfishers has been the result of predation on adult birds and their young and eggs, not a general loss of forest habitat. Since the pattern of the expansion of the snake's range on Guam was such that the northern portions of Guam were the last to be colonized by snakes, and in that the Northwest Field area was among the last area of northern Guam to be invaded by the predator, we concluded that the remaining birds were threatened primarily by the snake, not by the loss of habitat expected from the P-223 project.

In their October 28, 1987 letter to us, the Guam Division speculated that perhaps the then under consideration P-223 area (to the north of the Runway Site) had some special quality allowing the survival of the last known kingfishers remaining in the wild. They also stated that it appeared that P-223 area had a lower density of snakes than other areas in adjoining habitat of similar geology and vegetation composition where the kingfisher had already been extirpated. To follow up on this possibility, the Navy contracted Dr. Thomas Fritts, a herpetologist with this Service, to conduct snake surveys in the area. His report on the abundance and distribution of brown tree snakes concluded that no significant difference between snake densities within, and in similar habitat outside of, the project area existed. Although it is acknowledged that snake densities fluctuate in response to the availability of their prey, and thus change over time, the presence of a high density of snakes in the area at that time was documented. The densities of snakes found there could account for the decrease in the numbers of birds.

Dr. Fritts' report further noted that as evidenced by the surprisingly high snake activity on the ground at the Naval Communications facility at Andersen as opposed to its usual arboreal habits, treeless areas do not pose a barrier to snake movement. While we had previously hoped that the abandoned runway grid at Northwest Field may be a significant factor in the control of snakes, we now know that these large paved areas have not prevented the snakes from invading areas surrounded by runways.

More recently, there is evidence that the number of snakes in the area of the P-223 site has decreased (Rodda, 1989), and reports from the Guam Division indicate that in response, the populations of some bird species there and elsewhere on Guam may be increasing. However, we would not expect the snake population at the P-223 site to remain depressed without human intervention; rather, the number of snakes would be expected to fluctuate in response to the availability of their prey.

Evidence demonstrates that the brown tree snake, not the overall loss of forested habitat, has been the primary cause of the decline of crows and kingfishers on Guam. Using 1985 aerial photographs of northern Guam and 1975 aerial photographs of southern Guam we calculated that approximately 16,900 acres of habitat suitable for the crow exist in northern Guam with 13,600 acres of similar habitat available in southern Guam. The loss of 110 acres due to P-223 amounts to a loss of 0.7% of all forested habitat in northern Guam and a 0.4% loss island-wide. Further, this 110 acres is mostly second-growth vegetation, not the mature limestone forest found elsewhere on Andersen Air Force Base.

To calculate the areas of forest needed to reach the "recovered" population sizes of 500 crows in northern Guam and 200 crows in southern Guam recommended in the Draft Guam and Rota Forest Bird Recovery Plan, we have estimated that each crow requires approximately 25 acres of "good" forest habitat to support feeding, nesting, and the maintenance of territories. Good forest habitat is defined, in part, as forested areas that contain the species of food and nesting trees favored by the crow. To reach the recovery goal for northern Guam, therefore, a minimum of approximately 12,500 acres of good forest habitat is required. We have identified that an area of approximately 17,000 acres of forest on northern Guam offers forested habitat, some of which would

be considered "good" habitat for the crow. In that the Botanical Survey Report did not find the vegetation complex and stature which provide good forest habitat for the crow in the 110-acre area proposed to be cleared, we do not consider the loss of this small (0.6) percentage of forest to be of great significance.

The destruction of habitat required for P-223 at the Runway Site does not constitute a significant portion of available habitat in that sufficient habitat will remain after the installation of P-223 to allow for the recovery of the kingfisher and crow.

4. Marianas fruit bat:

In northern Guam, Marianas fruit bats forage and roost mainly in native limestone forest. Wiles (1981) and the Draft Recovery Plan for the Marianas Fruit Bat and the Little Marianas Fruit Bat on Guam (Draft Bat Recovery Plan) described the characteristics of six roosts used by colonies of Marianas fruit bats. These sites occurred in limestone forest and were found along or within 100 meters of the large 80 to 180 meter tall cliffline that fringes northern Guam. Bats prefer to roost in mature fig trees, although other species were used. They are primarily frugivorous, and bats roosting in northern Guam may forage throughout the forested areas of Andersen Air Force Base and the Naval Communications Area Master Station. No bat colonies or the vegetation normally associated with such a colony are located within or adjacent to the P-223 site, although a few solitary bats or very small groups may roost in the site on a temporary basis. The February 1989 Bird and Mammal Survey - Guam - Runway Site noted that although fruit bats have been rarely seen in the Northwest Field area for the last 10 years, a June 1988 sighting of a bat approximately 1,000 feet from the Runway Site indicates that the area close to the P-223 site is still used by the animals. Guam Division Conservation Officers have observed Marianas Fruit Bats feeding on flowers of Casuarina trees on Northwest Field, and the P-223 site contains this species of tree.

Illegal hunting by poachers and predation by the brown tree snake appear to be the two major causes of the bat's depressed population; hunting bats was outlawed in 1966. In 1984, 500 bats were estimated to exist in northern Guam; all the bats recorded during the surveys were found on Andersen Air Force Base (Draft Bat Recovery Plan). The recovery goal for the Guam population is 2,500.

As previously stated, lack of habitat does not appear to be implicated in the decline of the bat's population; losses due to poaching by humans and predation by the brown tree snake are responsible for their endangered status. There are sufficient fruit trees and roosting sites available in northern Guam to support a recovered population if illegal taking and the snake are controlled. The loss of 110 acres of bat foraging habitat resulting from P-223 will not significantly hinder the species' recovery.

The Guam Department of Agriculture's October 28, 1987 letter to us speculates that poaching bats may increase as a result of the P-223 project in that "any type of clearing in essential habitat promotes easier access by people into remote areas where bats occur.... Poaching could occur during both the initial phase of the project when the forest is being bulldozed and later after the construction of the antenna has been completed."

Extra protection against illegal activities will be provided by P-223. Currently Air Force security personnel are responsible for the Northwest Field area; after completion of the P-223 project, Navy security personnel will also patrol the project area. As the receiver will be operated throughout the full 24-hour day, every day of the year, persons with the authority to report illegal activities in the vicinity of the receiver will always be present. We would anticipate a decrease in illegal hunting as a result of the project. We also recognize that the P-223 area, although remote, is already accessible by car; the old aircraft runways provide speedy access and escape of poachers, if any, in that area. Access to the site will not be improved for trespassers. Additionally, the P-223 installation is a radar listening facility, and vehicle noises disturb the clarity of radar reception. The Navy would want to prevent poachers' or any other unauthorized vehicles from passing in front of the receiver field.

-In summary:

The overriding factor in the catastrophic decline of the kingfisher and crow on Guam is predation by the brown tree snake. While poaching is a major factor in the decline of the fruit bat, the snake is believed to have a significant role in the decline of this species as well. Should the Runway Site for P-223 at Northwest Field be selected and cleared, there are other areas for crows, kingfishers, and bats to feed and nest. Habitat availability is not the limiting factor.

Although bat colonies do not occur in the project site, they are located nearby, close to the cliff line. The bats may feed on fruit trees growing within the 110-acre area to be cleared, and a few bats have been observed roosting there. However, there is an abundance of similar feeding and roosting areas nearby which will be unaffected by the project.

Thus, it is our opinion that construction of P-223 at the Runway Site on Northwest Field will not be likely to jeopardize the continued existence of the Mariana crow, Guam Micronesian kingfisher, or the Marianas fruit bat. Some habitat which is known to currently support both the crow and bat and possibly support the kingfisher would be destroyed should the site be chosen for the project. However, clearing related to this project would represent less than 1% of forest habitat available in northern Guam and would not significantly affect the estimated core habitat necessary to sustain the recovered population goals.

Cumulative Effects

Cumulative effects are those impacts of future local government and private actions which are reasonably certain to occur. A non-federal action is reasonably certain to occur if the action requires the approval of a local resource or land use control agency, and such agencies have essentially approved the action. Activities that do not require local agency approval must be essentially ready to proceed. Future federal actions will be subject to the consultation requirements established in Section 7 of the Act and, therefore, are not considered cumulative to the proposed action.

As was stated previously, radar projects P-225 and P-002 may require separate consultations should it be determined that they may affect a listed species or a designated critical habitat. The impacts of these projects will be addressed at that future time, and the effects of P-223 will be considered as part of the environmental baseline.

With specific respect to the rezoning of the Artero property on Guam (located within the proposed essential habitat for the crow, bat, and kingfisher) to allow for hotel/resort development, we do not believe it qualifies for inclusion as a cumulative effect. Although the property owner may have expressed an interest in development of the area, no building plans or other progress toward development has been submitted; approval for any development project has not been granted by any Guamanian government agency. More importantly, the Artero property is totally surrounded by federally controlled areas. Any access to the property requires the authorization of a federal agency. If such access or any other private action requiring federal authorization or approval may affect any listed species, the federal agency will be required to formally consult with this Service. At that time, the impact of the development on listed species will be addressed.

A Japanese investment group (Marianas Agupa Enterprises, Inc.) is asking for land on Rota on which to construct a resort community with seven hotels, three golf courses, 1,500 to 2,000 condominium apartments, and a stadium (Guam Business News, July 1989). Although neither the transmitter nor receiver portions of the P-223 project are located on Rota, approximately 1,000 Mariana crows are estimated to be found there. The island of Rota has a total area of approximately 32.8 square miles, including 23.2 square miles of habitat suitable for the crow (Micronesian Forest Bird Survey, 1982: Saipan, Tinian, Agiguan, and Rota 1986). Preliminary descriptions of the project indicate the area required to be about 1,400 acres. If the site for the resort is located entirely within crow habitat on Rota, such a development would destroy approximately 9% of the crow habitat on the island. We cannot estimate the area of the 1,400-acre site which is used by crows or the value of the habitat they do use to the overall island crow population. However, such a loss would represent a significant decrease in crow habitat on Rota, where the crow population is considered healthy. We do know that some coastal strand vegetation habitat will most likely be destroyed due to the development, and that this type of habitat is used by the crows.

We do not know if any federal authorization may be required which would "trigger" formal Section 7, Endangered Species Act consultation with this Service. To the best of our knowledge, no Commonwealth permit has been issued allowing construction.

In evaluating the significance of such a loss of habitat on Rota to our consultation regarding the P-223 project, we considered the following:

1. Loss of habitat on Rota will not affect the individual crows remaining on Guam. However, should Rota crows be required as stock for repopulating Guam, a significant decrease in the number of crows on Rota will make it more difficult to take birds from there, negatively affecting the recovery of the species.

2. The drastic decline of crows on Guam is directly attributable to predation by the brown tree snake, not to a loss of habitat. Sufficient habitat remains on Guam to support a fully recovered crow population there.

3. Rota could be invaded and colonized by snakes. Should this occur, it would have the potential for seriously depleting the crow population there. There has been a report of what was likely a brown tree snake hidden in a ship's cargo on Rota which was killed when it was detected trying to escape.

The Rota resort development will diminish crow habitat there by possibly as much as 9%. However, this decrease will not substantially decrease the chances for the recovery of the species on Guam, its recovery there being directly dependent on control of the brown tree snake. While the loss of up to 9% of the crow habitat on Rota may equate to a loss of up to 90 birds (9% of their population of 1,000), the remaining 910 would still be sufficient to support a small-scale reintroduction program on Guam without jeopardizing the Rota population. However, a serious threat to the specie's recovery would likely result should future significant losses of habitat on Rota be sustained.

Incidental Take

Section 9 of the Act prohibits any taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species without specific exemption. Under the terms of Section 7(b)(4) and 7(o)(2), taking that is incidental to and not intended as part of the agency action (in this case, take associated with Project P-223) is not considered prohibited within the bounds of the Act provided that such taking is in compliance with the incidental take statement.

On Tinian:

1. We anticipate that Tinian monarchs will be forced from the project area as the tangentangen is removed. Surveys conducted as part of your preparation of the Draft Supplement and Draft Statement for the P-223 project estimated that there were 24 individual monarchs in the 58-acre area. Surveys of northern Tinian conducted by this Service several years ago estimated that there may be as many as 100 monarchs in a 58-acre area. However, this higher density was determined for habitat that was overall of better quality for monarchs than the habitat found in the P-223 area. We would expect fewer than 100 monarchs at the proposed 58-acre transmitter site, and your estimate of 24 is reasonable.

We would expect that the 24 monarchs would be forced into adjoining habitat or otherwise disturbed by the construction activities. Birds forced into new habitat may be stressed and would probably not survive due to lack of food or other resources claimed by the birds already existing in that new area. Because the size of the area which may be adversely affected by the project (the project site plus adjoining areas which will be affected by noise and similar disturbance) is larger than the 58 acres surveyed, it is anticipated that the project would result in the taking through harassment (possibly resulting in their death) of 40 individual monarchs. Additionally, monarch nests in the project site may be abandoned and destroyed when the land is cleared. The destruction of up to 12 Tinian monarch nests (the nests

maintained by 24 birds) and the eggs they may contain could be expected and is, therefore, also anticipated. Accordingly, the incidental take allowance is set at 40 birds and 12 nests (including eggs and young they may contain).

The island-wide population of Tinian monarchs is estimated to be about 40,000. In consideration of the fact that the possible loss of 40 monarchs constitutes only 0.1% of the total population, no jeopardy to the continued existence of the species exists if the maximum anticipated incidental take is reached. Even when the number of eggs or young which may be destroyed by clearing the site is added, the loss to the total population would be far less than .2%.

While we would expect that the incidental take level for individual birds may be reached, we would not expect it to be exceeded. This expectation is based on the previously referenced surveys. However, we recognize that it is impossible to determine the exact number of birds which may be taken.

Reasonable and prudent measures are considered necessary or appropriate to minimize the amount or extent of the anticipated incidental take of the species. To minimize the taking of Tinian monarchs on Tinian, you must (1) insure that as little vegetation is removed as is required to complete the project and (2) you must reduce the chances of monarchs being adversely affected by the project.

Terms and conditions are specific actions which must be carried out by the action agency (the Navy) to implement the reasonable and prudent measures. Incidental taking of monarchs is subject to the following terms and conditions, which must be implemented:

a. Project contractors must be made aware of the sensitivity of the area to monarchs and the Navy's commitment to further their conservation. You must insure that the contractor clears or otherwise adversely modifies only the area described in the present project documentation. Additional clearing for such uses as equipment storage, access roads, or other activities which have not been listed in the present project description and have not been subsequently reviewed by this Service as part of our Section 7 consultation are not to be allowed.

b. The Navy, project contractors, or others involved with the project must Notify the Chief of the Commonwealth Division immediately upon the discovery of any Tinian monarch injured or killed as a result of the clearing or construction activities. Their telephone number on Saipan is (670) 322-9729. The Commonwealth Division will advise on the handling and disposition of injured or killed birds (such as taking an injured bird to a veterinarian for treatment or how to preserve and forward any dead specimens).

c. This office is to be notified within three days of any project-related injury or death of any Tinian monarch. Our telephone number in Honolulu is (808) 541-2749. A written report of such an incident is to be sent to this office within five days of the incident and will contain such information as the time and date of the incident, how the injury or death occurred, the fate and present location of the bird, the name and telephone number of someone familiar with the incident, and measures implemented to prevent recurrence.

2. As previously discussed, it is possible that Mariana common moorhen may fly through the project area and be injured or killed by striking antennas or supporting cables. Based on previous moorhen population estimates on Tinian, the size of the Tinian installation in relation to the total land area of northern Tinian, the number and height of antennas and their supporting cables, and the nature of the moorhens' flight habits, an incidental take level of three birds per year injured or killed is anticipated. Should a total of three moorhens be injured or killed, the maximum level of incidental take will have been reached. If this level of three moorhens injured or killed is exceeded, consultation with this Service must be reinitiated immediately.

The population of Mariana common moorhens is estimated to be approximately 400; this includes approximately 200 in Guam and 200 in the Commonwealth. The loss of three birds constitutes a loss of 1.5% of the Commonwealth population or 0.73% of the total Marianas population. Such a loss would not jeopardize the continued existence of the species.

As reasonable and prudent measures, the Navy must assess the actual take of moorhens resulting from collisions with wires and antennas and must undertake a program to help moorhens avoid striking the wires or antennas.

The following terms and conditions must be implemented:

a. During the first year of operation, the P-223 transmitter site is to be inspected daily for injured or dead birds, and a verbal report of any found is to be made to this office (808-541-2749) within one working-day of the discovery. Any dead birds found must be frozen as soon as possible; we will advise on their disposition and will make arrangements for autopsies. (The determination of cause of death, whether by collision with structures, radiation, or other causes, may be very important.) Written reports should be submitted to this office within one week of discovery and should contain information on the date and time of the discovery, the extent of the injuries or notes on the cause of death, the location of the discovery in relation to antenna or cable placement, the name and telephone number of the person making the report, and any other pertinent information. A similar report on the discovery of dead birds found should also be made to the Chief of the Commonwealth Division at (670) 322-9729. Live moorhens found on the ground within the P-223 site are to be reported to the Commonwealth Division immediately. The Commonwealth Division will provide information on care and handling of the bird and will advise on veterinary care. After the first year of operation, we will reconsider the frequency of site inspection.

b. Personnel at the transmitter installation are to be advised of the endangered status of the moorhen and their conformance with these incidental take provisions shall be required. Any observations of moorhen flying in the vicinity of the project should be noted and reported to this office or to the Commonwealth Division. Such information as time and date of observation, number of birds seen, direction of flight, approximate altitude, and weather would be helpful to our recovery efforts.

c. To minimize the taking of Mariana common moorhen on Tinian you must incorporate some form of effective hazing tactic to discourage the birds from flying into the antennas or cables. This may take the form of visual warnings (such as reflective tape or other ornaments) to birds that the antennas and cables are present. As discussed in the Draft Statement, tall trees have been shown to be effective in either causing birds to increase their elevation to clear the trees, thus being more likely to fly over, rather than through, an antenna field, or to fly around the trees and around an antenna field. Tall trees already existing in the vicinity of the project are not be cut unless absolutely necessary due to project requirements. Such trees are to be further encouraged through fertilization, watering, pruning, or other standard techniques. Further, a tall species of tree, such as Casuarina equisetifolia (ironwood), shall be planted at close spacing along the side boundaries of the antenna site, perpendicular to the direct route moorhens may fly between Susupe and Hagoi. The trees are to be watered, fertilized, and otherwise encouraged to grow. You may wish to consult the Commonwealth's forester or another qualified aboriculturist in this regard. While we recognize that because of their initial short stature the trees planted will be of little immediate benefit in encouraging moorhens to avoid the field, their usefulness as a visual stimulus will increase as they grow.

d. As described in the Effects of the Proposed Action section of this letter, should any moorhens be injured as a result of collision with any transmitter-related structures, you must institute a more effective means of preventing moorhens from being injured by the antennas and their wires. Such other means must meet with the approval of this Service.

On Guam, it is possible that during the clearing of the P-223 area crow or kingfisher nests or a roosting Mariana fruit bat may be found. Construction-related activities prior to or during the discovery and identification of these may constitute harassment of those birds, their nests, or the bats.

Taking through harassment (not destruction) of one active crow nest (including birds tending or otherwise associated with the nest plus eggs or young) is anticipated. This number is based on the most recent data concerning the number of nests in the vicinity of the 172-acre site. Accordingly, an incidental take limit of one nest and associated birds and eggs is established.

Taking through harassment (not destruction) of one active kingfisher nest (including birds tending or otherwise associated with the nest plus eggs or young) is anticipated. Accordingly, an incidental take limit of one nest and associated birds and eggs is established.

Taking through harassment (not physical injury) of up to 10 Marianas fruit bats is anticipated. Accordingly, an incidental take limit of 10 Marianas fruit bats is established. It would be expected that the bat(s) would not remain in a tree for very long before leaving to forage or return to a colony. After the bats leave, construction activities in the vicinity of the tree(s) can be resumed.

"Harass" in the definition of "take" in the Act is defined in 50 CFR 17.3 (1988) as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering. As applied to this consultation, harassment would include disturbance of listed birds or bats by the activities leading up to the discovery of the birds, their nests, or bats. This would include survey work, land clearing, and other activities in the area.

Whenever the level of allowable incidental take established in this consultation is exceeded, consultation with this Service is to be reinitiated immediately. Any nesting of either of the bird species may be very significant in their recovery.

These levels of allowable incidental take were reached based on the fact that this incidental take allowance does not allow the injury or killing of any bird or bat, but only their initial harassment by personnel or machinery in the vicinity of a nest or roosting bat. As soon as a crow or kingfisher nest or a roosting bat is detected, the human activity in the vicinity of the nest or roost (as specified below) is to cease. We do not anticipate the loss of any bats, birds or their eggs as a result of this incidental take. As such, the allowable incidental take will not jeopardize the continued existence of any of the species.

Reasonable and prudent measures are designed to minimize incidental take. For the clearing of the P-223 area on Guam, reasonable and prudent measures are those which will reduce the probability of the crows, kingfishers or bats being harassed, injured or killed by project-related activities. You are to avoid harassment of crows, kingfishers, and bats by implementing the following terms and conditions, which are required:

a. Within the month prior to the commencement of clearing operations, the area to be cleared must be surveyed for crow and kingfisher nesting activity. A report of the results of such a survey will be forwarded to the Guam Division and this office.

b. Should crow or kingfisher nesting activity be discovered in the project area before or during construction, all construction activities within 200 meters of the nest site is to be halted and the Chief of the Guam Division (671-734-3944) and this office (808-541-2749) are to be notified. A decision will be made at that time as to how to avoid harassment of the birds until the nesting activity ceases. Upon cessation of nesting activity, construction may be resumed. (For the purposes of this Incidental Take section, cessation of nesting activity means either the destruction of the nest by "natural" causes with no attempt to renest within two weeks or abandonment of the nest by the adults.)

c. Should roosting bats be found in the P-223 area, activities within 50 meters of the roost shall cease. Construction activities may begin again after the bat(s) has/have left.

Conservation Recommendations

Section 402.02 (Definitions) of Section 7 of the Act states that discretionary measures which would serve to minimize or avoid adverse effects of a proposed action on listed species or critical habitat may be recommended. These recommendations supersede those listed in our September 15, 1987 biological opinion.

1. Cut as little vegetation as is needed to reach project requirements.

2. All vegetation which will be cut or otherwise uprooted must be taken off site to an approved dump or landfill area for disposal, buried within the project site, or burned. Should the vegetation be burned, precautions must be taken to insure that the fire remains under control. No vegetation, dirt, or other materials are to be dumped or pushed into the forest outside of the defined P-223 construction site.

3. The Hagoi wetland provides a unique habitat on Tinian. It is, however, susceptible to drought conditions. While we would not expect the withdrawals of water from the project's wells to significantly affect the water levels in the wetland, approximately 2.5 kilometers away, no water should be taken directly from the wetland during the construction or operation of the facility.

4. Naval personnel, private contractors, and others working on the P-223 project may be involved in moving materials and equipment from Guam to Tinian. The introduction of brown tree snakes to Tinian could devastate listed bird species there. All should be directed to take prescribed precautions to prevent the accidental transportation of the brown tree snake to Tinian. The snake prevention measures described and referenced in the Draft Statement and those to be modeled after the Black Micro Construction contract with the Air Force for the PACBAR III project on Saipan should be acceptable. However, we request that we be allowed to review and comment on the final plan when completed.

This concludes formal consultation on this action. As cited in sub-section 402.16 of Section 7, reinitiation of formal consultation is required and shall be requested by the Federal agency (Navy) or by this Service, where discretionary Federal involvement or control over the action has been retained or is authorized by law and:

a. If the amount or extent of taking specified in the incidental take statement is exceeded;

b. If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered;

c. If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion; or

d. If a new species is listed or critical habitat designated that may be affected by the identified action.

Portions of Guam including the project site are under consideration for designation as critical habitat. If and when a proposal for designation of critical habitat is published, and if you determine that the project may affect that proposed critical habitat, you are required to confer with this Service as directed by Section 7. We may then recommend measures which may be taken to reduce or eliminate the impact to the proposed critical habitat. Should a final designation be made, you must reinitiate consultation if the project may affect such designated critical habitat.

Sincerely yours,

Allan Marmelstein
Pacific Islands Administrator

Enclosures

cc: Assistant Regional Director - Fish and Wildlife Enhancement, Region 1, Portland, Oregon

A Partial List of References Cited or Consulted

Avery, M., P.F. Springer, and J.F. Cassel. 1976. The effects of a tall tower on nocturnal bird migration - A portable ceilometer study. The Auk 93: 281-291.

Beck, R.E. 1989. Current Status of the Mariana Crow, Corvus kubaryi, on Guam. Aquatic and Wildlife Resources Division, Government of Guam.

Bent, A. 1926. Life Histories of North American Marsh Birds, Smithsonian Institution Bulletin 135. Dover Publications, Inc. New York. pp. 352-353.

Glass, P.O., J.D. Reichel, E.C. Villagomez, E. Taisacan and D. Aldon. 1988. Five Year Progress Report 1983-1987, Pittman-Robertson Federal Aid in Wildlife Restoration Program, Saipan.

Little, E.L., and R.G. Skolmen. 1989. Common Forest Trees of Hawaii (Native and Introduced). U.S. Department of Agriculture, Forest Service, Handbook Number 679.

Naval Space Command. 1988. Draft Environmental Impact Statement for Electronic Installations on Tinian and Guam, 100% Submittal

Naval Space Command. July 1989. Draft Environmental Impact Statement for Electronic Installations in the Western Pacific.

Rodda, G. 1989. Personal communication regarding snake densities on Guam.

Shaw, N. The Development Race. Guam Business News. July 1989. page 10.

U. S. Fish and Wildlife Service. 1978. Impacts of Transmission Lines on Birds in Flight. FWS/OBS-78/48. 151 pp.

U. S. Fish and Wildlife Service. 1984. Distribution and Abundance of the Forest Birds on Guam: Results of a 1981 Survey. FWS/OBS-84/20. 54 pp.

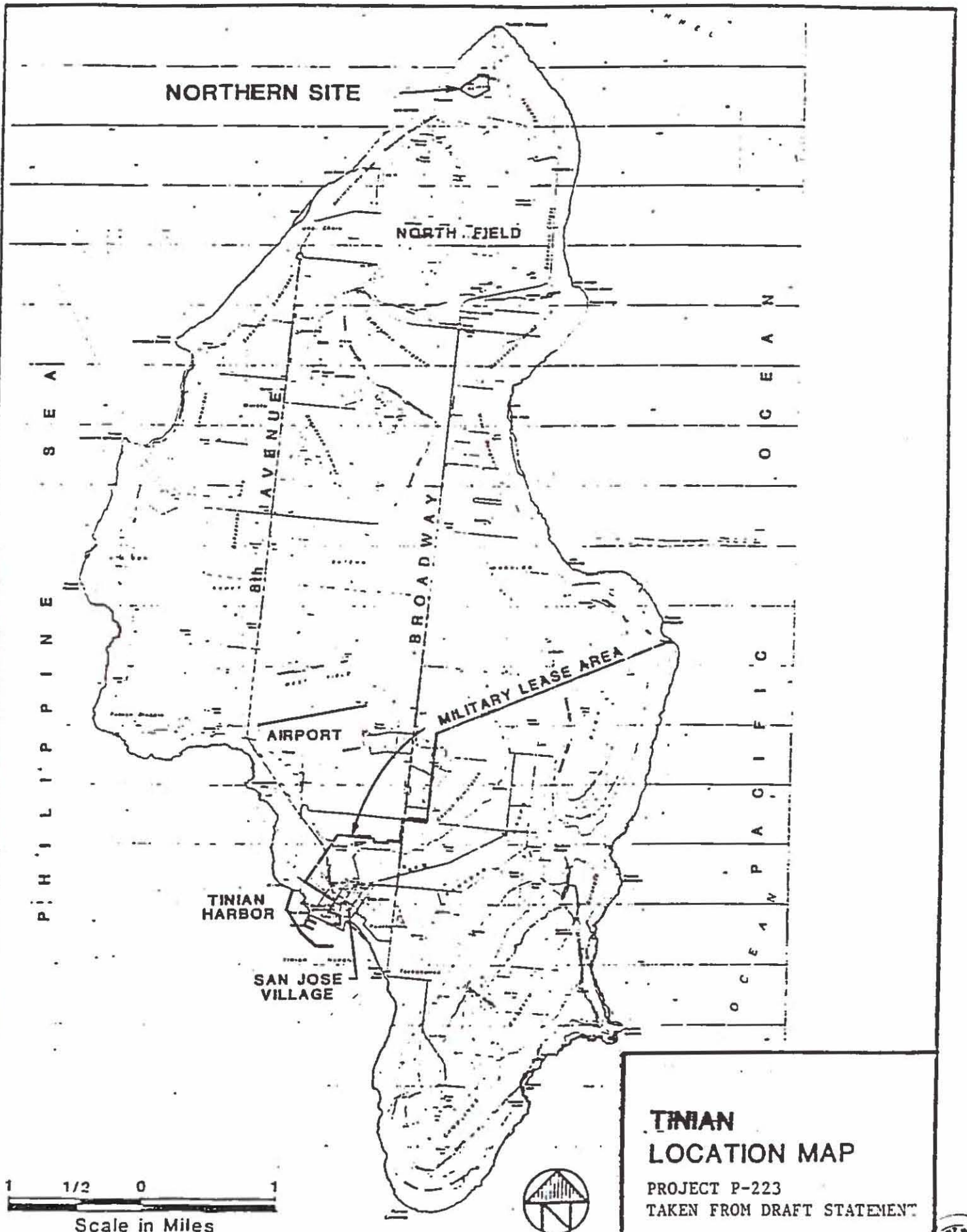
U. S. Fish and Wildlife Service. 1986. Micronesian Forest Bird Survey, 1982: Saipan, Tinian, Agiguan, and Rota. 143 pp.

U. S. Fish and Wildlife Service. 1987. Draft Guam and Rota Forest Bird Recovery Plan. 113 pp.

U. S. Fish and Wildlife Service. Undated. Draft Recovery Plan for the Marianas Fruit Bat and Little Marianas Fruit Bat on Guam.

Wiles, G. 1981-1984. Movement patterns and habitat utilization of the Marianas fruit bats. in Aquatic and Wildlife Resources Division Annual Reports, FY 1981-1984. Dept. of Agriculture, Guam. Unpubl.

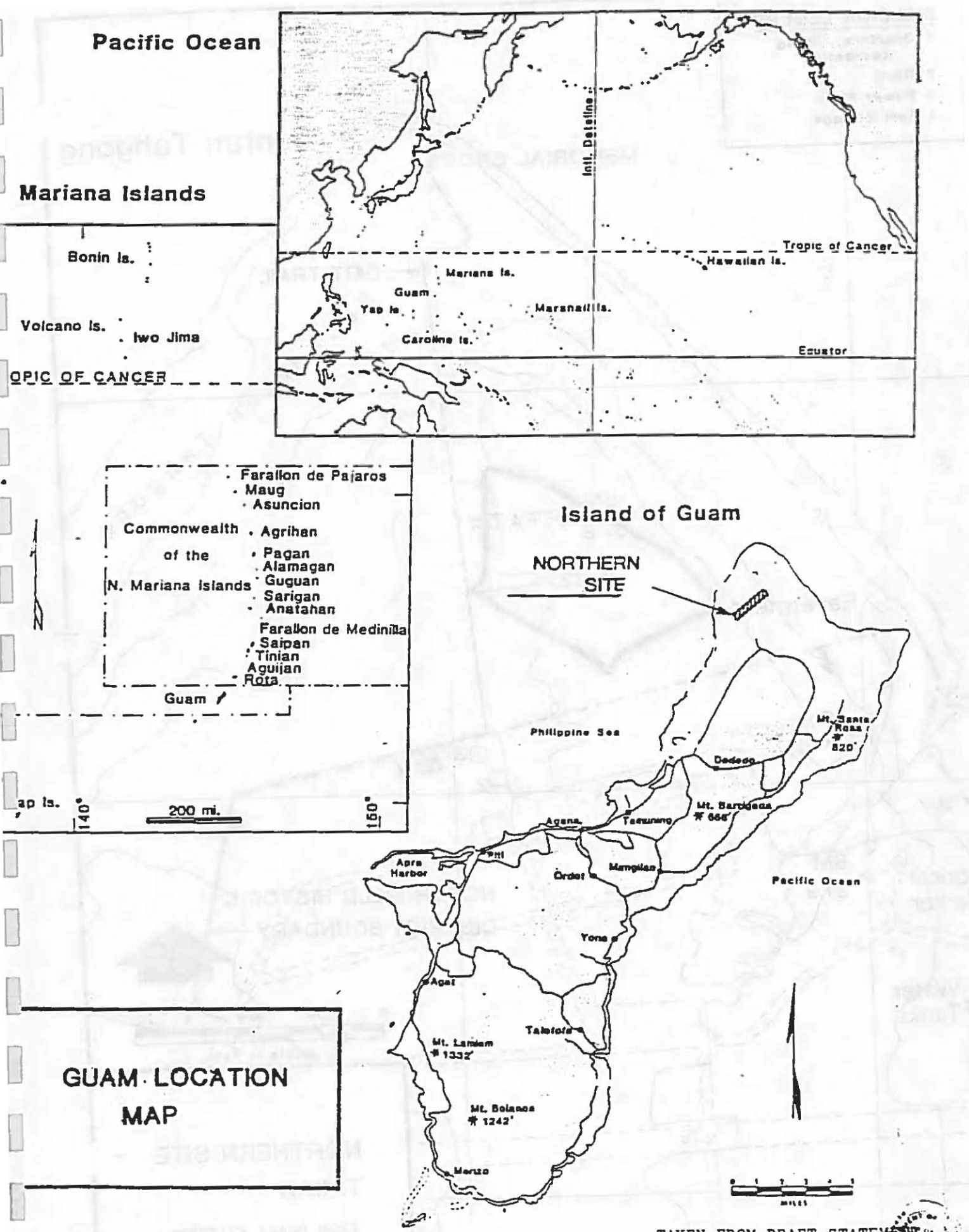
Wiles, G. 1981-1984. The current status, distribution and natural history of Marianas fruit bats. in Guam Aquatic and Wildlife Resources Division Annual Reports, FY 1981-1984. Dept. of Agriculture, Guam. Unpubl.Beck. R.E. 1989. Current Status of the Mariana Crow, Corvus kubaryi, on Guam. Aquatic and Wildlife Resources Division, Government of Guam.



TINIAN
LOCATION MAP

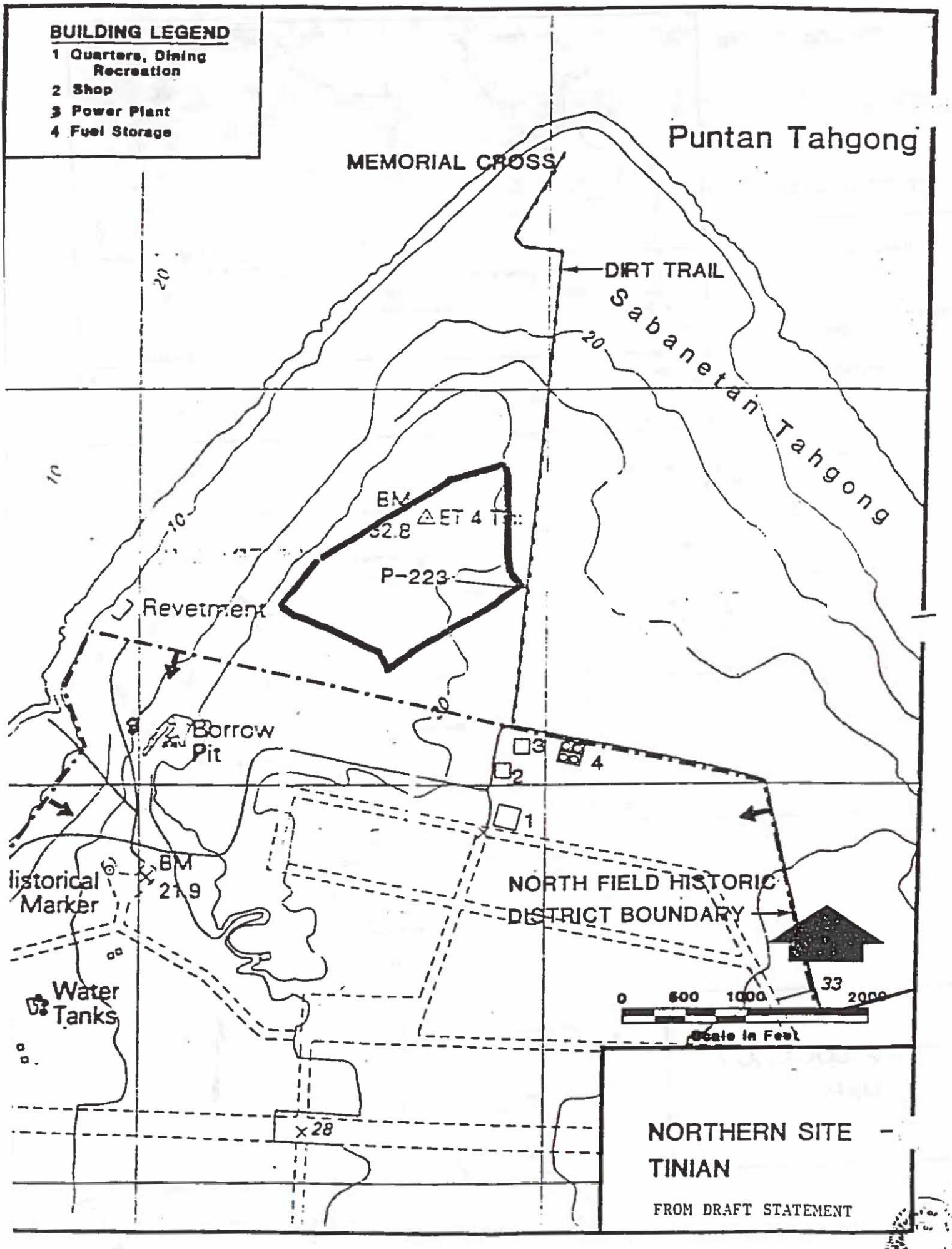
PROJECT P-223
TAKEN FROM DRAFT STATEMENT

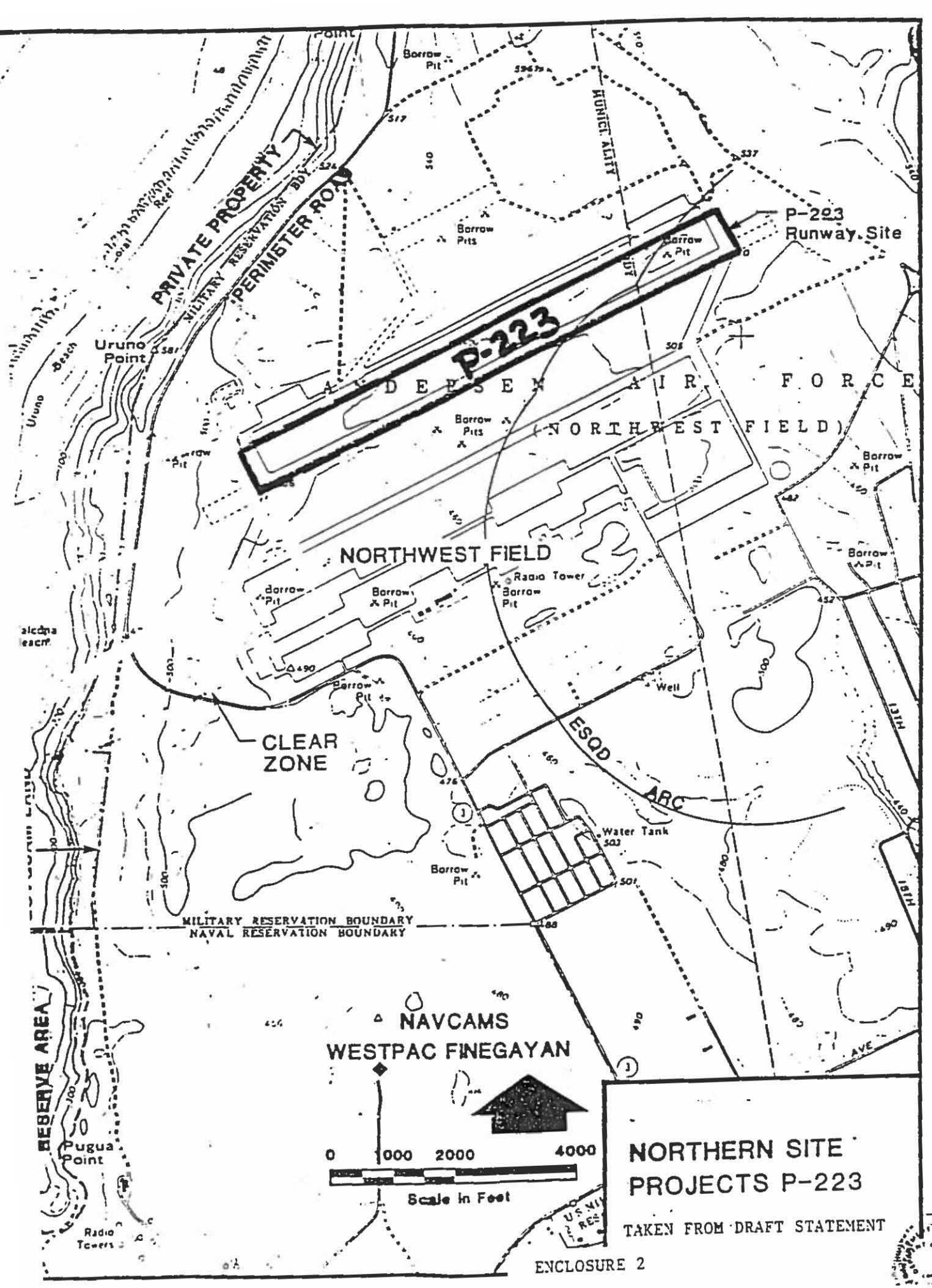
ENCLOSURE 1



GUAM · LOCATION MAP

TAKEN FROM DRAFT STATEMENT
ENCLOSURE 2


BUILDING LEGEND
1 Quarters, Dining Recreation
2 Shop
3 Power Plant
4 Fuel Storage
Puntan Tahgong
MEMORIAL CROSS
DIRT TRAIL
Sabanetan Tahgong
BM
32.8
ET 4
P-223
Revetment
Borrow Pit
BM
21.9
Historical Marker
Water Tanks
NORTH FIELD HISTORIC DISTRICT BOUNDARY
0 600 1000 2000
Scale in Feet
NORTHERN SITE
TINIAN
FROM DRAFT STATEMENT


PRIVATE PROPERTY
MILITARY RESERVATION BDY
PERIMETER ROAD
P-223
P-293
Runway Site
ANDERSEN AIR FORCE
(NORTHWEST FIELD)
NORTHWEST FIELD
Uruno Point
Uruno Beach
Borrow Pits
Radio Tower
Well
Water Tank
CLEAR ZONE
ESQD ARC
MILITARY RESERVATION BOUNDARY
NAVAL RESERVATION BOUNDARY
NAVCAMS
WESTPAC FINEGAYAN
RESERVE AREA
Pugua Point
Radio Towers
0 1000 2000 4000
Scale in Feet
NORTHERN SITE
PROJECTS P-223
TAKEN FROM DRAFT STATEMENT

ENCLOSURE 2

5.1.22 Means of Mitigating Potentially Adverse Effects

As previously discussed, the CNMI Division of Fish and Wildlife considers the Brown Tree Snake to be the single greatest threat to CNMI's wildlife resources. [Ref. 10] Measures to prevent the accidental introduction of the Brown Tree Snake to Tinian will have to involve the cooperation and diligence of a number of entities including the U.S. Navy, private contractors and government agencies on Guam, Saipan and Tinian. Cargo and equipment bound for Tinian originating in Guam or being transshipped through Guam presents the greatest hazard for the accidental introduction of the Brown Tree Snake to Tinian. Brown Tree Snakes could hide in the cargo as it leaves Guam and arrive in Tinian and eventually become established.

There are no biological controls known for the Brown Tree Snake. Although the snake mite has some potential as a biological control, the lack of information on potential secondary impacts makes it difficult to warrant its use at this time. [Ref. 58]

Since there is a high population density of snakes on Guam, mitigation or control measures should be used on Guam and Tinian. These measures were discussed and reviewed during workshops held in Saipan, Rota and Tinian in September 1986. [Ref. 10] Specific measures on Guam include:

- Control of snakes in and around warehouses, material and equipment storage areas;
- Stringent inspection of cargo and equipment prior to shipment from Guam;
- Special inspection attention to high risk cargo such as lumber, pipes, construction material, automobiles, heavy equipment/machinery and large unsealed crates; and
- Requirement that high risk cargo be certified as being snake-free prior to loading for shipment. [Ref. 10]

Mitigation or control measures applicable to North Field area and the commercial port on Tinian discussed during the September 1986 workshop include:

- Stringent inspection of cargo and equipment after arrival, especially those arriving from Guam;

- o Visual inspection by the quarantine officer in Guam prior to shipment of high risk cargo such as lumber, pipes (PVC, cast iron and ductline), hollow blocks, crates, and other material where snakes could hide; and

- o Visual inspection by the quarantine officer at the destination (Tinian).

All cargo moving via surface ship or air either originating in Guam or transhipped through Guam was to be subjected to these procedures. This requirement extended to material shipped directly by the Contractor or via a freight forwarder. All types of high risk cargo were required to be treated in this manner.

An inspection check list covering 16 items and a signed verification by the quarantine officer was included in the Black Micro Construction Implementation Plan. [Ref. 65]

The U.S. Navy has not as yet selected a prime construction contractor for the ROTHR project. However, once selected, the prime construction contractor will be required to develop a snake protocol modeled after the one prepared by Black Micro Construction. Use of a protocol modeled after the Black Micro Construction will ensure that personnel handling high risk cargo in Guam and in CNMI will be familiar with the established inspection and notification procedures. The final protocol for the ROTHR will be established in conjunction with appropriate CNMI and Government of Guam agencies, the prime construction contractor and the U.S. Navy. The prime contractor for operation of the ROTHR systems will also be required to establish a similar snake protocol.

- o Construction of a fenced cargo and equipment area for holding material after unloading. (Snakes would have to climb the fence to leave the area and could be detected);

- o Searches for snakes from 2000 to 2200 hours (8:00 to 10:00 P.M) the night following the unloading of high risk cargo;

- o Conduct of full-scale control efforts immediately after any snake sighting to eliminate it before a colony can become established; and,

- o Post instructions with immediate notification procedures in the event a snake sighting at cargo entry points. [Ref. 10]

The construction of the U.S. Air Force Pacific Barrier III (PACBAR III) Project on northern Saipan presented a similar situation as the ROTHR projects. The accidental introduction of the Brown Tree Snake to snake-free Saipan poses the same threat as introduction of the snake to Tinian. As a mitigation measure for the PACBAR III project, the Prime Contractor, Black Micro Corporation of Guam, a subsidiary of Black Construction Corporation, prepared a plan entitled, An Implementation Plan to Prevent Importation of Harmful Insects, Rodents and Especially Brown Tree Snakes. [Ref. 65] The plan identified "high risk equipment and materials" as equipment and materials originating from Guam, especially those not containerized or not in completely sealed containers. Cargo imported from elsewhere and unloaded, stocked and reloaded for transshipment from Guam was also identified as high risk cargo. This category includes those in breakbulk condition or not in completely sealed containers.

The Black Micro Corporation Plan also presented guidelines to prevent the accidental transport of the Brown Tree Snake. [Ref. 65] Specific guidelines included:

- o Appointment of quarantine officer to visually inspect cargo in Guam prior to shipment;

- o Thorough cleaning by high pressure water blaster to remove all foreign materials, such as dirt, grease, grass, weeds, insects, and snakes from all equipment being shipped from Guam whether by ship or air;

- o Inspection of all incoming cargo at the destination by an appointed quarantine officer immediately upon arrival or within 12-hours of off-loading cargo; and

- o In the event of a snake sighting, the quarantine officer shall take all efforts to capture and eradicate the snake, then contact the CNMI snake control team.

The specific guidelines for shipment of high risk material were similar and included:

MAP-1

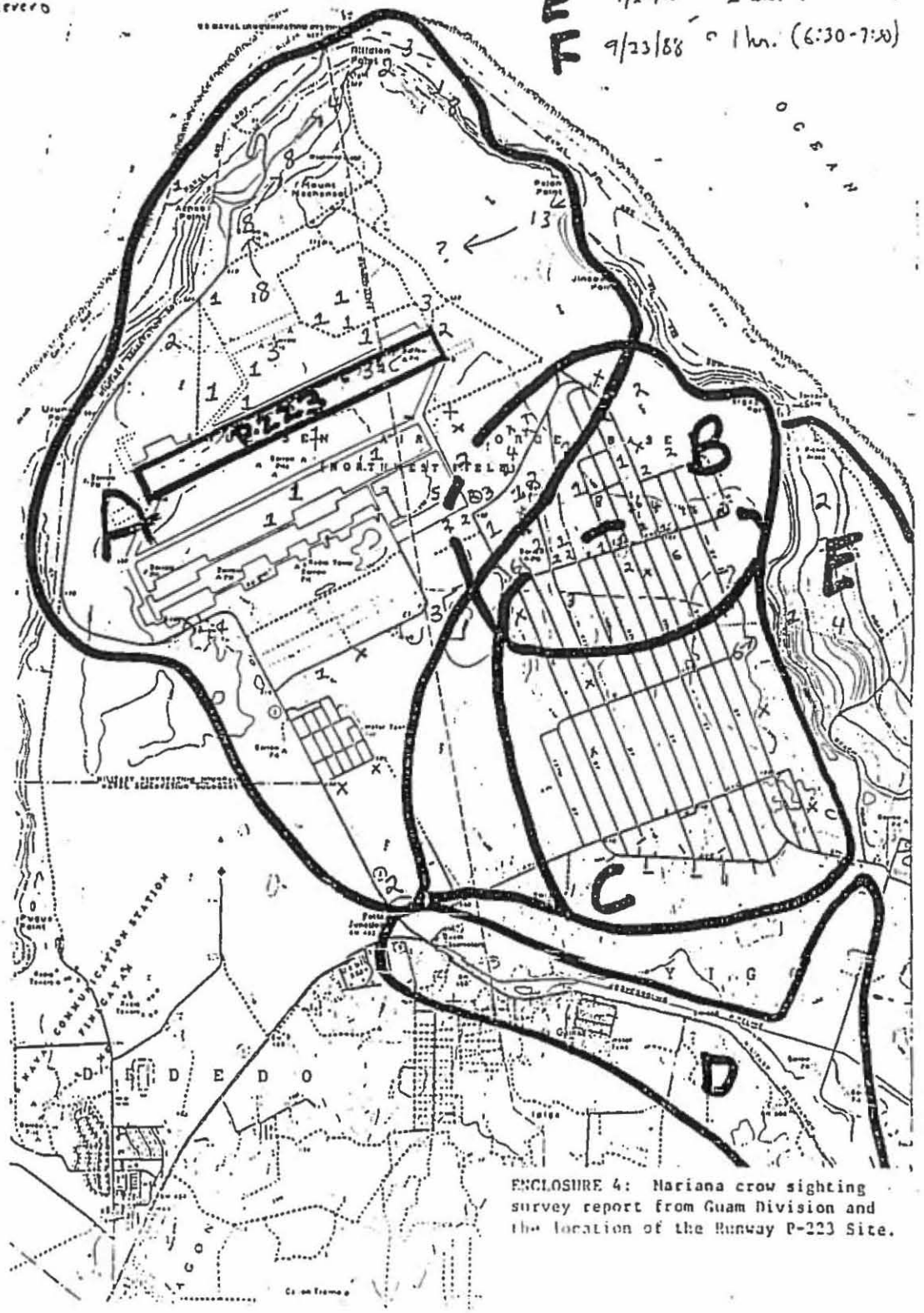
"X" - crows heard but not seen

"3" - number of crow seen at that location

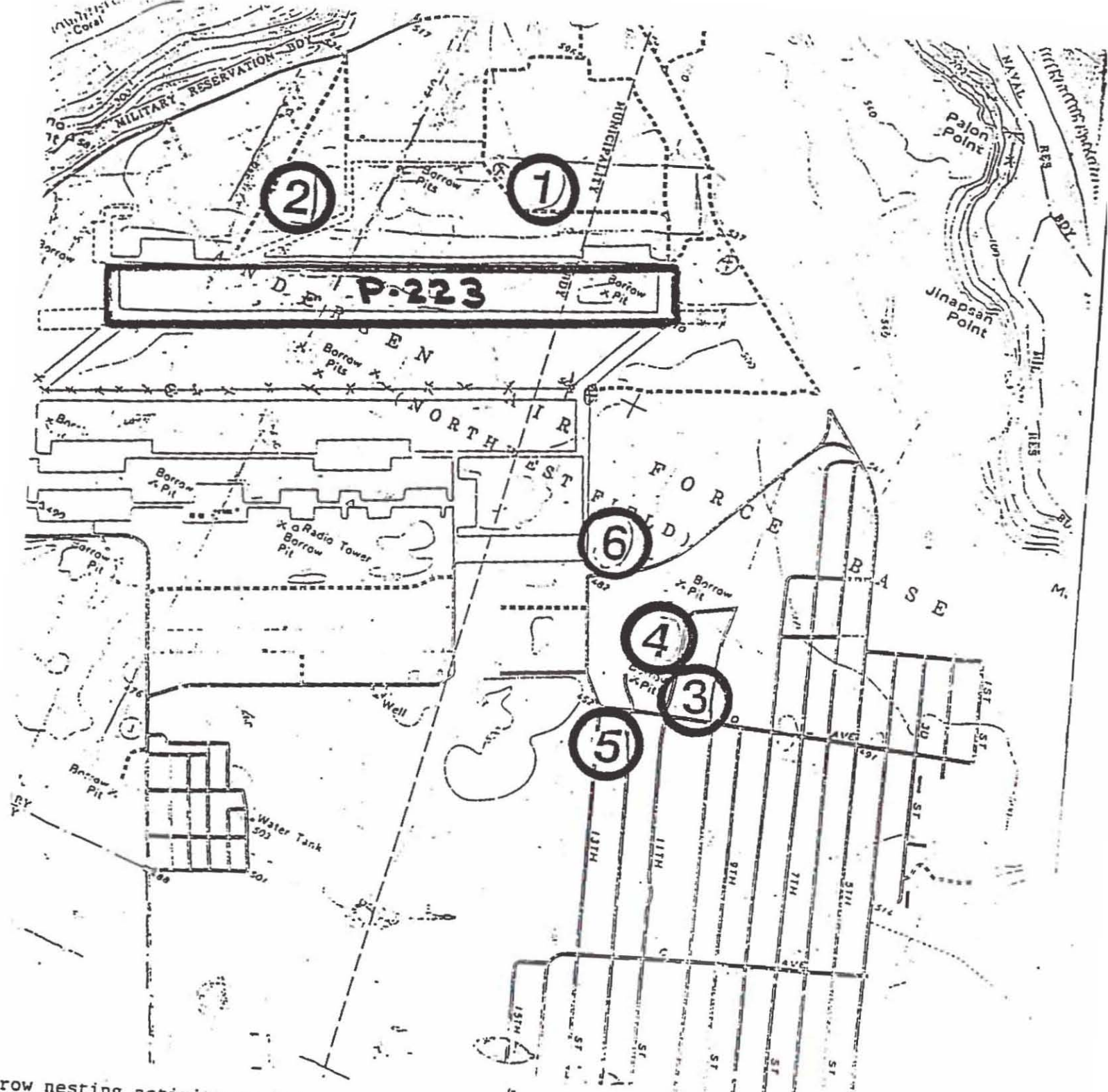
⟶ - direction of movement of crows

Observers:
R. Beck
M. Ritter
H. Munn
J. Guerrero

Survey Section NAME	Date	Person hours
A	8/2, 8/3, 8/5, 8/9/1988	23½ hrs (5:30-10:00)
B	7/26, 7/25/1988	18 hrs (6:30-10:00)
C	9/22/88	3 hrs (6:45-9:45)
D	9/23/88	3 hrs (6:30-9:30)
E	9/23/88	2 hrs. (7:00-9:00)
F	9/23/88	1 hr. (6:30-7:30)



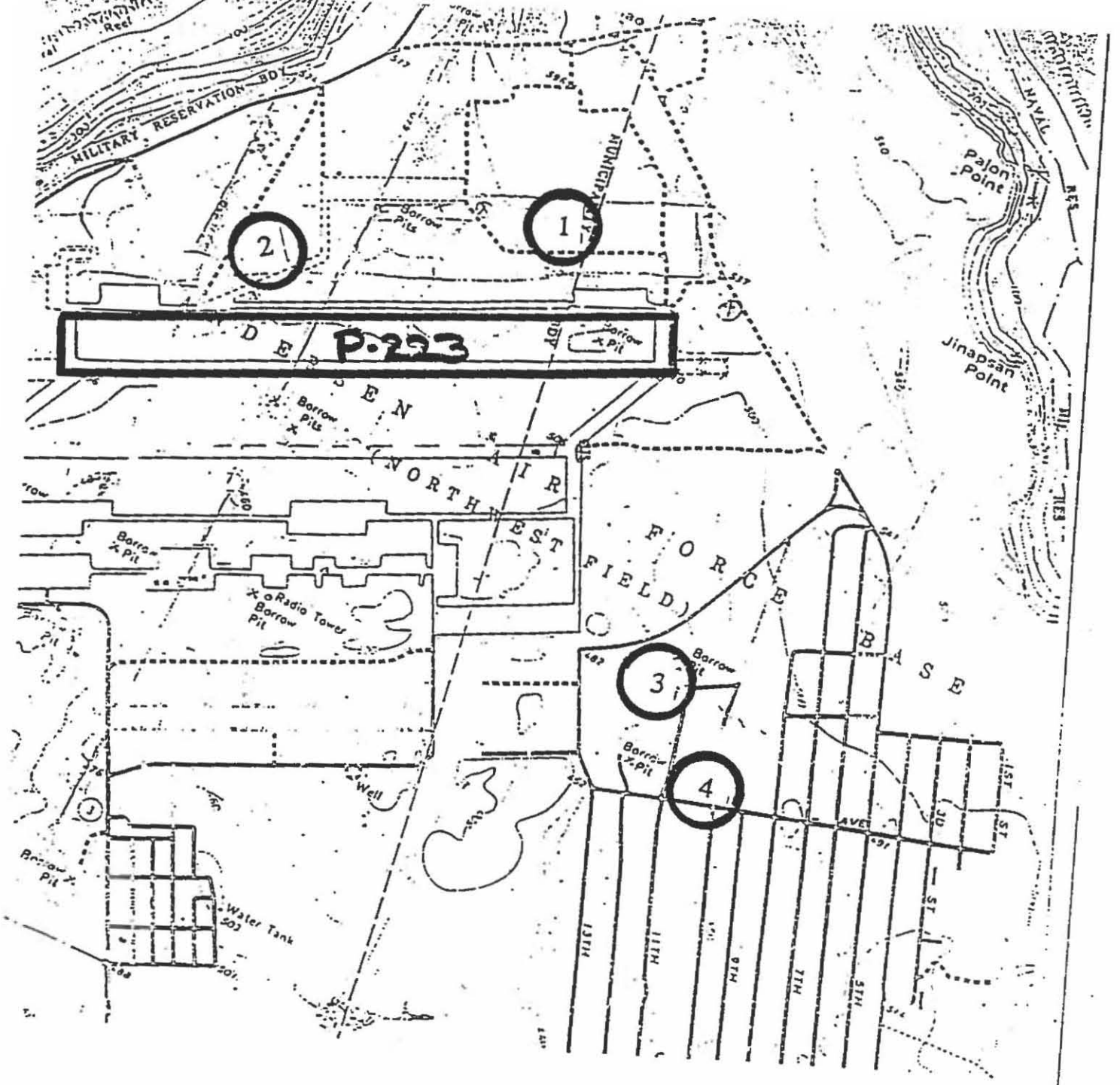
ENCLOSURE 4: Mariana crow sighting survey report from Guam Division and the location of the Runway P-223 Site.



row nesting activity on Andersen Air Force Base, Guam.

Date	Activity	Location
ıber 01, 1988	Nest	Northwest Field (P-223 Site)
er 26, 1988	Nest	Northwest Field (P-223 Site)
er/1988	Nest	Conventional Weapon Storage Area
er/1988	Nest	Conventional Weapon Storage Area
er/1988	Nest	Conventional Weapon Storage Area
/1988	Possible crow fledgling	Northwest Field

ENCLOSURE 5 From Guam Division Report



Location of Mariana Crow nests on Northwest Field, AAFB, "snakeproofed" since October 1988 by DAWR staff.

From Guam Division Report

United States Department of the Interior

FISH AND WILDLIFE SERVICE
PACIFIC ISLANDS OFFICE
P.O. BOX 50167
HONOLULU, HAWAII 96850

May 8, 1990

Mr. J. L. Busekrus
Assistant Head, Facilities Planning Department
Pacific Division, Naval Facilities Engineering Command
Pearl Harbor, Hawaii 96860-7300

Dear Mr. Busekrus:

This replies to your May 4, 1990 request for our assistance in updating biological information on endangered species occurring at the proposed P-223 radar project site at Northwest Field, Andersen Air Force Base, Guam. Specifically, you asked if Mr. John Engbring or another biologist from our staff could participate in an upcoming survey of the project site.

Although we fully support your effort to gather the best and most current data available through continued field investigations, we regret that we do not have sufficient staff time to participate in the survey. Mr. Engbring is working almost exclusively in drafting our proposal to designate certain forested areas of Guam as critical habitat for forest birds and bats, and other staff members are equally charged with priority tasks through the remainder of this spring and into the summer.

Thank you for your confidence in our field personnel. Again, I regret that we cannot assist you at this time.

Sincerely yours,

William R. Kramer

for Ernest Kosaka
Field Office Supervisor
Fish and Wildlife Enhancement

DEPARTMENT OF THE NAVY
PACIFIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
(MAKALAPA, HI)
PEARL HARBOR, HAWAII 96860-7300

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Ser 2432/ 38
17 MAY 1990

Mr. Allan Marmelstein
Pacific Islands Administrator
Pacific Islands Office
U.S. Fish and Wildlife Service
P.O. Box 50167
Honolulu, HI 96850

Dear Mr. Marmelstein:

INTERAGENCY ENDANGERED SPECIES CONSULTATIONS 1-2-88-F-51R AND 1-2-87-F-051, CONSTRUCTION AND OPERATION OF RELOCATABLE OVER-THE-HORIZON RADAR ON TINIAN, COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS, AND GUAM; MILCON P-223

From on-going informal discussions with your office, it is our understanding that the Service is proceeding with preparation of a proposed rule for designation of critical habitat for six endangered species on the Island of Guam. In view of this and in response to advice contained in the December 18, 1989 biological opinion issued under the referenced consultations, the Navy requests technical assistance from your agency in developing conservation recommendations. Specifically, the Navy requests mitigation recommendations for the potential clearing of forest lands which may be included in the area under consideration for designation. Such clearing may result from future Navy construction projects on Guam, including MILCON Project P-223.

The Navy is interested in considering those additional conservation recommendations which could be effective in minimizing the loss of habitat for endangered species. In order to minimize costly delays in project construction and implementation, the Navy would prefer measures which could be undertaken in advance of project commencement. One concept which may have merit is the setting aside and conversion of marginal habitat, such as existing grassland and scrub forest, into more favorable endangered species forest habitat. These restored habitats or habitat banks could be utilized as mitigation for future construction projects located in forest habitat that may be designated as critical habitat.

Your additional technical assistance and recommendations regarding MILCON P-223 are requested. The Navy anticipates continuing to work closely with your agency on this matter. Should any further information concerning this letter be required, please contact Mr. Timothy Sutterfield of our Natural Resources Management Branch at telephone 471-3217.

Sincerely,

P. W. Hiller

P. W. HILLER
Commander
Civil Engineer Corps
U. S. Navy
Head, Facilities Planning Department