Final
Engineering Evaluation/
Cost Analysis
Former Culebra Island
Naval Facility
Culebra Island, Puerto Rico

DERP-FUDS Project Number 102PR006802

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ENGINEERING EVALUATION/COST ANALYSIS
CULEBRA ISLAND NAVAL TRAINING FACILITY
CULEBRA, PUERTO RICO

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PROFESSIONAL ENGINEER'S CERTIFICATION

This is to certify that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. In my professional judgment, and based upon my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and technically complete.

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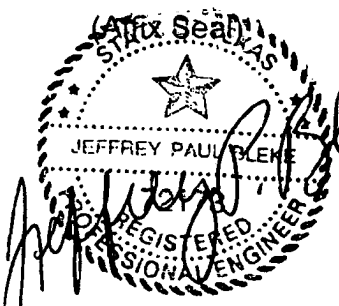

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List of Acronyms and Abbreviations

ARARs	Applicable or Relevant and Appropriate Requirements
ASR	Archive Search Report
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESAJ	U.S. Army Corps of Engineers South Atlantic Jacksonville
CFR	Code of Federal Regulations
CWM	chemical warfare material
DDESB	Department of Defense Explosives Safety Board
DO	Delivery Order
DOD	U.S. Department of Defense
DRMO	Defense Reutilization and Marketing Office
EEAE	estimated expected annual exposure
EE/CA	Engineering Evaluation/Cost Analysis
EM	Electromagnetics
EMM	earth-moving machinery
EOD	Explosive and Ordnance Disposal
EODT	EODT, Inc.
EPA	U.S. Environmental Protection Agency
ESE	Environmental Science & Engineering, Inc.
°F	degrees Fahrenheit
ft	feet
ft	foot
ft-msl	feet above mean sea level
FUDS	Formerly Used Defense Sites

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GPR	Ground Penetrating Radar
GPS	Global Positioning System
GSA	General Services Administration
HE	high-explosive
HEI	high explosive incendiary
HTRW	hazardous, toxic, and radiological waste
HVAR	high velocity aircraft rocket
lb	pound
lbs	pounds
m	meter
m^2	square meter
mph	miles per hour
MTA	MTA, Inc.
MTV	Mobility, Toxicity, or Volume
NATO	North American Treaty Organization
NATO	North Atlantic Treaty Organization
NCP	National Oil and Hazardous Contingency Plan
NTCRAs	non time-critical removal actions
O&M	operation and maintenance
OE	ordnance and explosives
OE*Cert*	Ordnance and Explosives Cost Effectiveness Tool
OOUs	Ordnance Operable Units
ORS	Ordnance-Related Scrap
OSHA	Occupational Safety and Health Administration
PRDNR	Puerto Rico Department of Natural Resources
PRPA	Puerto Rico Power Authority
QA	quality assurance
QC	quality control
RLDA	Renan Lopez de Azua and Associates Inc.
SOP	Standard Operating Procedures
SOW	Statement of Work
SRA	Safety Risk Assessment
SSHP	Site-Specific Safety and Health Plan
TCRA	time-critical-removal-action
TEAE	total expected annual exposures
USACE	U.S. Army Corps of Engineers
USAESCH	U.S. Army Engineering and Support Center, Huntsville
USFWS	U.S. Fish and Wildlife Service
UXO	unexploded ordnance
WP	work plan

1.0 Executive Summary

Environmental Science and Engineering, Inc. (ESE) received contract DACA 87-92-D-0018, Delivery order No. 0027, Annex "AC" from the U.S. Army Engineering and Support Center, Huntsville (USAESCH) to conduct an Engineering Evaluation/Cost Analysis (EE/CA) in and around Culebra Island National Wildlife Refuge. The government's intention is that ESE prepare the EE/CA in accordance with the National Oil and Hazardous Contingency Plan (NCP) and the special requirements of the Statement of Work (SOW) for Delivery Order 27 to serve as a basis for selecting the corrective action alternative to reduce public safety risks associated with ordnance and explosives (OE) at the former Culebra Island Naval Facility. USAESCH has chosen to generally follow the NCP guidance for conducting EE/CAs to analyze removal response alternatives for Formerly Used Defense Sites (FUDS) that may be contaminated by OE.

1.0.1 The Inventory Project Report dated May 1, 1991 identified the need for ordnance detection and removal actions at sites on Culebra Island and adjacent cays. The *Archives Search Report Findings for Culebra Island Natural Refuge* (USACERI,1995) summarized the ordnance activities in the Culebra Archipelago. A total of 11 areas of known ordnance use was identified in the Archive Search Report (ASR). These areas include the Northwest Peninsula, Flamenco Beach, Cerro Balcon, Isla Culebrita, Cayo Botella, Cayo Lobo, Cayo del Agua, Cayos Geniqui, Alcarraza, Los Gemelos, and Cayo Tiburon.

1.0.2 Time-critical-removal-action (TCRA) operations were executed at Flamenco Beach by MTA, Inc. (MTA) from May 12 through May 27, 1995. This interim remedial action, to remove near surface unexploded ordnance (UXO), resulted in the removal and disposal of 11 UXO items found in the 3.66 acres included in the investigation. The results of the investigation are included in the TCRA report (MTA, 1995).

1.0.3 The EE/CA investigation was conducted on Culebra Island and surrounding cays, referred to in this report as the Culebra Archipelago. The Culebra Archipelago is approximately 20 miles east of the main island of Puerto Rico and is comprised of approximately 2,660 acres. Several of the areas within the Culebra Archipelago were used between the 1930s and 1975 by the U.S. Navy, the U.S. Marines, and several other North American Treaty Organization (NATO) countries for naval gunfire, aerial bombing, aerial rocket, mortar training ranges, and torpedo targets.

1.0.4 The objective of the EE/CA process was to evaluate areas that are contaminated or potentially contaminated with UXO and OE. This investigation included sampling and data collection to classify the location and density of surface and subsurface OE remaining at the former Culebra Island Naval Facility. Areas investigated included the following:

1.0.4.1 Flamenco Peninsula is on the northwest end of Culebra Island and is comprised of approximately 613 acres, including Flamenco Beach, Northwest Peninsula Sector A, and Northwest Peninsula Sector B. ESE investigated ten grids on Flamenco Beach and located 5 UXOs and 151 ordnance-related scrap (ORS) items. ESE investigated 28 grids in the Northwest Peninsula and found 39 UXOs and 449 ORS items.

1.0.4.2 Isla Culebrita is approximately 1 mile east of Culebra Island and comprises approximately 366 acres. ESE traversed the entire island with an EOD escort equipped with a magnetometer. No evidence of other ordnance ranges or target area was seen on Isla Culebrita. ESE investigated six grids in this area and found 39 UXOs and 26 ORS items.

1.0.4.3 Cayo Botella is approximately .75 mile east of Culebra Island and comprises approximately 3.5 acres. ESE investigated two grids in this area and found 20 UXOs and 23 ORS items.

1.0.4.4 Cayo del Agua (or water cay) is approximately 1.5 miles southwest of Culebra Island and is comprised of approximately 2 acres. ESE investigated two grids in this area and found 16 UXOs and 20 ORS items.

1.0.4.5 Cayo Lobo (or Cross Cay) is approximately 2.5 miles southwest of Culebra Island and is comprised of approximately 20 acres. ESE investigated four grids in this area and found no UXOs and 17 ORS items.

1.0.4.6 Cerro Balcon is on Culebra Island, approximately 2.5 miles from the former Lower Camp. ESE investigated six grids in this area and found no UXOs and 19 ORS items.

1.0.5 The EE/CA investigation was complicated by the presence of endangered species, limited access, heavy vegetation, and rugged terrain in many areas. Much of the Culebra Archipelago is administered by the U.S. Fish and Wildlife Service (USFWS) or the Puerto Rico Department of Natural Resources (PRDNR). All activities were carefully coordinated with these agencies.

1.0.6 Sample grid location selection was based on the data presented in the ASR, previous site visit findings, previous TCRA actions, and information obtained from local residents. The ESE

site manager, with the assistance of an ESE botanist, USFWS personnel, the land surveyor subcontractor, and EOD escort personnel from EODT Inc., located the grid sites.

1.0.7 Each investigation site was cleared of vegetation, subdivided, and geophysically investigated with magnetometers. Anomalies were identified, flagged, and mapped.

1.0.7.1 Gridstats software (by QuantiTech, Inc., Huntsville, Alabama) was used to determined the anomalies to be excavated. Selected anomalies were excavated and ORS, UXO, and other materials were properly handled and disposed of. Only UXO-qualified personnel were allowed to handle OE/UXO.

1.0.8 The ESE/EODT team fully investigated 57 EE/CA sampling grids at the 7 investigation sites. A total of 9,510 anomalies was identified, of which 2,640 were excavated. UXO/ORS was encountered at depths of less than 1 foot (ft) in all cases. Approximately 1,700 pounds (lbs) of ORS was collected and weighed by scale during the field effort.

1.0.8.1 UXOs were found on the ground surface and in the subsurface during the EE/CA investigation. A total of 57 surface UXOs was found at Cayo Botella, Isla Culebrita, Cayo del Agua, and the Northwest Peninsula. Additionally, 62 of the anomalies investigated were buried UXOs. The buried UXOs were discovered at the same sites as the surface UXOs and also at Flamenco Beach. UXOs found included 20mm high-explosive incendiary (HEI) devices, MK76 practice bombs, MK50s, 37mm projectiles, 5-inch rockets, 76mm projectiles, 3- to 6-inch naval projectiles, 81mm mortars, and grenades.

1.1 Ordnance Operable Units (OOUs)

To facilitate the evaluation of risk-reduction alternatives, the former Culebra Island Naval Facility was subdivided into the following five OOUs:

- OOU-1 — Flamenco Beach,
- OOU-2 — Northwest Peninsula,
- OOU-3 — Cerro Balcon,
- OOU-4 — Isla Culebrita, and
- OOU-5 — Other Surrounding Cays

1.1.0.1 OOU-1 is comprised of approximately 300 acres in the southern part of the Flamenco Peninsula of Culebra Island and includes a beach, campground, and interior ridge area. Approximately 50,000 persons visit the area each year, primarily the beach and campground. Access to the beach and campground area is relatively easy. The ridge area is hilly and access to

the ridge area is restricted by the presence of thick thorny brush and small trees. The presence of this thick vegetation generally restricts visitors to the cleared trails, although some visitors may venture off the trails. There are plans to construct villas and hiking trails in this area.

1.1.0.2 OOU-2 includes all the area of the Flamenco Peninsula north of OOU-1 and encompasses 313 acres. The entire unit is publicly owned. The southern part of the unit (Sector A) is administered by PRDNR and the northern part is administered by USFWS. Both areas are used as a wildlife preserve. Public access to these units is restricted. A fence has been erected across the peninsula between the two sectors. This fence further restricts access to Sector B. Plans are being discussed regarding construction hiking trails and allowing access to Sectors A and B. Construction of a fire break is also being discussed.

1.1.0.3 OOU-3 is located in the east-central part of Culebra Island on the western slope of the hill named Cerro Balcon. The OOU encompasses approximately 30 acres and extends from the southern part of the San Isidro region of the island to the northern part of the Fraile region. All of the unit is privately owned and used primarily for grazing. Part of the unit is fenced. Access by the public is restricted by the landowner, poor roads, thick vegetation, and by the fencing.

1.1.0.4 OOU-4 includes a 82 acre portion of the 266-acre Isla Culebrita located east of Culebra Island. The island is currently administered by the USFWS. It is currently used for recreation, including swimming, boating, and hiking. The island is accessible only by boat. Permission from the USFWS must be obtained before accessing the island. Approximately 21,000 people visit the island in a typical year.

1.1.0.5 OOU-5 consists of all the small cays or islands that were identified by the ASR as being part of the Culebra Island Naval Facility and include:

- Cayo Botella,
- Cayo Alcarraza,
- Los Gemelos,
- Cayo Lobo,
- Cayo de Agua,
- Cayo Tiburon, and
- Cayos Geniqui

1.1.0.6 All of the islands have rugged terrain and limited beach areas. Most of the small cays are accessible only during calm seas and good weather. All of the cays are administered by the USFWS and require an entry permit. Access by the public is currently limited and will be similarly limited in the future.

1.2 Overall Evaluation of Ordnance Contamination

1.2.1 OOU-1 — Flamenco Beach

The Flamenco Beach area was used primarily as a target area for naval gunfire. The sampling conducted during the EE/CA field investigation concentrated in the campground area at the base of the western slope of the ridge area. During this sampling, no UXO was found in the beach and campground area. However, one grid, located in the western ridge area, contained UXO. A significant amount of ORS was found at many of the sampling grids. The highest percentage of ORS was recovered from grids in the beach and campground area.

1.2.1.1 TCRA operations included sampling a 3.7-acre portion of the campground area and recovered 11 UXO. These UXO included one practice bomb; two illumination candles; four 40mm projectiles; two fuze components from 5-inch projectiles; and one live, fuzed, 3-inch high-explosive (HE) round.

1.2.2 OOU-2 — Northwest Peninsula

Historical activity at the Northern Peninsula sampling area was similar to that of the Flamenco Beach area. Most of the gunfire is believed to have been fired from the water east of the peninsula and directed at targets located on the eastern slope of the peninsula. Sampling was conducted during the EE/CA field investigation throughout the peninsula. During the sampling, UXO was found at three of the grids along the target cable, at two of the grids along the central ridge, and at all of the seven grids located on the northeast slope of the peninsula. Most of the UXO were projectiles, illumination candles, and practice bombs. In addition, a round was found that was identified as an 81mm mortar. Significant amounts of ORS were found throughout the peninsula. The highest number of ORS was found at the grids in the central part of the sampling area, particularly near where bombing range activity was reported. The greatest weight of ORS, however, is concentrated at the grids on the northeast slope where most of the activity was from naval gunfire.

1.2.3 OOU-3 — Cerro Balcon

The Cerro Balcon area was used as a mortar practice range. Some fragments and two inert 81 and one 76mm mortars were discovered during the sampling. Historical accounts of finding explosive ordnance items exist. On at least one occasion, injuries resulted when the item was inadvertently detonated. Ordnance would most likely be found in the primary target area, but could be found anywhere within the range. The contaminated portion of the mortar range at Cerro Balcon is

estimated to comprise 30 acres. Some contamination should be expected anywhere within this area. The main impact area is estimated to be 20 acres. Right-of-entry to approximately half of the suspected main impact area could not be obtained during the field sampling effort.

1.2.4 OOU-4 — Isla Culebrita

Strafing activity on Isla Culebrita was confined to an 82-acre strafing range located on the western end of the island. During the field investigation, a magnetometer and visual search was conduced in an attempt to locate any unreported ranges on the island. No evidence was uncovered indicating that other target areas existed. It can therefore be assumed that all of the island's contamination is confined to the 82 acre range. Sampling of the strafing range recovered only 20mm projectiles. Many of these projectiles contained high explosive incendiary fill. All were recovered from a depth of less than 6 inches.

1.2.5 OOU-5 — Other Surrounding Cays

All of the other surrounding cays were used as target areas for bombing and rocket fire. No data are available to indicate the relative ordnance intensity on each of the cays. Grids sampled during the EE/CA field investigation had UXO densities ranging from 0 for all four of the Cayo Lobo sites to 373 UXO/acre on Cayo Botello.

1.3 Removal Response Alternatives

Five applicable alternatives for risk reduction were considered for the Culebra Archipelago. These include the following:

- No Further Action,
- Institutional Controls,
- Surface Clearance,
- Clearance for Use, and
- Complete Clearance.

1.3.1 Alternative 1 — No Further Action

This alternative is a no action alternative and is included to provide a baseline comparison with other alternatives. No technologies are associated with this alternative. No risk reduction measure resulting in the treatment, containment, risk reduction, or limited access to OE would be implemented. Therefore, potential OE would not be removed and no restrictions would be placed on access to the site.

1.3.2 Alternative 2 - Institutional Controls

Institutional controls is a limited-action alternative that uses current land access and currently proposed land use restrictions to minimize exposure to OE in the Culebra Archipelago, and could result in limiting the future use and development of the areas.

1.3.2.1 Institutional controls could consist of the following:

- Educating agency personnel, surrounding landowners, and visitors about the potential hazards associated with the sites;
- Posting signs, and/or
- Erecting perimeter fencing.

1.3.2.1.1 Institutional controls in the form of public education can serve as an effective alternative to reduce risk at FUDS.

1.3.3 Alternative 3 — Surface Clearance

This surface clearance alternative consists of using UXO specialists who are trained in recognition, handling, and disposal of OE to perform a visual survey of the entire surface of each OOU and to remove OE from the ground surface, near surface, or any that is partially buried. Implementing this alternative includes vegetation clearance (as needed) and the use of Geophysics (magnetic methods) to assist in locating surface ordnance items. Selective probing of the near surface soil up to a depth of 6 inches may be employed to investigate magnetic anomalies and identify near surficial metallic debris that may not be visually apparent. This alternative would be effective in minimizing the risk to members of the public engaged in nonintrusive activities from having incidental contact with OE.

1.3.4 Alternative 4 — Clearance for Use

This alternative involves all activities necessary to fully locate, excavate, and remove OE to a depth conducive with the expected land use and overall health and safety of the affected community. This activity will be performed only in areas where specific land use dictates the need for ordnance clearance. Activities could potentially include clearing vegetation as required to geophysically investigate the sites, completing geophysical investigation(s), excavating anomalies, and destroying OE. Technologies that could be used for this alternative include magnetic geophysical investigative methods and handling/disposal of OE (including detonation of UXOs). This alternative includes surface clearance of the entire site and excavation/clearance over portions of the site with known activities.

1.3.5 Alternative 5 - Complete Clearance

This alternative involves all activities necessary to fully locate, excavate, and remove all anomalies detected. Activities could potentially include vegetation clearance as required to geophysically investigate the sites, completing the geophysical investigation(s), excavating all anomalies, and destroying all OE found. Technologies that could be used for this alternative include magnetic geophysical investigative methods and handling/disposal of OE (including detonation of UXOs).

1.3.5.1 The following sections identify the selected alternatives for each of the five OOUs.

1.4 Results of EE/CA

1.4.1 Risk Reduction Analysis

The Quantitech OE*Cert* (Quantitech, 1996) report presents the total expected annual exposures (TEAE) after implementation (based on the high and low density estimate) for several alternatives for each OOU. This analysis was broken down by individual sectors within each OOU. The TEAE values presented in the OE*Cert* report were produced using a statistical model software created by Quantitech. ESE believes the model to be a conservative estimate of the site conditions. The values from the OE*Cert* report to were used to calculate the Estimated Risk Reduction (yearly exposures) for each OOU (Table 1-1).

1.4.1.1 The result of the analysis show there is little difference between the Estimated Risk Reduction of Alternatives 3 through 5 (Surface Clearance, Clearance for Use, and Total Clearance). This is most likely due to the fact that most UXOs were found close to the surface. The thin soil cover over the rock at most of the sample areas was a major contributor to the shallowness of UXOs.

1.4.1.2 The analysis of the cost and Estimated Risk Reduction would indicate that the Surface Clearance Alternative surface clearance would be the best choice for all OOUs. However, since there are construction activities planned for Flamenco Beach and Northwest Peninsula, ESE suggests that additional clearance to below the excavation depth (estimated to be approximately 4 ft) should be required in construction areas. Therefore Alternative 4, Clearance for Use, will be required for only portions of Flamenco Beach and the Northwest Peninsula where construction will occur.

Table 1-1 Cost Estimate and Risk Reduction (Yearly Exposures) of Operable Units at the Former Culebra Naval Facility, Culebra Island, Puerto Rico

Location	Alternative Number and Description	Cost	Estimated Risk Reduction (Reduction in Yearly Exposures)	
			High	Low
OOU-1 Flamenco Beach	1 No Action	$0	0	0
	2 Institutional Controls	$331,000	NC	NC
	3 Surface Clearance	$921,000	9,607	0
	4 Clearance For Use	$1,536,000	9,695	23
	5 Complete Clearance	$2,488,000	9,961	90
OOU-2 Northwest Peninsula	1 No Action	$0	0	0
	2 Institutional Controls	$112,000	NC	NC
	3 Surface Clearance	$1,127,000	6,941	4,275
	4 Clearance For Use	$2,945,000	6,941	4,275
	5 Complete Clearance	$6,996,000	6,941	4,275
OOU-3 Cerro Balcon	1 No Action	$0	0	0
	2 Institutional Controls	$12,000	NC	NC
	3 Surface Clearance	$199,000	2,389	0
	4 Clearance For Use	$298,000	2,389	0
	5 Complete Clearance	$398,000	2,389	0
OOU-4 Isla Culebrita	1 No Action	$0	0	0
	2 Institutional Controls	$378,000	NC	NC
	3 Surface Clearance	$678,000	173,202	106,448
	4 Clearance For Use	$2,060,000	173,643	106,718
	5 Complete Clearance	$2,120,000	173,666	106,733
OOU-5 Surrounding Cays	1 No Action	$0	0	0
	2 Institutional Controls	$85,900	NC	NC
	3 Surface Clearance	$315,000	2,032	60
	4 Clearance For Use	$574,000	2,032	60
	5 Complete Clearance	$873,000	2,032	60

Source (ESE, Quantitech)

NC = Risk Reduction Values Not Calculated (see text).

Estimated Risk Reduction (yearly exposures) values are calculated from total expected annual exposures presented in the Quantitech OE*Cert* Report (Quantitech, 1996). These data are conservative estimates produced by Quantitech's Risk Assessment Model. Highlighted fields indicate the chosen alternatives.

1.4.2 OOU-1 — Flamenco Beach

Alternative 4, Clearance for Use, is the recommended alternative at Flamenco Beach based on the following rationale:

- OOU-1 is extensively visited by the tourists (approximately 50,000 visit every year).
- UXO and ORS items were detected during the EE/CA investigation.
- Erosion at the beach may unearth subsurface UXO.
- Alternative 4 reduces the likelihood that members of the public would encounter OE.
- Alternative 4 is administratively feasible, but will require addressing environmental concerns.
- Implementing Alternative 4 would meet the clearance to depth requirements of the varied land usages.
- Alternative 4 is technically feasible.

1.4.2.1 The estimated cost to implement Alternative 4 at Flamenco Beach is $1,536,000.

1.4.3 OOU-2 — Northwest Peninsula

Alternative 4, Clearance for Use, is the recommended alternative for the Northwest Peninsula. This alternative was selected based on the following rationale:

- OOU2 may be visited by increasing numbers of tourists.
- UXO and ORS items were detected at the OOU during the EE/CA investigation.
- Alternative 4 reduces the likelihood that members of the public would encounter OE.
- Alternative 4 is administratively feasible, but will require addressing environmental concerns.
- Implementating Alternative 4 would meet the clearance to depth requirements of the varied land usages in OOU2.
- Alternative 4 is technically feasible.

1.4.3.1 The estimated cost to implement Alternative 4 at the Northwest Peninsula is $2,944,880.

1.4.4 OOU-3 — Cerro Balcon

Alternative 3, Surface Clearance, is recommended for the Cerro Balcon mortar range. This alternative was selected based on the following rationale:

- Cerro Balcon is privately owned property and intrusive activities would be difficult to control at the OOU.
- UXO collected from the OOU critically injured civilians during 1930s.

- The presence of OE is likely in the impact area.
- Alternative 3 reduces the likelihood that members of the public would encounter OE.
- Alternative 3 is administratively feasible.
- OOU3 is owned by several property owners. Alternative 3 would be implementable on portions of the OOU; however, right-of-entry may not be obtainable on the entire OOU.
- OOU3 is currently zoned for agricultural use; therefore, any new construction will be minimal.

1.4.4.1 The estimated cost to implement Alternative 3 at Cerro Balcon is $199,000.

1.4.5 OOU-4 — Isla Culebrita

Alternative 3, Surface Clearance, is the recommended alternative for the strafing fire range (82 acres) portion at Isla Culebrita. This alternative was selected based on the following rationale:

- The area outside the strafing fire range was used only as an observation point during target practice.
- The ASR reported no evidence of activities that indicate the presence of UXO items in the area outside the firing range.
- During the EE/CA field investigation, all UXO items were detected within 6 inches of the ground surface in the strafing fire range.
- Isla Culebrita is used for recreational activities, including swimming and hiking, which do not involve intrusive activities. These activities are seldom performed in the former strafing range.
- Intrusive activities are not anticipated since the OOU is monitored by USFWS personnel.
- Alternative 3 is administratively feasible.
- Alternative 3 would be easily implemented.
- Alternative 3 is technically feasible.
- Alternative 3 would reduce the likelihood that members of the public would encounter OE.

1.4.5.1 The estimated cost to implement Alternative 3 at Isla Culebrita is $678,400.

1.4.6 OOU-5 — Other Surrounding Cays

Alternative 3, Surface Clearance, is the recommended alternative for the Surrounding Cays. This alternative was selected based on the following rationale:

- OOU5 may be visited by increasing numbers of tourists.
- UXO and ORS items were detected at several of the cays in this OU during the EE/CA investigation.
- The shallow rock on several of the cays should have inhibited the penetration of most OE devices into subsurface and therefore Surface Clearance will be effective in removing OE.
- Alternative 3 reduces the likelihood that members of the public would encounter OE.
- Alternative 3 is administratively feasible, but will require addressing environmental concerns.
- The cays currently encounter light traffic mostly from USF&W personnel. This alternative will allow safety for their access to these cays.
- Although the sea conditions may be hazardous during certain times of the year, this alternative can be technically feasible for all but the smallest cays.

1.4.6.1 The estimated cost to implement Alternative 3 at the other surrounding cays is $315,160.

1.4.7 Priorities For Removal Actions

The "expected annual exposures for the high density estimate" provided in the OE*Cert* report (Appendix K), is used by ESE to rank the OOUs in terms of exposure potential. This value is based on the highest expected ordnance density and the number of visitors to each site. This number does not take into account the degree of hazard from the specific types of ordnance found at each site. The OOU exhibiting the highest expected annual exposures for the high density estimate is given the highest ranking for exposure potential with one (1) being the highest ranking and five (5) being the lowest ranking. Table 1-2 presents each OOU and the ranking based on the expected annual exposures for the high density estimate.

Table 1-2. Ranking of Exposure Potential

LOCATION	PRIORITY
Culebrita (OOU-4)	1
Flamenco Beach (OOU-1)	2
Northwest Peninsula (OOU-2)	3
Surrounding Cays (OOU-5)	4
Cerro Balcon (OOU-3)	5

1.4.7.1 ESE used the ranking of the sites based on the expected number of exposures for the high density estimate from the OE*Cert* report along with information collected during the EE/CA evaluation to provide a priority ranking for removal actions for each OOU. The types of ordnance

used at each OOU along with what was recovered during the EE/CA site investigation were reviewed for the analysis to determine the potential hazard at each site. The resulting recommended priority for removal actions is included in Table 1-3.

1.4.7.2 Culebrita (OOU-4) has the highest ranking in terms of exposure potential (Table 1-3). However, only 20mm HEI straffing rounds were found at Culebrita. The hazard from exposure to these rounds are not as great as the hazard associated with bombs or naval projectiles. Because the straffing rounds are less hazardous than most ordnance items found elsewhere, the priority for a removal action at the site was reduced.

1.4.7.3 The items found at Flamenco Beach (OOU-1) are generally naval projectiles, a 5-inch Barrage Rocket, a 5-inch MK 50 projectile, and illumination candles. These items have a higher degree of hazard associated with them than 20mm HEI. This site has the highest priority for removal actions as there is a large visiting population and the degree of hazard of the items found at this site is high.

1.4.7.4 The items found at Northwest Peninsula (OOU-2) include items listed for Flamenco Beach and assorted other projectiles, bombs, aerial rockets, mortars, and grenades. An unexploded "Tiny Tim" rocket warhead was previously found and disposed of onsite. This site has the second highest priority for removal actions as there is a high degree of hazard but less visitors than Flamenco Beach.

1.4.7.5 The surrounding cays (OOU-5) have varying amounts of bombs, rockets, and projectiles. This OOU has the greatest diversity of ordnance items, but is remote and inaccessible to most people. Even though the hazard of each individual ordnance item may be as high as the Northwest Peninsula, the remoteness of the cays and the low volume of visitors will make this OOU a lower priority for removal action.

1.4.7.6 Cerro Balcon (OOU-3) was used as a mortar range. The hazard of live mortars is high, but the remoteness of the site and lack of mortars found during the investigation lead ESE to place this site at lowest priority for removal action of the five OOUs.

Table 1-3. Priority for Removal Action

LOCATION	PRIORITY
Flamenco Beach (OOU-1)	1
Northwest Peninsula (OOU-2)	2
Culebrita (OOU-4)	3
Surrounding Cays (OOU-5)	4
Cerro Balcon (OOU-3)	5

2.1.2 Definitions

The following definitions will be used for the purposes of this report:

- Unexploded Ordnance (UXO)—All ordnance items that may potentially be explodable or ignitable,
- Ordnance-Related Scrap (ORS)—All ordnance items that clearly are not explodable or ignitable,
- Ordnance and Explosives (OE)—Includes all ORS and UXO items as defined previously, and
- Ordnance—Military supplies (i.e., weapons and ammunition).

2.2 Facility Description and History

The Culebra Island National Refuge is located approximately 20 miles east of the main island of Puerto Rico. The area of the investigation includes the Island of Culebra and several of the surrounding cays. Figure 2-1 shows the location of Culebra Island and surrounding cays, referred to in this report as the Culebra Island Archipelago.

2.2.1 Culebra Facility Description

Spain ceded all of Puerto Rico to the United States in 1898 following the Spanish American War. The public lands in the Culebra Island Archipelago were placed under the control of the U.S. Department of Navy in 1901. A small permanent base of operations was constructed on Culebra Island around 1902. The base of operations (Lower Camp) was established in the former town of Idelfonso.

2.2.1.1 The Culebra Island Archipelago was used for training purposes by the U.S. Navy and U.S. Marines, and was later used by North Atlantic Treaty Organization (NATO) gun ships and carriers. Facilities set up by the U.S. Navy included a desalination plant, an airfield, barracks, helicopter pads, range instrumentation facilities, gun sites (for the defense of the islands), observation points, and impact ranges for aerial bombs and rockets, missiles, mortars, and naval projectiles.

2.2.2 General Site Military History

2.2.2.1 Military Operations

The U.S. Marines used portions of Culebra Island as a training facility from 1903 through 1941. In 1903 the Marines conducted their first amphibious landing, including transporting a 5-inch gun that the Marines moved through rough terrain. This training included the use of guns and underwater mines to defend the island. The Marines constructed a firing range on Culebra Island in 1913. In January 1914, the Marines conducted their first large-scale exercise with the First Advanced Brigade, defending the island against an attacking force of 1,200 men. This included the bombardment of shore fortifications. In 1914 the Marines used Culebra Island to train new pilots in the operation of seaplanes.

2.2.2.1.1 The U.S. Caribbean Fleet used the Culebra Island Archipelago for naval exercises throughout its history. The U.S. Navy Fleet first ran maneuvers in the area of Culebra Island in October 1902. The Navy built a small grass airstrip in the center of Culebra Island around 1920. In the 1930s, the Navy and the Marines built tent camps at several locations near the airstrip. From January through April 1922 two companies conducted field maneuvers, landing field artillery up to and including 155mm guns.

2.2.2.1.2 A large fleet exercise was conducted from December 1923 through February 1924. Approximately 3,300 Marines participated in the maneuvers, armed with six 155mm guns, twelve 75mm guns, and eighteen machine guns.

2.2.2.1.3 A fleet landing exercise (FLEX-1) was conducted January through March 1935. The troops fired weapons including rifles, machine guns, 81mm mortars, and 75mm pack howitzers from boats as they approached beach targets. The Navy conducted shore bombardment exercises and aircraft conducted bombing and strafing maneuvers. A similar exercise (FLEX-2) was conducted during the period of January through February 1936. Culebra Island's final known amphibious exercise, FLEX-7, was conducted between February 4 and 16, 1941.

2.2.2.1.4 The Lower Camp area was abandoned by the Navy in 1920. The area was reactivated in 1942 before reducing it to caretaker status in September 1944.

2.2.2.1.5 Culebra Island was used as a bombing and gunnery range from 1935 through 1975. Navy records indicate that Naval bombardment of Flamenco Peninsula began in 1936. Reports indicate two air strikes and 50 bombardment exercises were conducted in fiscal year 1949. Another report from July through December 1949 indicates that one air strike and 29

bombardment exercises were conducted. The report also listed ordnance stocks of GP bombs, aerial depth charges, fragmentation bombs, aviation ammunition, small arms, and anti-aircraft rockets.

2.2.2.1.6 Submarine warfare maneuvers were also conducted in the Culebra Island Archipelago by the Navy.

2.2.2.1.7 In a letter dated November 1959, Submarine squadron 2 was authorized to fire 14 live torpedoes at Cayos Geniqui. Other Navy records indicate that submarines also fired torpedoes at Marcs Point on Isla Culebrita. Firing of torpedoes within the Culebra Island Archipelego stopped prior to 1969.

2.2.2.1.8 Until the early sixties, Flamenco Peninsula, Los Gemelos, and Alcarraza were the only aircraft targets in the complex. To support the increased training needs during Viet Nam operations, the Navy acquired additional training areas on cays east and west of Culebra Island for use as aircraft ranges. The main observation point at Flamenco Point was supplemented by additional operation posts on Isla Culebrita and Cayo de Luis Pena. In addition, spotting stations were constructed on Cayo Lobo, Flamenco Peninsula, Isla Culebrita, and at Duck Point on the eastern side of Culebra Island. A run line, consisting of an excavated linear feature which was used to align aircraft to target areas, was constructed on Cayo de Luis Pena. A Nike-Ajax radar was constructed at the observation point on Luis Pena for general range surveillance and aircraft tracking during loft and over-the-shoulder bombing. The only strafing fire practice ranges were set up at Isla Culebrita and Flamenco Peninsula.

2.2.2.1.9 Navy records indicate that the Flamenco Peninsula was the only target area for naval gunfire support training. The targets included four old Sherman tanks as well as truck panels. Ships fired from a range of 2,000 to 12,000 yards, usually sailing parallel to the coast. In 1969, ships fired live 40mm, 3-inch/50 caliber (3-inch/50), 5-inch/38, 6-inch/47, and 8-inch/55 rounds. In some instances, the firing was directed at 81mm white phosphorous spotting rounds fired from the nearby Flamenco Point observation point. It is likely that 81mm illuminating rounds were also fired. Ships from Great Britain, Canada, Germany, Netherlands, France, Brazil, Columbia, and Venezuela also used Flamenco Peninsula's targeting facilities.

2.2.2.1.10 In 1964, the range usage was expanded to include eastern and western cays. The cays used in 1969 for aircraft bombing/rocket targets were Alcarraza, Los Gemelos, Cayo del Agua, Cayo Tiburon, Cayos Geniqui, and Cayo Botella. Aircraft ordnance expended in 1969 included 20mm HE/HEI projectiles, MK44 and MK45 flares, various live and practice bombs up to 500 lbs, and 2.75-inch rockets. The Navy also stated that inert 2,000 lb bombs were dropped during

B-52 exercises. The ordnance used by the United Kingdom varied from 28 to 1,000 pound (lb) bombs and 2-inch rockets. Alcarazza and Los Gemelos were favored for high altitude radar bombing. Navy records indicate that Bullpup missiles with inert warheads were only fired at Los Gemelos.

2.2.2.1.11 Aerial mining operations were conducted south of Cayo de Luis Pena in 1967. All of the mines were reportedly recovered by EOD swimmers or minesweepers.

2.2.2.1.12 Live ordnance operations reached their peak in 1969 as the fleet was training pilots for Viet Nam. Aircraft bombing and strafing of the Flamenco Peninsula ended around 1970, while the use of live rounds for naval gunfire support training ended in 1971. Subsequent naval support training was conducted using quieter puff rounds until ordnance use was terminated on September 30, 1975.

2.2.2.1.13 In 1972, the Navy reported an estimated 750,000 rounds had been fired at Flamenco Peninsula. These included the following:

- 80 percent 5-inch projectiles;
- 10 percent 3-, 6-, and 8-inch rounds; and
- 10 percent other calibers including mortars, howitzers, and 16-inch rounds.

2.2.2.1.14 It is also estimated that up to 320,000 units (approximately 1,000 lbs) of aerial ordnance were delivered to the peninsula.

2.2.2.1.15 Cayo Lobo was used for aerial bombing and rockets late in the military history of the area. In 1974, a Babcock target scoring system that electronically reported the accuracy of the aerial bombing and rocket runs was installed on Cayo Lobo. The records indicate that items known to be dropped during 1974 for the electronic scoring system included 2.75-inch rockets and MK76 practice bombs. It is not known if live bombs were previously used on Cayo Lobo.

2.2.2.1.16 A Marine letter dated 1934 identifies Cayo Lobo as a location of experimental naval gunfire has occurred. This use of Cayo Lobo was not confirmed.

2.2.2.1.17 Between 1975 and 1982, the facilities were turned over to the General Services Administration (GSA). The only properties that remain in U.S. Navy ownership are Flamenco Lagoon, Zoni Lagoon, and an 87-acre tract including an abandoned observation point at Flamenco Point. This area is currently owned by the Navy but will eventually be turned over to GSA for disposal.

2.2.2.2 Range Clearance and OE Removal

Navy records indicate that Explosive and Ordnance Disposal (EOD) personnel routinely removed surface UXO from the target areas. Although complete records are not available, the Navy did make attempts to clean up the ranges.

2.2.2.2.1 The archive search team obtained memorandums indicating that the Puerto Rico Army National Guard conducted a range clearance in 1985. The records of this clearance or where it occurred were not found by the archive search team.

2.2.3 Environmental Setting

2.2.3.1 Geology/Physiology

Culebra Island and the adjacent cays are underlain by both intrusive and extrusive volcanic rock of Upper Cretaceous age. Andesite lava and Andesite tuff are the most dominant volcanic rocks seen in the Culebra Archipelago. Toward the north central portion of Culebra and on the eastern portion of Cayo De Luis Pena, the tuff and lava contain diorite porphyry inclusions. The volcanic rocks exhibit little or no porosity due to compaction and filling of the pores with quartz and calcite. The volcanic rocks exhibit strong magnetic properties that can affect magnetometer readings.

2.2.3.1.1 Culebra Island (598 acres) has sandy beaches, irregular rugged coastlines, lagoons, coastal wetlands, steep mountains, and narrow valleys. Ninety percent of the island is mountainous with population concentrations in the flatlands. The highest point on Culebra Island is Monte Resaca, which is approximately 630 feet above mean sea level (ft-msl).

2.2.3.1.2 The three largest cays, Isla Culebrita (266 acres), Cayo Norte (254 acres), and Cayo de Luis Pena (342 acres) also have sandy beaches and rugged coastlines along with gentle sloping to steep hills. The smaller cays are predominantly solid rock with rugged topography. A few of the smaller cays have tiny areas of sandy beaches.

2.2.3.1.3 Culebra Island has a limited variety of soil types, owing to its volcanic origin, limited size, rugged terrain, and moderately uniform climate. Most soils, except along slopes, are the result of weathering bedrock. The Descalabrado series is found on slopes of 20 to 40 percent of the island and located over 75 percent of Culebra Island and is seen in most of the cays. This soil

is well drained with rapid runoff and moderate permeability. These soils exist over most of Flamenco Peninsula to a maximum depth of 3 feet (ft). Sandy, well-drained soils exist in beach areas. These sands are not extensive but are seen in the relatively low, flat coastal areas.

2.2.3.2 Water Resources

Fresh water is scarce on the island and is high in chloride and saline. Most residents get their water from a desalinization plant installed by the U.S. Navy at the Lower Camp, and from some shallow 10 to 20 ft-deep wells.

2.2.3.2.1 Surface water is also scarce on Culebra Island. Creeks and streams are intermittent and seasonal. Normally they are dry and only collect and drain runoff during rainstorm events. There are approximately one dozen natural springs and seeps that discharge water only during the wet seasons. Saltwater lagoons are seen on Culebra Island but are generally the result of flooding from storms.

2.2.3.3 Climatic Data

Culebra Island has a tropical marine climate with year-round warm temperatures. The average daily temperature is 80 degrees Fahrenheit (°F). Summer month temperatures (May through October) reach an average maximum of 86°F. The average minimum temperature on Culebra Island is 74°F. The lowest recorded temperature on Culebra Island was 69°F in February 1973 and the highest recorded temperature was 95°F during July 1969. The average water temperatures range from 77 to 83°F with an average of 80°F.

2.2.3.3.1 The average yearly rainfall is 36 inches, ranging from a low of 16 inches in 1967 to a high of 59 inches recorded in 1952. The heaviest rainfall occurs in May and during the period of September through November. The rainy season is generally from August through November. During the summer months, the rainfall occurs in frequent brief showers that result from convectional heating. During the winter months, the rainfall is associated with the movement of weather systems into the area. The most rainfall recorded in 1 month was 27 inches in May, 1979. The least amount of rainfall recorded on Culebra Island was during the drought of 1994 when no precipitation fell for several months.

2.2.3.3.2 The average humidity is approximately 73 percent, with a daytime average of approximately 65 percent and a nighttime average of approximately 80 percent. The most humid months are August through January, although the humidity in the remaining months is only slightly lower.

2.2.3.3.3 The prevailing winds are from the east-northeast from November through January and are from the east during the rest of the year. The average wind speed is 8 knots. The hurricane season is from June through November with most storms occurring July through September. Severe hurricanes occur through this area every 10 to 20 years. Hurricane Marilyn passed over the region during September 1995, postponing the field effort for this EE/CA investigation. Sustained winds from Hurricane Marilyn were in excess of 120 miles per hour (mph).

2.2.3.4 Natural Resources

2.2.3.4.1 Vegetation

There are two sensitive plant species that may potentially be located in the Culebra Island Archipelago. A list of these plants is included on Table 2-1. The plant species identified during the investigation was *Justicia culebritae* (a candidate endangered plant species) on Cayo Botella.

2.2.3.4.1.1 Vegetation on the undeveloped areas of Culebra Island and the larger cays ranges from moderately to extremely dense. These forested areas are thick with undergrowth including plants with long, sharp thorns (Mesquite acacia). The smaller cays are predominantly rock with sparse or no vegetation other than cactus, thorny brush (Mesquite acacia), and/or tall grasses. The poisonous manzillo tree is present on Flemenco Peninsula and may potentially be found in other areas.

2.2.3.4.2 Animal Populations

There are several sensitive birds, reptiles, and mammals that may be potentially located in the Culebra Island Archipelago. A listing of the administered animal species is included in Table 2-1. These animals are not common and were not encountered during the site investigation.

2.2.3.4.2.1 The most dangerous animals on the island are primarily insects. Spiders with poisonous bites exist on the Culebra Island. Even though the bites may be very painful, they are generally not considered lethal. The mosquitos and biting gnats on these islands are not suspected of carrying harmful pathogens. Packs of wild dogs were encountered on Flamenco Peninsula. The dogs were vociferous but did not attack the EOD team.

2.2.3.4.2.2 There are many hazardous animals located in the water. Fire coral and sea urchins can cause severe pain when encountered. Sharks, barracuda, and moray eels were also seen in the water. These animals generally do not attack people unless provoked.

2.2.3.5 Archaeological Resources

Little is known about the archeology of the Culebra Island Archipelago. A report by Garrow and Associates (Garrow, 1982) includes a description of the archaeologic areas of the Lower Camp site on Culebra Island. No other reports on Culebra Island archeology are known to exist. Several other archaeological sites have recently been discovered, but are not known to be in the investigation areas. When planning site remediation, the Puerto Rico Office of Historical Preservation should be contacted to ensure that any future identified archeological sites are located.

2.2.4 Investigation Areas

The Culebra Island Archipelago consists of Culebra Island and approximately 24 smaller cays and islands. The Inventory Project Report dated May 1, 1991, identified the need for ordnance detection and removal actions at about 11 sites on Culebra Island and adjacent cays. The *Archives Search Report Findings for Culebra Island Natural Refuge* [U.S. Army Corps of Engineers (USACE) RI,1995), summarized the ordnance activities in the Culebra Island Archipelago. Ten areas of known ordnance use were identified in the Archive Search Report (ASR). These included: Isla Culebrita, Cayo Botella, Cayos Geniqui, Cayo Tiburon, Cayo del Agua, Cayo Lobo, Cayo Alcarraza, Cayos Gemelos, Cerro Balcon, and Flamenco Peninsula. These areas, with the exception of Cerro Balcon, were included in the original Delivery Order No. 0027 (EE/CA, Culebra Island National Wildlife Refuge, Culebra Island, Puerto Rico) dated March 18, 1995.

2.2.4.0.1 Subsequent data from local residents and from the archive search report led to the addition of the Cerro Balcon mortar range to the investigational areas. The mortar range target area was located at the base of Cerro Balcon.

2.2.4.0.2 Most of the study areas are owned by the U.S. Government or the Commonwealth of Puerto Rico, and are under the protection of the U.S. Fish and Wildlife Service (USFWS) or by the Puerto Rico Department of Natural Resources (PRDNR). The exception, Cerro Balcon, is privately owned. The entire local population, approximately 1,542, live on Culebra Island. There are no permanent residents in any of the other areas within the Culebra Island Archipelago.

2.2.4.1 Flamenco Peninsula

Flamenco Peninsula is located on the northwest end of Culebra Island. The Flamenco Peninsula, including Flamenco Beach encompasses approximately 613 acres. The Flamenco Peninsula was

formerly used as naval gunfire, rocket and strafing ranges, and for aerial bombing. The southern boundary is located at a fire break and a wire cyclone fence is southwest of Flamenco Beach. The area from the current entrance to the end of the peninsula was used by the Navy as a bombing range from 1941 to 1975.

2.2.4.1.1 For the purposes of this report, the Flamenco Peninsula is subdivided into three specific regions: (1) Flamenco Beach, (2) Northwest Peninsula Sector A, and (3) Northwest Peninsula Sector B. Flamenco Beach, including the camping area and the area behind the campground on the west side of the peninsula, consists of approximately 300 acres on the south side of the peninsula. Flamenco Beach is currently administered by PRDNR and is used as a public beach and for camping and hiking. Northwest Peninsula Sector A consists of approximately 150 acres of mostly wooded, densely vegetated terrain. This area is administered by the PRDNR. Northwest Peninsula Sector B comprises approximately 163 acres of mostly tall grass and thorny brush. This area is administered by USFWS. According to USFWS, the north end of the Northwest Peninsula holds the largest rookery for Sooty Terns in the Culebra Archipelago.

2.2.4.1.2 Approximately 50,000 people visit Flamenco Beach every year. Flamenco Beach is open to the public and is used for camping, hiking, bird watching, and water sports. Northwest Peninsula Sector A is open to the public, but must be accessed on foot. ESE estimates approximately 20 percent of visitors to Flamenco Beach will hike the road to the Northwest Peninsula, as observed during the field effort. Based on this estimate and the numbers provided by PRDNR, ESE estimates 10,000 people reach the Northwest Peninsula Sector A each year.

2.2.4.1.3 The fence located between Sector A and Sector B limits access to the north end of the Northwest Peninsula. According to USFWS personnel, only 200 persons a year legally cross the fence and enter into Sector B. A permit is required to access all USFWS land.

2.2.4.1.4 Plans have been presented for the construction of villas on approximately 10 acres behind the parking area of Flamenco Beach. A copy of the preliminary plans are included in Appendix B. Included in the plans are the creation of hiking trails throughout the entire peninsula. Currently, the thick vegetation generally limits hiking to the roadways located in various parts of the park.

2.2.4.1.5 USFWS has plans for creating a fire break at the tip of Northwest Peninsula. The fire break would protect the Sooty Terns nesting area from fires that may originate from the lower portions of the peninsula.

2.2.4.1.6 The Puerto Rico Power Authority (PRPA) has been interested in construction of wind energy systems on the Flamenco Peninsula. This will require the construction of several 7.4 square meter (m^2) foundation pads and piles drilled 12 m below the surface. Neither the location nor the approval has been given.

2.2.4.2 Isla Culebrita

Isla Culebrita comprises approximately 366 acres and is approximately 1 mile east of Culebra Island. Isla Culebrita has sandy beaches, rocky shoreline, moderate to steep hills, and light to dense vegetation.

2.2.4.2.1 A former lighthouse, constructed in February 1886, exists on Isla Culebrita and was used as an observation point for bomb runs on Cayo Botella (See Photograph Number 35, Appendix C). Two additional wooden observation points were constructed for observing operations at Cayo Botella. One (See Photograph Number 36, Appendix C) was located near Marc Point (on northern Culebrita) and the other near the strafing fire range (western Culebrita).
2.2.4.2.2 The strafing fire range is approximately 82 acres in size, a portion of which enters the water near the north beach. The remains of the supports for the old strafing targets are still visible in the water off the beach.

2.2.4.2.3 Marc Point is a rugged cliff and former torpedo range. On January 17, 1996, ESE traversed the entire island with an EOD escort equipped with a magnetometer. No evidence of other ordnance ranges or target areas was seen on Isla Culebrita.

2.2.4.2.4 Isla Culebrita is administered by USFWS; however, several tour guides are permitted access to the island. According to USFWS, approximately 20,800 visitors per year come to Isla Culebrita to hike and for water activities at the beaches. The north bay of Isla Culebrita is a popular area for boaters and beach visitors.

2.2.4.2.5 Most tour guides drop off visitors on the south shore of Isla Culebrita and the visitors hike to North Bay. The shoreline on the south is deeper and less dangerous for boat operations than the shallower North Bay. The east and west sides of the island are difficult to access due to broad shallow reefs and rocky shores.

2.2.4.2.6 Threatened or endangered species of sea turtles commonly nest on the sandy beaches of Isla Culebrita. During the nesting season, beaches where nesting occurs are patrolled by USFWS or by paid contracted personnel. Isla Culebrita does not support large scale seabird nesting.

2.2.4.2.7 There have been recent discussions regarding converting the lighthouse on Isla Culebrita to a bed and breakfast. No formal plans for the conversion have been presented.

2.2.4.3 Cayo Botella

Cayo Botella is located approximately 3/4 mile east of Culebra Island. Cayo Botella is a small Cay (approximately 3.5 acres in size) with mostly rocky shores and light vegetation. This cay was used as a bombing range and for aerial rockets. A large bulls eye was painted on the ground with lime to act as a target for pilots.

2.2.4.3.1 Cayo Botella is administered by USFWS. Based on data from USFWS, ESE estimates approximately 50 people per year visit this cay, mostly illegally (without permits from USFWS). Scuba divers commonly visit the underwater reefs around this cay. Nesting birds and turtles do not frequent this cay and it is fairly inaccessible by water during most of the year due to the rocky shores and shallow reefs.

2.2.4.3.2 One potential candidate for a threatened species of plant was identified on Cayo Botella. *Justicia culebritae* was seen on the eastern portion of the cay by the ESE Botanist (see Photograph Number 31, Appendix C). This necessitated careful placement of the sampling locations to avoid disturbing this plant species.

2.2.4.4 Cayos Geniqui

Cayos Geniqui are located approximately 1.25 miles northeast of Culebra Island. Cayos Geniqui consists of two very small cays (approximately 4 acres total) with steep rocky shores and light vegetation. These cays were used for aerial bombing and for aerial rockets. The Navy also used these cays as torpedo targets.

2.2.4.4.1 Cayos Geniqui are administered by USFWS. Based on data from USFWS, ESE estimates approximately 50 people per year visit this cay, including illegal poachers who steal the eggs of nesting birds. Access onto Cayos Geniqui is difficult due to the rocky shores and shallow reefs. Only experienced boaters will attempt to transport people to these cays and only in the calmest sea conditions.

2.2.4.4.2 Cayos Geniqui are also a common nesting area for several bird populations. The Brown Noddies, Laughing Gulls, Audubons Shearwaters, Red Billed Tropic Birds, Brown Boobies, and Red Footed Boobies are the most common nesting birds on Cayos Geniqui. USFWS

personnel visit these cays at least four times a year to observe nesting activities of migratory birds.

2.2.4.5 Cayo Tiburon

Cayo Tiburon is located approximately 1.25 miles northeast of Culebra Island. Cayo Tiburon (or shark cay) is very small (approximately 1 acre) with steep rocky shores and light vegetation. This cay was used for aerial bombing and for aerial rockets.

2.2.4.5.1 Cayo Tiburon is administered by USFWS. Based on data from USFWS, due to the size people do not visit this cay. Access onto Cayo Tiburon is difficult due to the rocky shores and shallow reefs. Only experienced boaters will attempt to transport people to this cay and only in the calmest sea conditions.

2.2.4.5.2 This cay may be a common roosting area for several bird populations. USFWS personnel visit this cay at least four times a year to observe nesting activities of migratory birds. They generally do not land on this cay.

2.2.4.6 Cayo del Agua

Cayo Del Agua (or Water Cay) is located approximately 1.5 miles southwest of Culebra Island. Cayo del Agua comprises approximately 2 acres, has steep rocky shores, and light vegetation. This cay was used for aerial bombing and rockets.

2.2.4.6.1 Cayo Del Agua is part of the three brothers (Los Hermanos) chain, which also includes Cayo Yerba, and Cayo Raton. Even though there is no mention of ordnance at the latter two cays, local divers have indicated the possibility of underwater ordnance near these cays. This EE/CA report does not include the investigation of underwater ordnance.

2.2.4.6.2 Cayo Del Agua is administered by USFWS. Access onto Cayo Del Agua is difficult due to the rocky shores and shallow reefs. Based on data from USFWS, ESE estimates approximately 250 people per year visit this cay; including illegal poachers who steal the eggs of nesting birds.

2.2.4.6.3 This cay is a common nesting area for several bird populations. According to USFWS, the most important bird populations on Cayo Del Agua are the Bridled Tern, Zenaida Doves, Audubon's Shearwaters, and Red Billed Tropic Birds. USFWS personnel visit this cay at least four times a year to observe nesting activities of migratory birds.

2.2.4.7 Cayo Lobo

Cayo Lobo (or Cross Cay) is located approximately 2.5 miles southwest of Culebra Island. Cayo Lobo is comprises approximately 20 acres, has steep rocky shores, and some sandy beach access. Tall grasses and thorny brush cover most of this cay. It was used for aerial bombing and for aerial rockets. In later years, observation posts were constructed to observe activities on Cayo Del Agua and Los Hermanos as well as to observe activities on Cayo Lobo itself.

2.2.4.7.1 Cayo Lobo is administered by USFWS. This cay is not very popular as it is overrun with rats, which devour the eggs of nesting birds. As a result, no significant nesting bird populations occur on this cay. Access onto Cayo Lobo is difficult due to the rocky shores and shallow reefs. USFWS personnel visit this cay only once or twice a year. Based on data from USFWS, ESE estimates approximately 200 people per year visit this cay, mostly illegally.

2.2.4.8 Cayo Alcarraza

Cayo Alcarraza (or Fungi Bowl) is located approximately 2 miles northwest of Culebra Island. Cayo Alcarraza comprises approximately 7 acres and has very steep rocky shores and light vegetation. This cay was used for aerial bombing and for aerial rockets. Local divers report that they have seen torpedoes underwater at Alcarraza

2.2.4.8.1 Cayo Alcarraza is administered and access is regulated by the USFWS. Approximately 25 people per year visit this cay; including illegal poachers who steal the eggs of nesting birds. Access onto Cayo Alcarraza is difficult due to the rocky shores, steep cliffs, and shallow reefs. Only experienced boat operators can access this cay, and only during calm sea conditions.

2.2.4.8.2 This cay is a common nesting area for several bird populations. USFWS personnel visit this cay at least four times a year to observe nesting activities of migratory birds. According to USFWS, Cayo Alcarraza may have populations of nesting Bridled Terns, Brown Noddies, Audubon's Shearwaters, Red Billed Tropic Birds, and Masked Boobies.

2.2.4.9 Los Gemelos

Los Gemelos (or Twin Rocks) is located approximately 1.5 miles northwest of Culebra Island. Los Gemelos comprises approximately 2 acres and has very steep rocky shores and light vegetation. This cay was used for aerial bombing, rockets, and missiles. Most of the 2 acres used for bombing is at or below the surf zone.

2.2.4.9.1 Los Gemelos is administered by USFWS. Based on the size of the cay and data from USFWS, this cay is not visited by people. Access onto Los Gemelos is difficult due to the rocky shores, steep cliffs, and shallow reefs. Experienced boat operators have difficulty accessing this cay. This cay is a roosting area for occasional bird populations and is monitored for roosting birds by USFWS. The rocks are easily swept by north swells.

2.2.4.10 Cerro Balcon

Cerro Balcon is located on Culebra Island approximately 2.5 miles from the former Lower Camp. The Base of Cerro Balcon was used as a mortar range, with the firing point located less than 1 mile from the impact area. The mortar range was used in the 1930s with the entire range fan comprising approximately 48 acres. The main impact area was approximately 6 acres. ESE estimates that less than 50 people visit this site per year based on the fact that this site is remote and privately owned.

2.2.4.10.1 The archive search team reportedly found fragments from a stokes mortar during their site visit. The archive search report documented the one known civilian fatality that occurred in 1935. Two live mortar rounds were found by a local resident, whose children were playing with the rounds and were critically injured.

2.2.4.10.2 The former mortar range is located on private property. The rights-of-entry were secured from two of the three property owners. However, the owner of a portion of the mortar impact area (approximately 6.1 acres) would not allow access to his property. Three acres were investigated at this site during the ESE field effort.

2.2.4.10.3 The former mortar range is currently used for cattle grazing and is covered by tall grasses and thorny brush. There are tall trees near the south side of the mortar range that are favorite nesting areas for hawks and some peregrine falcons. Even though Wheeler's peperomia, an endangered plant, was suspected to be in this area, it was not observed in the field investigation area.

2.3 Previous OE Investigations

A site visit was conducted on April 30, 1991, by Mr. Ivan Acosta, U.S. Army Corps of Engineers South Atlantic Jacksonville District (CESAJ)-PD-EE, and Mr. Henry Morales, a USFWS National Wildlife Refuge representative. Mr. Morales is a native of Culebra Island and was familiar with OE areas. Their preliminary assessment concluded the following:

"There are at least eleven identified bomb impact sites on the island and adjacent cayos that are dangerous and still contain visible unexploded bombs. It (the former Culebra military facility) requires investigation beyond the scope of this preliminary assessment." (Source: Site Survey Sheet for DERP-FUDS Site No. I02PR006800 Culebra Island NWR, P.R. dated 9 May 1991, Prepared by Mr. Ivan Acosta, CESAJ-PD-EE).

2.3.0.1 The report that was prepared subsequent to this site visit qualified 2,660 acres as FUDS-eligible and recommended referral to USAESCH for an evaluation of confirmed ordnance contamination.

2.3.0.2 In March 1993, Mr. Wayne Galloway of USAESCH and Mr. Robert Bridgers of CESAJ visited Culebra Island in connection with a proposed interim OE removal action at the Flamenco Beach campground area. MTA Inc. (MTA) was selected to perform a TCRA at the campground area of Flamenco Beach. The work was delayed until May 1995.

2.3.0.3 A detailed archives search was conducted in 1994 and was completed in February 1995 (USACERI, 1995). As stated in the ASR, the purpose of the investigation was to:

"Characterize the site for potential OE contamination, to include chemical warfare material (CWM). This was achieved by a thorough evaluation of historical records and photographs, interviews, and an on-site visual inspection."

2.3.0.4 The ASR contained numerous color photographs of Culebra Island and the associated cays depicting ordnance and the potential areas of OE contamination.

2.3.0.5 TCRA operations at Flamenco Beach were executed by MTA from May 12, 1995 through May 27, 1995. This interim remedial action to remove near surface UXO, resulted in the removal and disposal of 11 UXO items found in the 3.66 acres included in the investigation. The results of the investigation are included in the TCRA report (MTA, 1995).

2.3.1 Identification of EE/CA Sampling Sites

ESE identified nine sites for EE/CA sampling based on the data provided by previous investigations, the SOW for this EE/CA investigation, and historical data provided in the ASR (USACERI, 1995). The sites to be investigated during the EE/CA field effort included the following:

- Flamenco Peninsula,
- Cerro Balcon,
- Isla Culebrita,
- Cayo Botella,
- Cayos Geniqui,
- Cayo Tiburon,
- Cayo del Agua,
- Cayo Lobo, and
- Los Gemelos.

2.3.1.1 The Flamenco Peninsula investigation area included Flamenco Beach and Sectors A and B in the Northwest Peninsula. The results of the EE/CA field investigation are presented in Section 2.4.7 of this EE/CA report.

2.4 EE/CA Investigation

The purpose of the EE/CA investigation was to select non time-critical removal actions (NTCRAs) necessary to reduce the public safety risk associated with OE at Culebra Island. The focus of this EE/CA was on the residual (subsequent to the TCRA) conventional OE risks requiring NTCRA's within the land boundaries of the Culebra Island Archipelago. The EE/CA investigation also summarizes the factors affecting the existing risk levels using the U.S. Army's Safety Risk Assessment (SRA) model and evaluates available remedies to compare their effectiveness in reducing overall risk.

2.4.1 Prefield Activities

The prefield activities for this project included but were not limited to the following primary tasks:

- Public meetings;
- Preparing the EE/CA WP;
- Logistics and supplies preparation, procurement, and shipping protocol;
- Documenting the Special Environmental requirements and concerns;
- Obtaining the necessary permits required for execution of the field effort; and
- Prefield Meeting.

2.4.1.1 Public Meetings

Two public meetings were held at the Culebra Island Municipal Building, Culebra Island, Puerto Rico, to discuss the EE/CA activities with the public.

2.4.1.1.1 The first public meeting was held concurrently with a site visit on Thursday, May 4, 1995. Attendees included representatives of MTA, ESE, USAESCH, and local residents. Topics of discussion included MTA TCRA activities at Flamenco Beach and the impending EE/CA sampling activities.

2.4.1.1.2 The second public meeting was held on November 29, 1995. Attendees included representatives of ESE, USAESCH, USFWS, PRDNR, USACE, residents of San Juan and local residents. The purpose of the meeting was to discuss the activities of the EE/CA investigation with local residents in response to a local television report that erroneously reported that an underwater investigation was being performed to remove ordnance in the reefs surrounding the cays. The public was told that there will be absolutely no underwater operations during the current investigation.

2.4.1.1.3 Also discussed were the field activities and how they were to be conducted. Several local residents requested that Isla Culebrita and Flamenco Beach be investigated first to avoid interference with the main attractions to Culebra Island during the busy holiday season. ESE agreed to this request and performed the investigations on Isla Culebrita and Flamenco Beach concurrently at the beginning of the project.

2.4.1.2 WP

The final version of the WP for this project was submitted to USAESCH in October 1995 and approved on November 9, 1995. The objectives of the WP were to present the site background, field objectives, field procedures, field personnel, and field equipment to be used for the EE/CA effort.

2.4.1.2.1 The WP proposed approximate locations for the investigation grids at each of the original nine sites. To conduct this EE/CA with the concurrence of the jurisdictional parties involved a pre-field site selection team consisting of representatives of the USFWS, the PRDNR, ESE, the project EOD support [EODT, Inc. (EODT)] and land surveyor [Renan Lopez de Azua and Associates Inc (RLDA)], located and adjusted (when necessary) the field sampling sites. A total of 59 grid sites was selected, but only 57 of the sites met the criteria of the concerned parties. These 57 grid sites were later surveyed.

2.4.1.3 Special Environmental Requirements

The Culebra Island Archipelago is part of the Culebra Island National Wildlife Refuge. This area contains known sensitive environmental resources such as endangered species habitat, endangered and sensitive plant habitat, and migratory bird and bird nesting habitats. To protect these sensitive areas, ESE closely coordinated site activities with the regulatory agencies.

2.4.1.3.1 Prior to the investigation, USAESCH applied for approval pursuant to Section 7 of the Endangered Species Act and Migratory Bird Treaty Act. A letter from James Oland of USFWS on October 25, 1995 included comments to the Section 7 letter. After addressing the USFWS comments, James Oland gave the approval for the field effort to proceed in a letter dated November 9, 1995.

2.4.1.4 Permits

There were 2 categories of permits required for this project. Explosive permits and environmental permits.

2.4.1.4.1 Explosive Permits

The explosive permits were obtained and held by EODT prior to shipment of explosives onto Culebra Island. The permit was required by the Commonwealth of Puerto Rico Police for the handling and detonation of Explosives during the EE/CA field effort.

2.4.1.4.2 Environmental Permits

ESE researched the requirement for a depredation permit for the possible injury of wildlife in the Culebra Island Wildlife Refuge. ESE contacted the USFWS offices in Atlanta, Georgia and in Washington DC. It was determined that a depredation permit would not be required for the work on Culebra Island as the main purpose of the activity was for ordnance sampling and disposal. Any injury to wildlife during the operations would be purely accidental, and safeguards to limit the possibility of injury were in place. ESE was asked to closely coordinate all activities with USFWS personnel.

2.4.1.4.3 The USFWS also provided ESE with permits to visit the cays and other areas under their jurisdiction. A copy of each permit is included in Appendix D.

2.4.1.5 Prefield Meeting

A prefield meeting was conducted by ESE on November 9, 1995. The meeting was attended by ESE QC personnel and ESE, EODT, and USAESCH project management and safety personnel. The purpose of the meeting was to review the requirements of the project to guarantee that field personnel understood the work process, QC, and safety requirements for the EE/CA investigation. The meeting concluded with the approval for the field effort to proceed.

2.4.1.5.1 Prior to beginning intrusive field activities, ESE and USAESCH obtained concurrence of the WP from PRDNR, USFWS, and the Puerto Rico Environmental Control Board. Copies of communications with the agencies are included in Appendix D.

2.4.1.6 Hurricane Marilyn

Hurricane Marilyn passed by Culebra Island on September 16, 1995. The storm had sustained winds of over 120 mph as it encountered the Culebra Archipelago. The damage to the Culebra Island infrastructure led to a delay of the field effort.

2.4.1.7 Site Logistics

Prior to the field effort, ESE and USAESCH personnel visited the site on September 25, 1995, to establish the field logistics following Hurricane Marilyn. ESE personnel had identified several vendors, set up a schedule, and investigated facilities on the Island. During that site visit it was learned that the road to the Northwest Peninsula had been washed out and that it would be nearly impossible to access many of the sites on the peninsula. The PRDNR was planning to bring in soil to backfill the washed out area.

2.4.2 Project Management

The WP defined the project objectives, identified key personnel and their responsibilities, defined project lines of communications and reporting requirements, and outlined a schedule for implementing the project. The WP was followed during the EE/CA field investigation.

2.4.3 Public Affairs

2.4.3.1 Public Affairs and Project Coordination

Mr. Robert Bridgers (CESAJ), is the life-cycle manager for investigation activities on Culebra Island. Lt. Col. Fowler of the local Antilles area office (USACE) provided onsite assistance and personnel. The USAESCH, as the technical center for explosive safety and removal, was given the primary task of technical management of the Culebra project. Mr. Roland Belew was the USAESCH technical manager.

The following coordination protocol was followed:

- All ESE communications and contacts with the public were coordinated under the direction of the CESAJ public affairs officer and the USAESCH technical manager.
- Information/contacts made by ESE during the project were documented and forwarded to the CESAJ public affairs officer and the USAESCH technical manager, and
- Public meetings were conducted based on instructions received from the USAESCH technical manger in conjunction with CESAJ.

2.4.3.1.1 Coordination for the project was performed by Mr. Robert Bridgers and the USACE Antilles area office. Personnel from the Antilles office assisted with public coordination. Public statements were prepared by the Antilles personnel and distributed to local and regional news media. Mr. Alfonso Oneil of the Antilles office remained onsite during most of the field activities to assist with coordination of the investigation and to provide information to local residents.

2.4.3.1.2 The 30-day review period for the Draft Final EE/CA was initiated on July 30, 1996, with a public meeting on Culebra Island. The results of the meeting and the public comments concerning the Draft Final EE/CA report are included in the Responsiveness Summary (Appendix M). The public comments are incorporated in the Responsiveness Summary.

2.4.4 Sampling Grid Selection

ESE, with the assistance of local environmental agencies, selected 59 sites for investigation during the field effort. The site selection criteria are discussed in the following subsections.

2.4.4.1 Sample Location Selection Rationale

The selection of sample grid locations was based on the data presented in the ASR, previous site visit findings, previous TCRA action, and information obtained from local residents. The ESE site manager, with the assistance of an ESE botanist, USFWS personnel, the land survey subcontractor, and EOD escort personnel from EODT, located the 59 grid sites. The sample grid location was based on the following criteria:

- Site Historical Data—Historical data obtained from the ASR along with historical photographs were used to locate impact areas. Descriptions of activities at each site were also used to determine the dispersion of ordnance at the site. Sites were chosen near known target areas to obtain maximum densities, and in areas away from known targets to collect dispersion data.
- Environmental Concerns—ESE closely coordinated grid locations with PRDNR and USFWS to position sites away from environmentally sensitive areas.
- Accessibility—The selection of survey grid locations considered the amount of site preparation needed prior to executing sampling activities, as well as the advantages of inspecting areas that would require minimal site preparation. Access to areas of dense vegetation required not only the clearing vegetation at the grid site, but also clearing a path to the grid.
- Field modification—The exact locations of the final placement and dimensions of the sampling grids were considered to be modifiable until the grid survey was conducted. The USAESCH technical manager approved the modification of grid sizes in response to site conditions such as vegetation and topography.
- Field crew safety—The safety of the OE investigation teams was a factor in choosing grid locations. Many of the investigation areas contain steep rocky slopes that could be hazardous to personnel using grubbing equipment or transporting supplies to and from the site. The site safety manager approved all survey grid locations.

2.4.4.2 Two of the chosen grids, IC-1 at Isla Culebrita and NP-29 at Northwest Peninsula were deleted from the investigation. Grid IC-1 was deleted because nesting turtles moved into the area. Grid NP-29 was deleted as USFWS would not approve the location of the grid. As a result, only 57 of the 59 grids were investigated.

2.4.5 Site Preparation

Site clearing operations were completed prior to beginning investigation activities at each site to avoid delays. The absolute minimum amount of site clearing in the grid sampling areas both in vegetation volume and height was completed. The clearing operations were completed in accordance with the site-specific WP (ESE, 1995).

2.4.6 Investigation Methods

This section describes standard practices, investigation methods, and procedures for collecting, processing, and controlling the data associated with OE geophysical surveys at each sampling site. The investigative methods were completed in accordance with the site- specific WP (ESE, 1995).

2.4.6.1 Geophysical Investigation

Prior to the investigation, a piece of steel approximately the size of a 105-mm projectile was buried 3 ft-bgs, as specified in the USACE SOW. This item was used for daily calibration of the magnetometer.

2.4.6.1.1 The field investigation team subdivided each sampling grid into geophysical sensor survey lanes centered approximately 5 ft apart. Survey lane spacing of 5 ft was required to provide full coverage when using a Shonstedt flux-gate or equivalent type magnetometer. A small surveyor's flag was placed at the exact location of any anomaly until the survey and excavation operations were complete.

2.4.6.2 Geophysical Survey Mapping

Once subsurface anomalies were identified and flagged, they were mapped onto a previously prepared field sketch of the site. The anomaly locations were estimated and placed onto the sketch by the team leader. When large numbers of anomalies were detected, it was not feasible to mark each anomaly on the map. Instead, the anomalies were counted for each survey lane and denoted on the map at the end of each lane surveyed. All surface and subsurface UXOs encountered during the investigation were placed on the map.

2.4.6.3 Excavation of Anomalies

The Gridstats software developed by Quantitech, Inc. was used to locate the anomalies to be excavated. Each grid was subdivided into 36 subgrids that corresponded to subgrid numbers in the

gridstats program. The gridstats program randomly selected a sampling sequence number that corresponded to a previously prepared table of random numbers from 1 to 36. The prepared table identified the sampling order.

2.4.6.3.1 One anomaly in each of the chosen subgrids was sampled by the UXO survey team in the order the subgrids were listed in the table. Manual or equipment methods (e.g., hand tools) as specified in the WP were used to perform all excavation activities. All excavation activities were conducted in a prepared exclusion zone within which only UXO-qualified personnel were allowed. Soil removal from the access pit was stockpiled in the immediate area for later backfilling of excavations.

2.4.6.3.2 The UXO team leader identified each anomaly as either ORS, UXO, or a false positive (usually the result of magnetic rock). After the inputting the findings from the excavation, the gridstats program alerted the operator when a statistically significant number of samples had characterized the grid. As circumstances allowed, unearthed OE items were photographed for documentation purposes.

2.4.6.4 UXO Handling and Disposal

Only UXO-qualified personnel were allowed to handle any OE items in accordance with the Site-Specific Safety and Health Plan (SSHP) (Appendix D of the WP) and Demolition/Disposal Range Standard Operating Procedures (SOP) (Appendix E of the WP). The UXO supervisor evaluated all encountered and suspected UXO and determined if the work planned for the area could safely continue and what actions must occur prior to commencing OE handling and disposal efforts. Such recommendations were immediately communicated to the senior UXO supervisor, who contacted the onsite ESE site manager and USAESCH safety representative, if necessary, to determine the appropriate course of action. Relevant training requirements of 29 CFR 1910.120e(i) applied to all UXO handling and disposal activities conducted during the field investigation [Occupational Safety and Health Administration (OSHA), 1994].

2.4.6.4.1 UXOs that were unfuzed or determined safe for movement by the UXO team were transported to a disposal area. UXO items removed from discovery locations were loaded onto appropriate transport vehicles and moved to a prepared onsite location for further handling or temporary storage.

2.4.6.4.2 UXO items determined not to be movable within safety guidelines were blown in place. The final decision on what UXO items were transported was made by the UXO site supervisor and Site Safety Officer.

2.4.6.5 UXO, ORS, and Explosives Accounting

A detailed account of all UXO materials encountered during the investigation was entered onto an Ordnance Accountability Form. The accounting included the number of UXO items, description of the condition of the item and fuze with photographs (as appropriate), date, and method and location of disposition.

2.4.6.5.1 All explosive disposal operations were documented on a Blast Record form. The form tracked the date, location, explosives used, site conditions, and items disposed of. An explosives log was also kept to account for all explosives expended in the disposal of UXO items.

2.4.6.5.2 The ORS accounting process included all shrapnel, and all non-OE metallic debris encountered. An attempt was made to describe the ORS collected from each site. Total metallic debris was accounted for by gross weight per sampling site either by direct measurement using a scale or by estimation based on the number and size of items found.

2.4.6.6 Explosives Storage

The explosives were shipped to Culebra Island and stored in two locked explosives magazines located at the PRDNR facility at the former Lower Camp facility. The magazines were placed on a concrete pad and secured by a double locked galvanized steel fence. Lightning protection was provided in accordance with USAESCH safety requirements.

2.4.6.7 Disposal of Inert ORS

Inert ORS was transported and stored in fabric bags in an unused corner of the secured magazine storage area. All metallic debris disposed of was then inspected by the senior UXO supervisor, who signed a certification to the fact that the ORS was inert. The ORS items were turned over to the local DRMO office located at Roosevelt Roads Naval Facility on the mainland of Puerto Rico.

2.4.6.8 Land Locational Survey

ESE subcontracted with RLDA to provide location survey and mapping support for the Culebra Island EE/CA investigation. RLDA personnel provided initial layout of the grids, set control points, then located the grids based on North American Datum, 1983.

2.4.6.8.1 Many of the sample grid locations were densely vegetated. This presented difficulties in setting grid corners. A compass and a fiberglass tape were used to flag the corners of each grid

for vegetation clearing. The survey crew returned to the site using a total station to perform a radial stakeout to set the actual corners.

2.4.6.8.2 Initially, RLDA attempted to use remote Global Positioning System (GPS) receivers to acquire coordinates on two corners of the sampling grids. That method was aborted due to the lack of an overhead window. The vegetation was too thick to traverse with an antenna, and the overhead vegetation prohibited the reception of the signal from the GPS satellites. To collect the required data, RLDA determined that they would set up baselines in the area of the sample grids and tie into the baseline using the total station. The coordinates of the baselines were determined by GPS. A copy of the GPS data is included in Appendix H.

2.4.6.8.3 The GPS control network consisted of three existing monuments that were used for the orientation of the land survey. These monuments were:

- A concrete monument (L-284) used during the TCRA on Flamenco Beach;
- A brass disk located in a large rock north of Flamenco Beach, and
- A brass disk set in an abandoned helicopter pad on the PRDNR facility at the former Lower Camp.

2.4.6.8.4 As part of the investigation, RLDA installed six survey monuments. The monument construction and design were in accordance with the site-specific WP (ESE, 1995) and the SOW. The coordinates for the survey monuments were located using GPS. Maps showing the location of grids, survey control points, and survey monuments are included in Appendix H.

2.4.7 Field Investigation Results

The ESE/EODT team was able to fully investigate 57 of the 59 EE/CA sampling grids at the seven investigation sites. A total of 9,510 anomalies was identified at these 57 grids. The sampling grids varied in size in accordance with the site vegetation and topography. The grid dimensions were either 100 by 100, 100 by 50, 50 by 50 or 40 by 40 ft.

2.4.7.0.1 Figure 2-1 presents the Culebra Archipelago and the key to the locations of the site maps. The locations of the investigation sites are shown on the figure.

2.4.7.0.2 The gridstats software program was used in the field to determine anomaly sample locations within each grid. The field investigative team excavated 2,640 of the 9,510 anomalies during the field effort. All UXO/ORS was encountered at depths of less than 1 ft. However, due to the scope of work, anomalies due to magnetic rock were excavated to an average depth of 2 ft or until solid rock was encountered. Table 2-2 presents the depth of ordnance found during the

investigation. Copies of the grid stat data summaries for each grid are included in Appendix E of this report.

2.4.7.0.3 Photographs and videotapes were taken at each of the sites. The photographs, included in Appendix C, show typical OE and vegetation at the sampling grids.

2.4.7.0.4 Approximately 1,700 lbs of ORS was collected and weighed by scale during the field effort. Due to the remote location, some of the ORS was not removed from a few of the sites. In these cases, the amount of ORS left behind is estimated by weight per grid. The weight of ORS and other appropriate information is included in the descriptions of items found in each grid as discussed in the following sections. The weight of ORS collected during the investigation per site is included in Table 2-3. The ORS was collected in a locked storage area and was later delivered to Defense Reutilization and Marketing Office (DRMO) at the Roosevelt Roads Naval Facility. The Proof of Delivery and signed declaration are included in Appendix F.

2.4.7.0.5 UXOs were found on the ground surface and in the subsurface during the EE/CA investigation. A total of 57 surface and 62 subsurface UXOs was collected at the investigated sites at Cayo Botella, Isla Culebrita, Cayo del Agua, Northwest Peninsula, and Flamenco Beach. All UXOs on Flamenco Beach were buried. Appendix G includes the UXO accountability logs that were completed during the investigation. Also included in Appendix G are descriptions of the ordnance items found during the EE/CA investigation.

2.4.7.0.6 RLDA surveyed each grid location (as discussed in Section 2.4.6) and placed six survey markers (labeled Culebra-1 through -5 and Culebra-7). Culebra-6 was to be installed in the Flamenco Beach area but was deleted with the approval of the representative from the Antilles office of the USACE - Jacksonville District. Two existing survey markers were located in close proximity to the site, and it was agreed that the installation of a third would not be required. Survey marker location maps and descriptions are included in Appendix H of this report.

2.4.7.0.7 The field effort was initiated on November 14, 1995, with the initial site layouts. The ESE site manager, an ESE botanist, USFWS personnel, a EODT UXO safety escort, and the EODT UXO supervisor were onsite to choose grid locations. The UXO investigation crews arrived onsite on December 3, 1995, to begin clearing vegetation in the grid locations. Several grids were heavily vegetated with thick, dense underbrush and trees. ESE received approval of the WP on December 8, 1995 and actual grid clearing began on December 11, 1995. Demobilization of the project was completed by February 26, 1996. A summary of the dates and activities completed at each grid during the investigation is presented in Table 2-3. The following

sections describe the rationale for choosing grid locations and the results of the investigations at each of the sites.

2.4.7.1 Flamenco Beach

Flamenco Beach is located on the south end of Flamenco Peninsula on the northwest side of Culebra Island. The beach is administered by the PRDNR. Flamenco Beach includes the beach (approximately 5 acres), the campground (approximately 20 acres), and the ridge behind the campground on the western side of the peninsula (approximately 275 acres) for a total of approximately 300 acres. Figure 2-2 presents the Flamenco Beach investigation area including the sample grid locations. A total of 10 sample grids was located in the area.

2.4.7.1.1 Two areas of Flamenco Beach, the camping area and the west side of the ridge, were not investigated during this field effort. Most of the camping area was investigated during a TCRA (MTA, 1995), the results of which were used in this EE/CA report to determine the ordnance density in the campground. The area west of the ridge is a sensitive nesting area for several species of birds and was also thought to be a sensitive habitat for some endangered plant species. PRDNR requested that this area not be investigated. ESE believes the density data collected from the eastern portion of the ridge will be adequate for estimation of density on the western portion of the ridge. There are no known targets on the western portion of the ridge. Therefore, the estimate of the ordnance density in this area, based on the results from the eastern portion of the ridge, should be conservative.

2.4.7.1.2 According to the archive data, the target area contained four Sherman tanks, and in some instances, fire was directed at 81mm white phosphorous spotting rounds or illumination candles fired from the Flamenco Point observation point. This information indicates that while some of the munitions were aimed at specific known targets, others were fired at targets that may have been dispersed across the site.

2.4.7.1.3 According to an interview with Sr. Juan Matta (see Appendix I), a PRDNR employee who works at Flamenco Beach, a cable target was set up at Flamenco Beach in the south side of the Northwest Peninsula. ESE and Sr. Matta visited the location of one of the tower foundations (See photograph number 2) to observe the cable system foundation that he helped construct.

2.4.7.1.4 Sr. Matta said that the moving target system was cumbersome, failed frequently, and was abandoned after 1 year. The approximate location of the cable system, based on conversations with Sr. Matta and from data included in the ASR (Map Figure L-3 of the ASR), is included on Figure 2-2. According to the *Report on the Culebra Complex and Study Alternatives*

by Tippetts-Abbett- McCarthy-Stratton Engineers and Consultants (1972) there were no moving targets in the area at the time of their investigation.

2.4.7.1.5 For public safety, Flamenco Beach was closed during the EE/CA investigation. The local residents requested that this site be investigated first and that the investigation be completed prior to the winter holiday season as Flamenco Beach is one of the main tourist attractions in the Culebra Island Archipelago. ESE concurred with the request and placed Flamenco Beach as a top priority.

2.4.7.1.6 Sampling grids FB-1 through FB-5 are located behind the current campground. Future plans for the Flamenco Beach camping area may include expansion. Sampling grid number FB-5 was located near one of the Sherman tank targets. The other grids located behind the campground were placed well within the vegetation areas.

2.4.7.1.7 Sampling Grids FB-6 through FB-8 and FB-10 were investigated to obtain data on the ridge area behind the campground. FB-8 was located below a Sherman tank target. FB-6 and FB-10 were located in the area of potential future construction (See Figure 2-2) of villas. Documents describing the potential future construction are included in Appendix B.

2.4.7.1.8 The density of ordnance at the beach may be interpolated from data collected from the TCRA investigation and from EE/CA sampling grids located behind the campground. Sampling area FB-9 is located near the edge of the north side of the beach. This area is near the Sherman tank target located on the beach and is located north of the TCRA investigation area.

2.4.7.1.9 Some of the most difficult clearing activities were conducted in the area behind the campground at Flamenco Beach. This area was heavily vegetated with thick underbrush and numerous tall trees. The underbrush commonly consisted of Mesquite acacia bushes, which have long sharp thorns that commonly ripped protective clothing. Most of the grids and pathways to the grids required extensive clearing.

2.4.7.1.10 Site FB-1

FB-1 encompassed an area 100 by 100 ft (0.23 acres) and was heavily vegetated with tall trees, vines, and thick underbrush including the thorny Mesquite acacia. This site required extensive grubbing.

2.4.7.1.10.1 Forty of the 116 total anomalies detected during the investigation were excavated. A total of 28 ORS items, weighting approximately 63 lbs, was encountered during the excavation.

The ORS consisted of unidentifiable metal frag most likely from naval projectiles. No UXOs were found on the surface or in the subsurface at this site.

2.4.7.1.11 Site FB-2

FB-2 encompassed an area 100 by 100 ft (0.23 acres) and was heavily vegetated with tall trees, vines, and thick underbrush including the thorny Mesquite acacia. This site required extensive vegetation clearing.

2.4.7.1.11.1 Twenty-two of the 64 total anomalies detected during the investigation were excavated. A total of 18 ORS items weighing approximately 38 lbs and consisting of unidentifiable metal fragments (most likely from naval projectiles) were encountered during the excavations. No UXOs were found on the surface or in the subsurface at this site.

2.4.7.1.12 Site FB-3

FB-3 encompassed an area 100 by 100 ft (0.23 acres) and was heavily vegetated with tall trees, vines, and thick underbrush including the thorny Mesquite acacia. This site required extensive vegetation clearing.

2.4.7.1.12.1 A pack of wild dogs occupied the woods near this grid. They appeared several times and made a large amount of noise but did not attack personnel working in this grid.

2.4.7.1.12.2 Ten of the total 28 anomalies detected during the investigation were excavated. A total of 3 ORS items, weighing approximately 10 lbs, was encountered during the excavation. The ORS consisted of unidentifiable metal fragments (most likely from naval projectiles). No UXOs were found on the surface or in the subsurface at this site.

2.4.7.1.13 Site FB-4

FB-4 encompassed an area 100 by 100 ft (0.23 acres) and was heavily vegetated with tall trees, vines, and thick underbrush including the thorny Mesquite acacia. This site required extensive vegetation clearing.

2.4.7.1.13.1 Thirty-one of the 49 total anomalies detected during the investigation were excavated. A total of 14 ORS items, weighing approximately 34 lbs, was encountered during the excavation. The ORS consisted of unidentifiable heavy case metal fragments (most likely from

naval projectiles), some with barnacles attached. No UXOs were found on the surface or in the subsurface at this site.

2.4.7.1.14 Site FB-5

FB-5 encompassed an area 50 by 50 ft (0.06 acres) and was heavily vegetated with tall trees, vines, and thick underbrush including the thorny Mesquite acacia. This site required extensive vegetation clearing.

2.4.7.1.14.1 Fifty of the 148 total anomalies detected during the investigation at FB-5 was excavated. A total of 3 ORS items, weighing approximately 5 lbs, was encountered during the excavation. The ORS consisted of unidentifiable metal fragments (most likely from naval projectiles). Other metal was also found, including tank parts from a nearby Sherman tank used for target practice. No UXOs were found on the surface or in the subsurface at this site.

2.4.7.1.15 Site FB-6

FB-6 encompassed an area 100 by 100 ft (0.23 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required moderate vegetation clearing. Forty of the 117 total anomalies detected during the investigation were excavated. A total of 3 ORS items, weighing approximately 5 lbs, was encountered during the excavation. The ORS consisted of unidentifiable metal fragments (most likely from naval projectiles). No UXOs were found on the surface. Five UXOs were identified in the subsurface at this site including:

- Two partial 5-inch illumination flares (no fuze);
- One 37mm HE projectile (no fuze);
- One 5-inch barrage rocket with HE (sand filled, with fired fuze); and
- One 5-inch, 38, HE MK-50 (with a fired mod 2 fuze).
- All five UXO items were blown in place.

2.4.7.1.16 Site FB-7

FB-7 encompassed an area 100 by 100 ft (0.23 acres) and was heavily vegetated with tall trees, vines, and thick underbrush including the thorny Mesquite acacia. This site required extensive vegetation clearing.

2.4.7.1.16.1 Forty-five of the 126 total anomalies detected during the investigation at FB-7 were excavated. A total of 8 ORS items, weighing approximately 62 lbs, was encountered during the

excavation. The ORS consisted of 5-inch projectile fragments and unidentifiable metal fragments. No UXOs were found on the surface or in the subsurface at this site.

2.4.7.1.17 Site FB-8

FB-8 encompassed an area 100 by 100 ft (0.23 acres) and was heavily vegetated with tall trees, vines, and thick underbrush including the thorny Mesquite acacia. This site and the access route into the site required extensive vegetation clearing.

2.4.7.1.17.1 One hundred forty of the 411 total anomalies detected during the investigation at FB-8 were excavated. A total of 4 ORS items, weighing approximately 59 lbs, was encountered during the excavation. The ORS consisted of projectile fragments and unidentifiable metal fragments. No UXOs were found on the surface or in the subsurface at this site.

2.4.7.1.18 Site FB-9

FB-9 encompassed an area 100 by 100 ft (0.23 acres) and was lightly vegetated with short grasses and vines. This site required light vegetation clearing.

2.4.7.1.18.1 Ninety-five of the 288 total anomalies detected during the investigation at FB-9 were excavated. A total of 67 ORS items, weighing approximately 84 lbs, was excavated. The ORS consisted of 5-inch projectile fragments and unidentifiable metal fragments. No UXOs were found on the surface or in the subsurface at this site.

2.4.7.1.19 Site FB-10

FB-10 encompassed an area 50 by 50 ft (0.06 acres) and was vegetated with tall grasses and brush including the thorny Mesquite Acacia. This site required moderate vegetation clearing.

2.4.7.1.19.1 Fifteen of the 34 total anomalies detected during the investigation at FB-10 were excavated. A total of three ORS items, weighing approximately 6 lbs and consisting of 5-inch illumination spacers and unidentifiable metal frag, was encountered during the excavation. No UXOs were found on the surface or in the subsurface at this site.

2.4.7.1.20 Summary of Results—Flamenco Beach

Figure 2-3 presents a map of each grid location represented by a pie chart indicating the predicted percent of subsurface UXOs (ranging from 0 to 13 percent), ordnance-related waste (ranging from 3 to 82 percent), and false positives (ranging from 18 to 97 percent) for each entire grid.

2.4.7.2 Northwest Peninsula

For the purposes of this report, the Northwest Peninsula refers to the area on the north end of Flamenco Peninsula. This area is subdivided into two sectors. The southern sector (Sector A) includes 150 acres and is administered by the PRDNR. The northern sector (Sector B) includes 163 acres and is administered by the USFWS. Sectors A and B, including their grid locations and other important information, are presented on Figures 2-4 and 2-5, respectively.

2.4.7.2.0.1 According to the ASR, this portion of the Flamenco Peninsula was used extensively for aerial bombing, aerial rockets, strafing, and naval gunfire. Targets included white painted drums, Sherman tanks, trucks, panels, and circular targets painted onto the ground surface with lime. A portion of the cable target system was constructed in Sector A and terminated near the fence line between sector A and sector B. Some of the naval gunfire was directed by flares or white phosphorous-filled rounds that were aimed at the peninsula from the observation point at Flamenco Point. The area between the ridges was an impact area used for conventional and napalm-laden bombs. The ASR also noted that one 11.75-inch "Tiny Tim" Aerial Rocket and one 5-inch rocket were observed on the Northwest Peninsula.

2.4.7.2.0.2 A total of 29 investigation grids were located on the Northwest Peninsula. Sampling grids NP-1 through NP-7, NP-9, and NP-23 through NP-27 were located in Sector A; and NP-8, NP-10 through NP-22, NP-28 and NP-29 were located in Sector B. All locations except NP-29 were sampled. NP-29 was deleted due to time constraints and the sensitivity of the location requiring approval from USFWS. NP-29 was located at the tip of the Northwest Peninsula, which is a rookery for Sooty Terns. The Sooty Terns did not occupy this area at the time of the investigation.

2.4.7.2.0.3 Several of the grids were chosen close to target areas. NP-3, NP-25, NP-26, NP-16, and NP-17 were located near known Sherman tank targets. NP-6 was located uphill from a tank that had fallen down a slope. Historical photographs indicate a bulls eye target painted on the ground in Sector B near NP-8, NP-10, and NP-11. The location of grid NP-19 is near the location where USFWS may plan to excavate a fire break and also close to the observation bunkers used. The approximate position of the fire break and the bunkers is presented in

Figure 2-5. The other sites were spread across the peninsula to gather ordnance density data between known targeted areas. Figures 2-4 and 2-5 show the locations of the grids as well as the location of known targets and other military features in Sector A and Sector B, respectively.

2.4.7.2.0.4 The vegetation in Sector A is generally very dense to the south with moderately tall trees and thick brush. As you traverse from south to north, the trees become less predominant. Tall brush is the dominant vegetation type north of Sector A. Vegetation clearing activities were difficult in Sector A.

2.4.7.2.0.5 The vegetation in the south section of Sector B is generally very dense tall brush. Traversing northward, the dominant vegetation type becomes tall grasses with some mesquite acacia bushes. Vegetation clearing activities were less difficult in Sector B than in Sector A.

2.4.7.2.1 Site NP-1

NP-1 encompassed an area 50 by 50 ft (0.06 acres) and was lightly vegetated. The vegetation consists of short grasses and vines with some Mesquite acacia. This site required light vegetation clearing.

2.4.7.2.1.1 One hundred of the 307 total anomalies detected during the investigation at NP-1 were excavated. A total of 23 ORS items, weighing approximately 88 lbs, was encountered during the excavation. The ORS consisted of 5-inch rocket and other unidentifiable fragments. One UXO was found on the surface and no UXO was found in the subsurface at this site. The UXO item included a fired, unfuzed, 3-inch projectile that was taken to a demolition area at grid NP-3 for disposal.

2.4.7.2.2 Site NP-2

NP-2 encompassed an area 100 by 100 ft (0.23 acres) and was heavily vegetated with tall trees, vines, and thick underbrush including the thorny Mesquite acacia. This site required extensive vegetation clearing.

2.4.7.2.2.1 Two hundred of the 605 total anomalies detected were excavated during the investigation. A total of 25 ORS items, weighing approximately 51 lbs, was encountered during the excavation. The ORS consisted of unidentifiable metal fragments. No UXOs were found on the surface or in the subsurface at this site.

2.4.7.2.3 Site NP-3

NP-3 encompassed an area 50 by 50 ft (0.06 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required moderate vegetation clearing.

2.4.7.2.3.1 Sixty-two of the 143 total anomalies detected during the investigation were excavated. A total of 27 ORS items, weighing approximately 24 lbs, was encountered during the excavation. The ORS consisted of metal scrap, related to aerial and naval ordnance. Two UXOs were found in the subsurface and no UXO was found on the surface at this site. The two UXO items were 3-inch, projectiles with fired fuzes. Both UXO items were moved to a demolition area near the tank for disposal.

2.4.7.2.4 Site NP-4

NP-4 encompassed an area 50 by 50 ft (0.057 acres) and was heavily vegetated with moderately tall trees, vines, and thick underbrush including the thorny Mesquite acacia. This site required extensive vegetation clearing.

2.4.7.2.4.1 Forty-seven of the 109 total anomalies detected during the investigation were excavated. A total of 10 ORS items, weighing approximately 40 lbs, was encountered during the excavation. The ORS consisted of unidentifiable fragments. One subsurface UXO and two surface UXOs were found at this site. The three UXO items were 5-inch illuminated candles that were taken to the demolition area at NP-3 for disposal.

2.4.7.2.5 Site NP-5

NP-5 encompassed an area 100 by 100 ft (0.23 acres) and was heavily vegetated with moderately tall trees, vines, and thick underbrush including the thorny Mesquite acacia. This site required extensive vegetation clearing.

2.4.7.2.5.1 Eighty of the 209 total anomalies detected during the investigation were excavated. A total of 44 ORS items, weighing approximately 55 lbs, was encountered during the excavation. The ORS consisted of metal scrap from heavy projectiles. No UXOs were found on the surface or in the subsurface at this site.

2.4.7.2.6 Site NP-6

NP-6 encompassed an area 50 by 50 ft (0.06 acres) and was heavily vegetated with moderately tall trees, vines, and thick underbrush including the thorny Mesquite acacia and tall grass. This site required extensive vegetation clearing.

2.4.7.2.6.1 Ninety of the 265 total anomalies detected during the investigation were excavated. A total of 32 ORS items, weighing approximately 108 lbs, was excavated to an average depth of 3 ft. The ORS consisted of metal scrap from heavy projectiles. No UXOs were found on the surface or in the subsurface at this site.

2.4.7.2.7 Site NP-7

NP-7 encompassed an area 50 by 50 ft (0.06 acres) and was vegetated with tall grasses and brush including the thorny Mesquite Acacia. This site required moderate vegetation clearing.

2.4.7.2.7.1 Thirty of the 92 total anomalies detected during the investigation were excavated. A total of 16 ORS items, weighing approximately 95 lbs, was encountered during the excavation. The ORS collected from this grid included a 5-inch projectile body, a bomb lug, an old style bomb nose, a 5-inch high velocity aircraft rocket (HVAR) venturi, and a 2.25-inch rocket. No UXOs were found on the surface or in the subsurface at this site.

2.4.7.2.8 Site NP-8

NP-8 encompassed an area 50 by 50 ft (0.06 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required moderate vegetation clearing.

2.4.7.2.8.1 Twenty-five of the 74 total anomalies detected during the investigation were excavated. A total of 13 ORS items, weighing approximately 10 lbs, was encountered during the excavation. The ORS consisted of unidentifiable metal fragments. No UXOs were found on the surface or in the subsurface at this site.

2.4.7.2.9 Site NP-9

NP-9 encompassed an area 100 by 50 ft (0.115 acres) and was heavily vegetated moderately tall trees, vines, and thick underbrush including the thorny Mesquite Acacia. This site required extensive vegetation clearing.

2.4.7.2.9.1 Sixty-five of the 202 total anomalies detected during the investigation were excavated. A total of 44 ORS items, weighing approximately 45 lbs, was encountered during excavation. The ORS consisted of aerial and naval ordnance fragments. Fragments were scattered over the entire site as a result of high explosive round detonation. No UXOs were found on the surface or in the subsurface at this site.

2.4.7.2.10 Site NP-10

NP-10 encompassed an area 100 by 100 ft (0.23 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required moderate vegetation clearing.

2.4.7.2.10.1 Fifty-four of the 165 total anomalies detected during the investigation were excavated. A total of 37 ORS items, weighing approximately 55 lbs, was encountered during excavation. The ORS consisted of a fire bomb case, MK76 expended practice bombs and assorted frag. No UXOs were found on the surface or in the subsurface at this site.

2.4.7.2.11 Site NP-11

NP-11 encompassed an area 50 by 50 ft (0.06 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required moderate vegetation clearing.

2.4.7.2.11.1 Seventeen of the 54 total anomalies detected during the investigation were excavated. A total of two ORS items, weighing approximately 1 lb and consisting of unidentifiable metal fragments was encountered during excavation. One UXO was found on the surface and no UXO items were found in the subsurface at this site. The UXO item, a sheared, 5-inch HVAR rocket, was taken to a demolition area for disposal.

2.4.7.2.12 Site NP-12

NP-12 encompassed an area 100 by 100 ft (0.23 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required moderate vegetation clearing.

2.4.7.2.12.1 Twenty-nine of the 146 total anomalies detected during the investigation were excavated. A total of 11 ORS items, weighing approximately 85 lbs, was excavated. The ORS consisted of unidentifiable metal fragments. Five UXOs were found in the subsurface and one UXO was found on the surface at this site. The UXO items included:

- One MK 23 practice bomb,
- Two 3-inch projectiles,

- Sheared base fuzes (projectile unknown), and
- One 20mm high explosive (HE) projectile.

2.4.7.2.12.2 All five UXO items were taken to a demolition area for disposal.

2.4.7.2.13 Site NP-13

NP-13 encompassed an area 100 by 50 ft (0.115 acres) and was vegetated with short to tall grasses and brush including the thorny Mesquite acacia. This site required light vegetation clearing.

2.4.7.2.13.1 Twenty of the 53 total anomalies detected during the investigation were excavated. No ORS item was detected. No UXOs were found on the surface or in the subsurface at this site. The many false positives detected were primarily due to magnetic rock.

2.4.7.2.14 Site NP-14

NP-14 encompassed an area 100 by 50 ft (0.115 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required moderate vegetation clearing.

2.4.7.2.14.1 Thirty-one of the 89 total anomalies detected during the investigation were excavated. A total of 15 ORS items, weighing approximately 51 lbs, was encountered during excavation. The ORS consisted of metal fragments. No UXOs were found on the surface or in the subsurface at this grid.

2.4.7.2.15 Site NP-15

NP-15 encompassed an area 100 by 100 ft (0.23 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required moderate vegetation clearing.

2.4.7.2.15.1 Twenty-two of the 79 total anomalies detected during the investigation were excavated. A total of 9 ORS items, weighing approximately 64 lbs, was encountered during excavation. The ORS consisted of unidentifiable metal fragments. Five UXOs were found in the subsurface and no UXO was found on the surface at this site. The UXO items included:

- Three 5-inch illumination candles, and
- Two MK-76 practice bombs w/ MK4 spotting charges and sheared fuzes.

2.4.7.2.15.2 All five UXO items were taken to a demolition area on this grid for disposal.

2.4.7.2.16 Site NP-16

NP-16 encompassed an area 100 by 100 ft (0.23 acres) and was vegetated with tall grasses and brush including the thorny Mesquite Acacia. This site required moderate vegetation clearing.

2.4.7.2.16.1 Twenty-eight of the 140 total anomalies detected during the investigation were excavated. A total of six ORS items, weighing approximately 125 lbs, were encountered during excavation. The ORS was collected but was not transported from this site due to steep access. The ORS included fragments from 5-inch rockets, a 500-lb bomb (MK82), and MK76 practice bombs. Five UXOs were found in the subsurface and no UXO items were found on the surface at this site. The UXO items found include:

- One 3-inch projectile with a sheared fuze,
- One 5-inch projectile with a sheared fuze,
- Two 6-inch projectiles with sheared fuzes, and
- One 81mm mortar.

2.4.7.2.16.2 All five UXO items were taken to a demolition area for disposal.

2.4.7.2.17 Site NP-17

NP-17 encompassed an area 100 by 100 ft (0.23 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required moderate vegetation clearing.

2.4.7.2.17.1 Eighteen of the total 128 anomalies detected during the investigation were excavated. A total of 10 ORS items, weighing approximately 170 lbs, were encountered during excavation. The ORS was collected but was not transported from this site due to steep access. The ORS consisted of unidentifiable metal fragments. Five UXOs were found in the subsurface and two UXOs were found on the surface at this site. The UXO items included:

- Three 5-inch projectiles with sheared fuzes,
- One 3-inch projectile with a sheared fuze,
- One 6-inch projectile with a sheared fuze, and
- One grenade with no fuze, and
- One partial 5-inch projectile.

2.4.7.2.17.2 All seven UXO items were blown on this grid.

2.4.7.2.18 Site NP-18

NP-18 encompassed an area 100 by 100 ft (0.23 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required moderate vegetation clearing.

2.4.7.2.18.1 Twenty-three of the 51 total anomalies detected during the investigation were excavated. A total of 10 ORS items, weighing approximately 125 lbs, were encountered during excavation. The ORS was collected but was not transported from this site due to steep access. The ORS consisted of 6-inch fragments and other assorted unidentifiable metal fragments. Two UXOs were found in the subsurface and no UXO items were found on the surface at this site. The UXO items were two 5-inch projectiles with no fuzes. Both UXO items were transported to a demolition area for disposal.

2.4.7.2.19 Site NP-19

NP-19 encompassed an area 100 by 100 ft (0.23 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required moderate vegetation clearing.

2.4.7.2.19.1 Thirty-six of the 103 total anomalies detected during the investigation were excavated. A total of three ORS items, weighing approximately 131 lbs, was encountered during excavation. The ORS consisted of one 6-inch empty projectile and unidentifiable metal fragments. No UXO was found in the subsurface and one UXO item was found on the surface at this site. The UXO item was a 5-inch illuminated candle that was transported to a demolition area for disposal.

2.4.7.2.20 Site NP-20

NP-20 encompassed an area 100 by 100 ft (0.23 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required moderate vegetation clearing.

2.4.7.2.20.1 Forty-four of the 131 total anomalies detected during the investigation were excavated. A total of 9 ORS items, weighing approximately 30 lbs, was encountered during the excavation. The ORS was collected but was not transported from this site due to steep access. The ORS consisted of metal scrap from 5-inch projectile and other unidentifiable metal fragments. One 5-inch projectile was found on the surface at this site.

2.4.7.2.21 Site NP-21

NP-21 encompassed an area 100 by 100 ft (0.23 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required moderate vegetation clearing.

2.4.7.2.21.1 Twenty-one of the 61 total anomalies detected during the investigation were excavated. A total of 10 ORS items, weighing approximately 10 lbs, was encountered during excavation. The ORS was collected but was not transported from this site. The ORS consisted of unidentifiable metal fragments. Four UXOs were found on the surface and no UXO items were found in the subsurface at this site. The UXO items included:

- Two 6-inch projectiles with sheared fuzes,
- One 81mm mortar with no fuze, and
- One projectile base fuze.

2.4.7.2.21.2 All four UXO items were transported to a demolition area on NP-20 for disposal.

2.4.7.2.22 Site NP-22

NP-22 encompassed an area 100 by 100 ft (0.23 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required moderate vegetation clearing.

2.4.7.2.22.1 Thirty-five of the total 91 anomalies detected during the investigation were excavated. A total of 3 ORS items, weighing approximately 70 lbs, was encountered during excavation. The ORS was collected but was not transported from this site due to steep access. The ORS consisted of 6-inch fragments and partial 6-inch bodies from smoke rounds. Two UXOs were found on the surface and no UXO items were found in the subsurface at this site. The UXO items included two 5-inch illuminated candles with no fuze. Both UXO items were transported to a demolition area at Site NP-20 for disposal.

2.4.7.2.23 Site NP-23

NP-23 encompassed an area 50 by 50 ft (0.057 acres) and was heavily vegetated with moderately tall trees, vines, and thick underbrush including the thorny Mesquite acacia. This site required extensive vegetation clearing.

2.4.7.2.23.1 Eighteen of the 52 total anomalies detected during the investigation were excavated. A total of 10 ORS items, weighing approximately 50 lbs, was encountered during the excavation.

The ORS consisted of 5- and 6-inch projectile fragments. No UXOs were found on the surface or in the subsurface at this site.

2.4.7.2.24 Site NP-24

NP-24 encompassed an area 50 by 50 ft (0.057 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required moderate vegetation clearing.

2.4.7.2.24.1 Twenty-eight of the 86 total anomalies detected during the investigation were excavated. A total of 16 ORS items, weighing approximately 43 lbs and consisting of fragments from projectiles of unknown size and 5-inch base plates, was encountered during excavation. No UXOs were found on the surface or in the subsurface at this site.

2.4.7.2.25 Site NP-25

NP-25 encompassed an area 100 by 50 ft (0.115 acres) and was heavily vegetated with moderately tall trees, vines, and thick underbrush including the thorny Mesquite acacia. This site required extensive vegetation clearing.

2.4.7.2.25.1 Forty-five of the 140 total anomalies detected during the investigation were excavated. A total of 18 ORS items, weighing approximately 52 lbs, was encountered during excavation. The ORS consisted of bomb and projectile fragments. No UXOs were found on the surface or in the subsurface at this site.

2.4.7.2.26 Site NP-26

NP-26 encompassed an area 50 by 50 ft (0.057 acres) and was heavily vegetated with moderately tall trees, vines, and thick underbrush including the thorny Mesquite Acacia. This site required extensive vegetation clearing due to the thick vegetation.

2.4.7.2.26.1 Twenty-seven of the 83 total anomalies detected during the investigation were excavated. A total of 16 ORS items, weighing approximately 15 lbs, was encountered during excavation. The ORS consisted of bomb and HE fragments. No UXOs were found on the surface or in the subsurface at this site.

2.4.7.2.27 Site NP-27

NP-27 encompassed an area 50 by 50 ft (0.06 acres) and was heavily vegetated with moderately tall trees, vines, and thick underbrush including the thorny Mesquite acacia. This site required extensive vegetation clearing.

2.4.7.2.27.1 Twenty-five of the total 70 anomalies detected during the investigation were excavated. A total of 19 ORS items, weighing approximately 55 lbs, was encountered during excavation. ORS consisting of fragments from large caliber projectiles was collected from this grid. No UXOs were found on the surface or in the subsurface at this site.

2.4.7.2.28 Site NP-28

NP-28 encompassed an area 100 by 50 ft (0.115 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required moderate vegetation clearing.

2.4.7.2.28.1 Thirty-two of the 97 total anomalies detected during the investigation were excavated. A total of 12 ORS items, weighing approximately 15 lbs, was encountered during excavation. The ORS consisted of fragments from bombs and large projectiles. No UXOs were found on the surface or in the subsurface at this site.

2.4.7.2.29 Summary of Results—Northwest Peninsula

Figures 2-6 and 2-7 present maps of each grid location and the results of the investigation from Sector A and Sector B, respectively. The pie charts indicate the sampling results for the entire Northwest Peninsula. The predicted percent of surface UXOs (ranging from 0 to 19 percent), subsurface UXOs (ranging from 0 to 28 percent), ORS (ranging from 0 to 76 percent), and false positives (ranging from 17 to 100 percent) for the entire Northwest Peninsula is also shown.

2.4.7.3 Cerro Balcon Mortar Range

The Cerro Balcon Mortar Range is in the east central section of Culebra Island. The firing point was located approximately 0.5 mile north-northeast of the former Lower Camp. The ASR reported possible Stokes mortar fragment observed on this site. The entire range fan, as drawn in the ASR, encompasses an area of approximately 158 acres, including Cerro Balcon. The range fan is drawn past the top of Cerro Balcon, but it is most likely that the impact area was at the base of the hill.

2.4.7.3.0.1 ESE traversed portions of the east side of Cerro Balcon, but found no evidence of ordnance-related items. ESE suggests that although evidence of ordnance-related items were not found on the east side of Cerro Balcon, it is possible that a few errant mortars may have impacted the east side of Cerro Balcon. Mortar fragments from several mortar types were found off the grid including 81mm Stokes mortars and possible 4-deuce mortar fragments. Most of the mortar fragments found at the impact area would not have the distance capability to go over Cerro Balcon, with the exception of the 4-deuce mortars. Maximum range data for typical mortars are included in Appendix F.

2.4.7.3.0.2 ESE, along with an EOD escort, traversed the south and west portion of the range fan near the impact area using a magnetometer. The magnetometer was affected by the magnetic rock in the area. No ordnance-related items were found at the surface in the traversed areas. Based on data from site traverses, ESE concludes the approximate area of impact to be 30 acres. The investigation of this site was concentrated on these 30 acres.

2.4.7.3.0.3 Cerro Balcon is privately owned and is currently used for cattle and goat grazing. The landowners did not have plans for development of the impact areas, however, some of the property near the top of the south end of Cerro Balcon may be subdivided for home sites at a later date.

2.4.7.3.0.4 ESE estimates the impact area to be approximately 20 acres. Approximately 10 acres in the impact area were not accessible to ESE as the landowner would not approve a right of entry.

2.4.7.3.0.5 ESE identified the locations of grids CB-1 through CB-4 to determine the lateral extent of the impact area. Data from the traverse on the west portion of the range fan impact area were used to locate CB-5 and CB-6. These locations were chosen close to the fence line across from the inaccessible property. Since the density of ORS was greater closer to the fence line, the data indicate that the main impact area is most likely on the property that was inaccessible for the investigation. Figure 2-8 presents the location of the mortar range fan, the grid locations, the extent of the suspected impact area, and the inaccessible property.

2.4.7.3.0.6 The vegetation in most of the impact area consists of tall grasses and numerous mesquite acacia bushes. Some cactus and other thorny vegetation was also observed. Tall trees exist on the south end of the investigation area. These trees are possible nesting sites for local hawk and other raptor populations. ESE was asked by USFWS to avoid investigation in the areas of the tall trees. All sites required moderate vegetation clearing.

2.4.7.3.0.7 The magnetic rock is close to the surface on the steep side slopes of Cerro Balcon. The large number of false positives is directly related to the magnetic rock in the area.

2.4.7.3.1 Site CB-1

CB-1 encompassed an area 100 by 100 ft (0.23 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required moderate vegetation clearing.

2.4.7.3.1.1 Fifteen of the 45 total anomalies detected during the investigation at CB-1 were excavated. No ORS items were detected. No UXO was found on the surface or in the subsurface at this site.

2.4.7.3.2 Site CB-2

CB-2 encompassed an area 100 by 100 ft (0.23 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required moderate vegetation clearing.

2.4.7.3.2.1 Thirteen of the 32 total anomalies detected during the investigation at CB-2 were excavated. No ORS items were detected. No UXO was found on the surface or in the subsurface at this site. The false positives were primarily due to magnetic rock.

2.4.7.3.3 Site CB-3

CB-3 encompassed an area 100 by 100 ft (0.23 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required moderate vegetation clearing.

2.4.7.3.3.1 Thirteen of the 36 total anomalies detected during the investigation at CB-3 were excavated. A total of three ORS items, weighing approximately 5 lbs and consisting of fragments, were encountered during excavation. No UXO items were encountered on the surface or in the subsurface at this site. The false positives were primarily due to magnetic rock.

2.4.7.3.4 Site CB-4

CB-4 encompassed an area 100 by 100 ft (0.23 acres) and was vegetated with tall grasses and brush including the thorny Mesquite Acacia. This site required moderate vegetation clearing.

2.4.7.3.4.1 A total of 17 anomalies was detected during the investigation at CB-4. All seventeen anomalies were excavated to an average depth of 3 ft. A total of 9 ORS items, weighing

approximately 22 lbs, was excavated. The ORS items included two partial 81mm mortars with no fuze, one partial inert 75mm projectile, and seven fragment items. No UXO was found on the surface or in the subsurface at this site. The false positives were primarily due to magnetic rock.

2.4.7.3.5 Site CB-5

CB-5 encompassed an area 50 by 50 ft (0.06 acres) and was vegetated with tall grasses and brush including the thorny Mesquite Acacia. This site required moderate vegetation clearing.

2.4.7.3.5.1 A total of 7 anomalies was detected during the investigation at CB-5. All seven anomalies were excavated to an average depth of 3 ft. A total of two ORS items, weighing approximately 5 lbs and consisting of fragments, was excavated. No UXO was encountered on the surface or in the subsurface at this site. The false positives were primarily due to magnetic rock.

2.4.7.3.6 Site CB-6

CB-6 encompassed an area 50 by 50 ft (0.06 acres) and was vegetated with tall grasses and brush including the thorny Mesquite Acacia. This site required moderate vegetation clearing.

2.4.7.3.6.1 A total of 12 anomalies was detected during the investigation at CB-6. All 12 anomalies were excavated to an average depth of 3 ft. A total of five ORS items, weighing approximately 10 lbs and consisting of fragments, was excavated. No UXO was encountered on the surface or in the subsurface at this site. The false positives were primarily due to magnetic rock.

2.4.7.3.7 Summary of Results—Cerro Balcon

Figure 2-9 presents a map of each grid location and an associated pie chart indicating the predicted percent of ordnance-related waste (ranging from 0 to 53 percent), and false positives (ranging from 47 to 100 percent) for each entire grid. No UXOs were found at this site.

2.4.7.4 Isla Culebrita

Isla Culebrita is approximately 1 mile east of Culebra Island, which was formerly used for naval activities. Isla Culebrita comprises approximately 266 acres. Approximately 82 acres on the western end of the island were formerly used as an aircraft strafing range. The strafing range extended out into the ocean where additional target panels were installed on metal posts. Some of these metal posts remain off the north beach.

2.4.7.4.0.1 Three observation posts were established on the island. The main observation post was at the old lighthouse, which was completed on February 25, 1886. Two additional observations posts were located on top of the north and west ridges. The observations posts were used to observe activities at the strafing fire range and at nearby Cayo Botella. The aircraft strafing range was the only targeting facility known on Isla Culebrita.

2.4.7.4.0.2 The base of Marc Point, a steep rugged cliff on the northeast corner of Isla Culebrita was used for a torpedo impact area. Since this was an underwater target and the scope of work for the EE/CA investigation does not include the underwater site investigations, this site was not studied.

2.4.7.4.0.3 During the investigation, an ESE field team traversed the island from the eastern shore to the lighthouse, to Marcs Point observation station, to the beach, and then to the strafing fire range with a magnetometer to identify additional impact areas. It was determined that the only land area used for targeting was in the strafing fire range. Due to the quantity of magnetic rock on this island, the usefulness of the magnetometer was limited.

2.4.7.4.0.4 USFWS protects and administers activities on Isla Culebrita. The north bay of Culebrita is a popular area for boaters, and the beaches attract over 20,800 visitors each year. Much of Isla Culebrita is also surrounded by shallow reefs, causing access by boat on the east and north side to be difficult. Most of the year, the seas are also much rougher on the north and east sides of the island. As a result, most visitors take boats, water taxis, canoes, or kayaks to the south side of the island and hike to the north shore. It is not uncommon for some visitors to investigate the island and enter the former strafing fire range.

2.4.7.4.0.5 Isla Culebrita beaches are nesting areas for protected sea turtle species including the Hawksbill Turtles. The USFWS monitors beach areas to protect the nests. The island is also a nesting area for Red-billed Tropic Birds.

2.4.7.4.0.6 ESE placed six grids on Isla Culebrita. Grid IC-1 was located near a current turtle nesting site and was eliminated from the investigation. Grids IC-2 through IC-6 were chosen near the former strafing fire target area based on historical aerial photographs from the ASR (USACERI, 1995). Figure 2-10 presents Isla Culebrita and the associated grid locations.

2.4.7.4.0.7 Isla Culebrita vegetation consisted of dense, moderately tall brush, scattered areas of tall grass, and thorny Mesquite acacia bushes scattered across the entire island. IC-2 and IC-3 were located in the tall brush area, and IC-4 through IC-6 were located in areas of tall grasses. Paths were cut into thick vegetation to access some of the grid sites.

2.4.7.4.1 Site IC-2

IC-2 encompassed an area 100 by 100 ft (0.23 acres) and was moderately vegetated with medium-sized trees, vines, and underbrush including the thorny Mesquite acacia. This site required some vegetation clearing.

2.4.7.4.1.1 One-hundred-seventy of the 512 anomalies detected during the investigation at IC-2 were excavated. A total of 4 ORS items weighing approximately 1 lb was excavated or collected. The ORS consisted of fuze parts and unidentifiable fragments. No UXO was encountered on the surface or in the subsurface at this site.

2.4.7.4.2 Site IC-3

IC-3 encompassed an area 100 by 100 ft (0.23 acres) and was moderately vegetated with medium-sized trees, vines, and underbrush including the thorny Mesquite acacia. This site required some vegetation clearing.

2.4.7.4.2.1 One-hundred-twenty of the 368 anomalies detected during the investigation at IC-3 were excavated. Neither ORS items nor UXO was encountered on the surface or in the subsurface at this site.

2.4.7.4.3 Site IC-4

IC-4 encompassed an area 100 by 100 ft (0.23 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required some vegetation clearing.

2.4.7.4.3.1 Eighty-five of the 460 anomalies detected during the investigation at IC-4 were excavated. A total of four ORS items consisting of unidentifiable fragments was excavated. No UXO was encountered on the surface. Five UXO items, all fired 20mm high explosive incendiary (HEI) devices, were encountered in the site subsurface. All UXO items were rendered enert by Explosive Demolition on this grid.

2.4.7.4.4 Site IC-5

IC-5 encompassed an area 100 by 100 ft (0.23 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required some vegetation clearing.

2.4.7.4.4.1 Sixty of the 116 anomalies detected during the investigation at IC-5 were excavated. A total of 5 ORS items weighing approximately 0.5 lb was excavated. The ORS consisted of metal fragments from 20mm projectiles and unidentifiable frag. No UXO was encountered on the surface. Five UXOs, all 20mm HEI, were encountered in the subsurface at this site. All UXO items were rendered inert by explosive demolition on this grid.

2.4.7.4.5 Site IC-6

IC-6 encompassed an area 100 by 100 ft (0.23 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required some vegetation clearing.

2.4.7.4.5.1 Forty-nine of the 545 anomalies detected during the investigation at IC-6 were excavated. A total of 13 ORS items was excavated consisting of 3-inch projectile fragments and other unidentifiable fragments. Twenty-three UXOs were encountered on the surface and six UXOs were encountered in the subsurface. All 29 UXO items were fired 20mm HEI rounds. All UXO items were rendered inert by explosive demolition on this grid.

2.4.7.4.6 Summary of Results—Isla Culebrita

Figure 2-11 presents a map of each grid location and an associated pie chart indicating the predicted percent of surface UXOs (ranging from 0 to 47 percent), subsurface UXOs (ranging from 0 to 12 percent), ordnance-related waste (ranging from 0 to 18 percent), and false positives (ranging from 0 to 27 percent) for each grid.

2.4.7.5 Cayo Botella

Cayo Botella is approximately 1 mile northeast of Culebra Island. Cayo Botella comprises approximately 3.5 acres, most of which were formerly used as a practice target range for aerial bombs and rockets. Cayo Botella is surrounded by fairly rocky shores with limited beach areas.

2.4.7.5.0.1 USFWS protects and administers activities on Cayo Botella. Due to the rough shoreline, few people visit this cay. Most visitors to Cayo Botella are USFWS personnel and a limited number of snorkelers and scuba divers. Access to Cayo Botella is difficult as shallow reefs surround most of the cay. The few beach areas are difficult to access. Historical photographs from the ASR (USACERI,1995) reveal a bullseye target painted on the surface of Cayo Botella with lime. The EE/CA investigation was concentrated in the area of the target. Two grids (BO-1 and BO-2) (Figure 2-10) were located on Cayo Botella.

2.4.7.5.0.2 Cayo Botella has limited biological and ecological importance. The shorelines are generally too rugged for turtle nesting. Currently, there are no known significant seabird nesting populations on this cay. During the grid location, a candidate endangered plant species, *Justicia culibritae*, was identified by the ESE botanist. Grid number BO-2 was relocated to avoid damaging this plant.

2.4.7.5.0.3 The vegetation on Cayo Botella consists of short to moderate grasses and some Mesquite acacia and cactus. This cayo required minimal vegetation clearing prior to the geophysical survey.

2.4.7.5.1 Site BO-1

BO-1 encompassed an area 100 by 100 ft (0.23 acres) and was vegetated with short to moderate tall grasses and brush including the thorny Mesquite acacia. This site required minimal vegetation clearing.

2.4.7.5.1.1 Ninety-three of the 532 anomalies detected during the investigation at BO-1 were excavated. A total of 12 ORS items were excavated. Approximately 12 lbs of ORS consisting of unidentifiable fragments, were collected from this grid and taken to the storage area on Culebra Island.

2.4.7.5.1.2 Two UXOs were encountered on the surface and five UXOs were encountered in the subsurface at this site. The UXO items included six MK76 practice bombs with cartridges and one 6-inch naval gun projectile. All UXO items were blown on this grid.

2.4.7.5.1.3 Approximately 1,200 lbs of inert fragments from MK76 practice bombs were left onsite due to the problem of shipping the great weight of fragments to the holding area.

2.4.7.5.2 Site BO-2

BO-2 encompassed an area 100 by 100 ft (0.23 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required minimal vegetation clearing.

2.4.7.5.2.1 Sixty of the 788 anomalies detected during the investigation at BO-2 were excavated. A total of 11 ORS items was excavated. Approximately 10 lbs of fragments were collected from this grid and transported to the storage area on Culebra Island. Seven UXOs were encountered on the surface and six UXOs were encountered in the subsurface at this site. The UXO items included twelve MK76s and one MK4. All UXO items were blown on this grid.

2.4.7.5.2.2 Approximately 800 lbs of inert fragments from MK76 practice bombs were left onsite due to the problem of shipping the great weight of the fragments to the holding area.

2.4.7.5.3 Summary of Results—Cayo Botella

Figure 2-11 presents a map of each grid location and an associated pie chart indicating the predicted percent of surface UXOs (ranging from 2 to 12 percent), subsurface UXOs (ranging from 5 to 10 percent), ordnance related waste (ranging from 13 to 18 percent), and false positives (ranging from 72 to 82 percent) for each grid.

2.4.7.6 Cayo del Agua

Cayo del Agua is approximately 1.5 miles southwest of Culebra Island. The cay consists of two joined sections totaling 2 acres. This cay is surrounded by rocky shores with a beach between the eastern and western sections. Access to this cay is not difficult despite being surrounding by reefs.

2.4.7.6.0.1 The target area contains numerous tires and a concrete box, most likely used for targets. Surface OE items were also observed on this cay prior to the investigation.

2.4.7.6.0.2 Cayo del Agua is protected by USFWS. This cay is a known nesting area for Bridled Terns, Sooty Terns, Zenaida Doves, Red-Billed Tropic Birds, and Audubon's Shearwaters. During the investigation, USFW personnel verified that the grids placed on this cayo were not in areas of active nesting.

2.4.7.6.0.3 Two grids were placed on Cayo del Agua. Grid AQ-1 was placed in the main impact area and Grid AQ-2 was placed on the western portion of the cay. Grid AQ-2 was reduced to 40 by 40 ft to conform to the top of the smaller portion of the cay due to steep slopes. Figure 2-12 presents the grid locations on Cayo del Agua.

2.4.7.6.0.4 Cayo del Agua was covered with short to medium grasses only on the higher elevations. The site locations required minimal vegetation clearing.

2.4.7.6.1 Site AQ-1

AQ-1 encompassed an area 100 by 100 ft (0.23 acres) and was vegetated with tall grasses and brush, including the thorny Mesquite acacia. This site required minimal vegetation clearing.

2.4.7.6.1.1 One-hundred of the 570 anomalies detected during the investigation at AQ-1 were excavated. A total of 26 ORS items, weighing approximately 81 lbs was excavated. The ORS consisted of MK76 practice round fragments and other unidentifiable fragments. Eleven UXOs were encountered on the surface and five UXOs were encountered in the subsurface. The UXO items included 16 MK76 practice bombs. One 76mm projectile was found just beyond the grid. This item was unfuzed and blown in place, along with the other UXOs.

2.4.7.6.2 Site AQ-2

AQ-2 encompassed an area 40 by 40 ft (0.037 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required minimal vegetation clearing.

2.4.7.6.2.1 Ten of the 23 anomalies detected during the investigation at AQ-2 were excavated. A total of 2 ORS items, weighing less than 1 lb, was excavated. The ORS consisted of unidentifiable fragments. No UXOs were encountered either on the surface or in the subsurface at this site. The false positives were primarily due to magnetic rock.

2.4.7.6.3 Summary of Results—Cayo del Agua

Figure 2-13 presents a map of each grid location and an associated pie chart indicating the predicted percent of surface UXOs (ranging from 0 to 11 percent), subsurface UXOs (ranging from 0 to 5 percent), ordnance-related waste (ranging from 20 to 26 percent), and false positives (ranging from 69 to 80 percent) for each grid.

2.4.7.7 Cayo Lobo

Cayo Lobo is approximately 2 miles southwest of Culebra Island. The cay comprises 35 acres surrounded by rocky shores and a limited beach. Access is fairly good to this cay although surrounded by reefs of varying depths.

2.4.7.7.0.1 Cayo Lobo was used for aerial bombing and aerial rockets. Two observation posts were constructed on Cayo Lobo to observe the activities on Cayo Lobo and in the Cayo Del Agua (Los Hermanos) area. Large ordnance was not encountered on Cayo Lobo during the site visit by the archive search team (SEE USACERI, 1995).

2.4.7.7.0.2 Cayo Lobo is protected by USFWS. During the visit, USFWS personnel verified that the areas chosen for the grids would not affect nesting habits of local birds. According to USFWS, Cayo Lobo is overrun by rats that consume the eggs of nesting birds. As a result, there

are no significant bird nesting populations on this cay. Protected plant species were not observed in the survey grid areas during the investigation. Figure 2-14 presents a map showing the location of each survey grid.

2.4.7.7.1 Site LO-1

LO-1 encompassed an area 100 by 100 ft (0.23 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required moderate vegetation clearing.

2.4.7.7.1.1 Twelve of the 25 anomalies detected during the investigation at LO-1 were excavated. No ORS items were detected. No UXO was encountered on the surface or in the subsurface.

2.4.7.7.2 Site LO-2

LO-2 encompassed an area 100 by 100 ft (0.23 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required moderate vegetation clearing.

2.4.7.7.2.1 Fifteen of the 45 anomalies detected during the investigation at LO-2 were excavated. No ORS items were detected. No UXO was encountered on the surface or in the subsurface.

2.4.7.7.3 Site LO-3

LO-3 encompassed an area 100 by 100 ft (0.23 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required moderate vegetation clearing.

2.4.7.7.3.1 Seventeen of the 51 anomalies detected during the investigation at LO-3 were excavated. A total of four ORS items, weighing approximately 24 lbs and consisting of unidentifiable fragments was excavated. No UXO was encountered on the surface or in the subsurface.

2.4.7.7.4 Site LO-4

LO-4 encompassed an area 100 by 100 ft (0.23 acres) and was vegetated with tall grasses and brush including the thorny Mesquite acacia. This site required moderate vegetation clearing.

2.4.7.7.4.1 Forty of the 120 anomalies detected during the investigation at LO-4 were excavated. A total of 13 ORS items weighing 50 lbs were excavated. The ORS consisted of NMK76 and

other unidentifiable fragments. No UXO was encountered on the surface or in the subsurface at this site.

2.4.7.7.5 Summary of Results—Cayo Lobo

Figure 2-15 presents a map of each grid location and an associated pie chart indicating the predicted percent of ordnance-related waste (ranging from 0 to 33 percent), and false positives (ranging from 68 to 100 percent) for each grid. No UXO was encountered on this cay during this investigation.

2.4.7.8 Cayo Tiburon

Cayo Tiburon is a small rugged cay approximately 2.5 miles northeast of Culebra Island. This cay comprises approximately 1 acre, is steeply sloped, and has no beach. This cay is inaccessible during most of the year. During the investigation, the high seas and swells made access impossible. Therefore, the information for this EE/CA will be based on site observations recorded in the ASR (USACERI, 1995).

2.4.7.8.0.1 Cayo Tiburon was used as a target for aerial bombing and rockets. Both live and inert ordnance was fired on this cay. The presence of OE on Cayo Tiburon has been confirmed by USFWS.

2.4.7.8.0.2 This cay is protected by the USFWS. Cayo Tiburon is used extensively as a roost by various species of nesting seabirds. Any activity on this cay requires close coordination with USFWS.

2.4.7.9 Cayos Geniqui

Cayos Geniqui consists of two cays approximately 2.5 miles northeast of Culebra Island. These cayos are approximately 4 acres in size, are steeply sloped, and have no beach. These cayos are inaccessible during most of the year. During the investigation, the high seas and swells made access impossible. Therefore, the information for this EE/CA will be based on site observations recorded in the ASR (USACERI, 1995).

2.4.7.9.0.1 Cayos Geniqui were used as targets for aerial bombing and rockets as well as torpedos. Both live and inert ordnance was fired. The presence of OE on Cayo Tiburon has been confirmed by USFWS. The ASR team visited the cay and observed ordnance components, including a MK14/15 snakeye fin used on 80 series bombs. A letter in Appendix F (letter number

F-10) of the ASR identified torpedo OE and three 500 lb bombs in the water near Cayos Geniqui. It is therefore possible that 500lb bombs may be encountered on the land at this site.

2.4.7.9.0.2 These cayos are protected by USFWS. Cayos Geniqui are lightly vegetated and are used throughout the year as roosts by brown and red footed boobies. Any activity requires close coordination with USFWS.

2.4.7.10 Alcarraza

Alcarraza (or Fungi Bowl) is approximately 2 miles northwest of the end of the Northwest Peninsula on Culebra Island. Alcarraza is comprises approximately 7 acres and is steeply sloped. There are no beaches, but there is a small rocky area that would be suitable for landing swimmers under the best sea conditions. The steepness of the slopes on Alcarraza make work extremely hazardous. This cayo is inaccessible during most of the year. During the EE/CA investigation, the high seas and swells made access impossible. Therefore, the information for this EE/CA will be based on site observations recorded in the ASR (USACERI, 1995).

2.4.7.10.0.1 Alcarraza was used as a target for aerial bombing and rockets. High and low level radar bombing, special weapons exercises (loft and over-the-shoulder bombing), B-52 high level radar drops, and MK83 1,000 lb bombs were used. Both live and inert ordnance was fired. The presence of OE on Alcarraza has been confirmed by USFWS.

2.4.7.10.0.2 This cayo is protected by USFWS. Alcarraza may be lightly vegetated at the top and is used as a roost by masked boobies and Sooty Terns, Bridled Terns, Noddy Terns, and Zenaida doves. Any remedial activity requires close coordination with USFWS.

2.4.7.10.0.3 During the investigation, Gene Thomas, a local master diver, told ESE that he had observed torpedos in the water near Alcarraza. There are no other records of torpedos being fired at this cayo.

2.4.7.11 Los Gemelos

Los Gemelos consists of two separate cays approximately 100 ft apart and approximately 1.5 miles northwest of the tip of the Northwest Peninsula on Culebra Island. The smaller of the cayos is a tiny group of rocks, barely above water level. Both cayos are difficult to access, and equally difficult to traverse. Los Gemelos are free of significant vegetation and comprise approximately 2 acres.

2.4.7.11.1 The loose rocks on Los Gemelos make work extremely hazardous. During the EE/CA investigation, the high seas and swells made access impossible. Therefore, the information for this EE/CA will be based on site observations recorded in the ASR (USACERI, 1995).

2.4.7.11.2 Los Gemelos were used as targets for aerial bombing and rockets, high and low level radar bombing, special weapons exercises (loft and over-the-shoulder bombing), and air-to-ground missiles including the Bullpup with inert warheads. Both live and inert ordnance were fired at this cay. The presence of OE on Los Gemelos has been confirmed by USFWS.

2.4.7.11.3 This cay is protected by USFWS. Los Gemelos may be lightly vegetated at the top and is used as a roost by several seabird species. Any remedial activity requires close coordination with the USFWS.

2.4.7.12 Other Investigated Sites

Two other sites, Cayo de Luis Pena and Cayo Noroeste, were investigated for OE during the EE/CA site investigation. These investigations were conducted at the request of USFWS personnel. The results of the investigations are outlined in the following subsections.

2.4.7.12.1 Cayo de Luis Pena

Cayo de Luis Pena is approximately .25 mile southwest of Culebra Island. This cay was used as an observation post during bombing runs at Cayo Lobo, Cayo del Agua, and the Northwest Peninsula of Culebra Island. The ASR did not identify this area as a former target range for any type of ordnance.

2.4.7.12.1.1 USFWS personnel informed ESE personnel that ordnance was picked up in the water offshore of two beaches on the northwest side of this Cay. ESE investigated this area with an EOD technical escort. Using a magnetometer, the beach and the heavily vegetated surrounding land area was investigated for the presence of ordnance. As a result of the investigation, it was determined that there was no large scale ordnance use in this area of Cayo de Luis Pena.

2.4.7.12.1.2 Several people reported to ESE personnel that they had seen bombing occur at the saddle area between the two peaks on the south side of the cayo. This area was investigated by ESE personnel with an EOD technical escort. Although one possible piece of fragment was collected, it was determined that the entire saddle was not used as an extensive target area.

2.4.7.12.2 Cayo Noroeste

Cayo Noroeste is located immediately off the tip of the Northwest Peninsula of Culebra Island. This area may have been targeted as part of the Northwest Peninsula complex. The ASR did not identify this Cayo as being of particular concern.

2.4.7.12.2.1 The USFWS said they had seen at least one ordnance item on Cayo Noroeste. This area was investigated by ESE personnel with an EOD technical escort. One possible OE item was seen below the water line in a tidal basin. ESE did not investigate any underwater ordnance items during this investigation. The unknown underwater ordnance item was most likely fired at this cayo erroneously. No other ordnance item was found at this cay. As the Cayo was small and treacherous, (a raft was inundated by waves while trying to access the site) and there was no other sign of OE on the cay, it was determined that this cay did not warrant additional investigation.

2.4.7.13 Production Rates

Production rates were estimated based on man hours spent on the specified tasks during the field effort. Figure 2-16 presents a pie chart showing the resulting production rates. The calculated percentages do not include project management hours.

2.4.7.13.1 Approximately 37 percent of the manhours were expended clearing vegetation. The clearing operations included clearing paths to sites in the interior of the study areas and clearing vegetation within the grids. The vegetation was cleared just enough for effective magnetometer use. Equipment maintenance is also included in the manhours for clearing.

2.4.7.13.2 Approximately 27 percent of the manhours was used for mapping and flagging operations. The time expenditure was greater than expected due to the amount of vegetation clearing required. It required more time to properly mag and flag sites through the remaining vegetation.

2.4.7.13.3 Approximately 29 percent of the manhours was spent conducting the intrusive activities, including locating the correct anomaly to be excavated using the Gridstats software created by QuantiTech. The manhours for the intrusive work also include the time expended collecting ORS and transporting the ORS to the storage area.

2.4.7.13.4 Approximately 7 percent of the manhours was required for demolition operations, including the filling of sand bags for tamping, transporting explosives, setting up charges, and the cleanup required after detonation.

2.4.8 Site Safety

The safety procedures provided in the site-specific work plan (WP) (ESE, 1995) were followed during the EE/CA field investigation conducted at Culebra Island. The procedures include the following:

- Non-UXO qualified personnel were not permitted to perform UXO operations (e.g., access, identification, transportation, storage, or disposal of UXO).
- UXO operations were not conducted during the hours from sunset to sunrise or during electrical storms or other severe weather conditions.
- A minimum of two UXO-qualified persons, trained as per 29 CFR 1910.120e(I), were present during all UXO operations.
- During all OE/UXO confirmation operations, only the minimum number of UXO-qualified personnel were allowed inside the exclusion zone. All others were evacuated to a pre-designated assembly point.
- All access, identification, and disposal/venting procedures of OEW/UXO were accomplished by UXO-qualified personnel.

2.4.8.0.1 Any suspected or known OE/UXO encountered during geophysical survey operations was clearly marked and its position noted on the appropriate map. A UXO supervisor evaluated all encountered UXO and determined if the work planned for the area could safely continue or what actions must occur prior to commencing work. Such recommendations were made immediately to the senior UXO supervisor, who in turn contacted the USAESCH safety representative, if necessary.

2.4.8.1 Site Control

On discovery of suspected OE/UXO, the immediate area was clearly marked and secured as an exclusion zone and warnings were posted to ensure no unauthorized personnel entered the exclusion zone.

2.4.8.1.1 Due to the number of sampling sites and the large size of Culebra Island, overall site control through one point was not feasible.

2.4.8.1.2 The protection of the public during the EE/CA investigation was a primary concern. ESE and regulatory agencies coordinated closely to ensure visitors were not in the vicinity during intrusive or demolition activities. PRDNR and USFWS personnel assisted with public control and disseminating information to the public. PRDNR closed the beach to the public during operations at Flamenco Beach. During the operations at the northern end of the Northwest Peninsula, PRDNR personnel assisted with controlling visitors to the work area. USFWS personnel were offshore and out of the exclusion zone during most demolition operations in the cays, and they assisted in keeping visitors out of the exclusion zone.

2.4.8.2 General Site UXO and Safety Procedures

General site safety procedures listed in this section were followed throughout this project, in addition to USACE safety concepts and considerations for UXO as described in the following appendices to the site-specific WP (ESE, 1995):

- Explosives Safety Precautions (Appendix C),
- SSHP (Appendix D), and
- Demolition/Disposal Range SOP (Appendix E).

2.4.8.2.1 The UXO supervisors were responsible for the handling of all UXOs. The UXO supervisor, site safety officer, and senior UXO supervisor reviewed the condition of each UXO and determined if the round could be moved to a demolition area for disposal. Only unfuzed items were approved for transportation.

2.4.8.2.2 The site safety officer prepared a daily tailgate safety briefing. The safety brief included discussion of each hazard suspected at the sites, the previous day's problems, and other pertinent information. A special safety briefing was conducted weekly to discuss one safety topics in detail.

2.4.8.2.3 The site safety officer conducted daily inspections and verified the implementation of safety procedures at each site, safe equipment operation, safety supplies, and other safety-related procedures.

2.4.8.2.4 One safety drill was conducted on February 13, 1996 by ESE with the assistance of the site safety officer. During the drill, the EODT team acted in response to a staged onsite injury of one of the team members. The team responded well to a complex injury situation.

2.4.8.3 Accident Reporting

During the field effort, three accidents were reported to the ESE site manager. The first accident (personal injury) occurred on December 7, 1995 when one of the surveyor helpers tripped on a rock while walking along a path on Cerro Balcon. The second accident (non-injury) occurred on January 8, 1996, when a tree branch caught in a window of a vehicle while backing up and damaged the window. The third accident (non-injury) occurred on February 16, 1996, when the back door of a field vehicle was damaged while it was parked in a parking space. The accident reports are included in Appendix J.

2.4.8.3.1 Immediately following the accidents, ESE was notified of the accident, the site manager notified the ESE project manager, who then notified the USAESCH project manager. Each accident was discussed during the following safety briefing.

2.4.9 Quality Control

The quality control (QC) procedures performed during the EE/CA activities at Culebra Island were in accordance with the site-specific WP (ESE, 1995). The site-specific WP was designed to manage, control, and document performance of work efforts in accordance with the USAESCH SOW.

2.4.9.0.1 According to the ESE QA program, effective daily field QC management was delegated to the ESE site manager. The site manager interacted daily with the project team to ensure that all QC procedures presented in the WP were followed during project performance. The ESE site manager generated daily field activity reports for the ESE project manager. These reports included a description of quality assurance (QA)/QC activities and was the basis of monthly project reports to USAESCH.

2.4.9.0.2 System audits were conducted to assess and document project staff performance. System audits were inspections of training status, records, QC data, calibrations, and conformance to approved procedures as specified in the WP. A systems audit was completed by the ESE project manager during his site visit during the week of January 29 through February 1, 1996. There were no major problems identified by the ESE project manager during the site audit.

2.4.9.0.3 The subcontractor, EODT, Inc. (EODT) was responsible for record keeping and the QC of ordnance, explosives, and ORS. Accountability logs were maintained under the supervision of the EODT site supervisor/manager. Safety records were maintained by EODT's site safety manager. The ESE site manager audited the records several times during the field effort.

2.4.9.1 Equipment Calibration

Equipment calibration QC was supervised by the UXO supervisor (team leader) and recorded in the daily log book. Calibration was completed on all field equipment by using the manufacturer's calibration procedures or use-specific equipment check program.

2.4.9.2 Field Investigation Documentation

Field investigation documentation consisted of the following elements:

- Daily training records,
- Photographic records,
- Working maps,
- Records of UXO items,
- Daily field records,
- Site safety records, and
- Cost tracking records.

2.4.9.2.1 All gridstat data were compiled daily and collected in a three-ring binder.

2.5 Evaluation of OE Contamination

The risk presented by UXO depends on the number, type, and depth of the ordnance and the likelihood that the public will come in contact with the UXO. This risk can be minimized by the selection of the most cost-effective removal response alternative and by implementing the alternative in a timely manner.

2.5.0.1 The risk presented by ordnance is determined in part by the type and size of the item. The risk is also determined by the density of unexploded ordnance in an area. Practice bombs that are equipped with a small spotting charge could be harmful to a person finding the item if the charge is intact. Unexpended incendiary devices such as white phosphorous can be extremely hazardous to the person finding the device but would not affect others some distance away. Projectiles containing high explosives, however, could be hazardous not only to the finder but also to persons thousands of feet away. Finally, areas that have a high concentration of ordnance-related items are also likely to contain a higher number of items that could endanger the public.

2.5.0.2 To evaluate the degree of risk presented by the ordnance areas identified in the Culebra Island area, a careful judgement must be made of the amount, location, and type of UXO in each area. The result of this determination will then be used to evaluate the cost of the various removal

response alternatives that are appropriate for each area of the project site. This judgement must be based on not only the field sampling but also on the available historical information and collective experience gained from investigation of sites where similar activity has occurred. Statistical analysis of collected data is useful as guidance when judging ordnance density, but the data required for reliable analysis is rarely obtainable. Similarly, the identity of the ordnance items that are found during sampling may help to characterize the type of ordnance within an area but also rarely is complete enough to accurately identify the true nature of the contamination.

2.5.1 Estimation of Ordnance Density

As the first step in the evaluation of UXO contamination at the Culebra Naval Facility, a numerical analysis of the sampling data was performed. Table 2-4 presents the results of this analysis. The table is divided into sections corresponding to the sampling areas investigated during the field sampling effort. Totals and averages were calculated to assist in the evaluation of each area. In most cases, the sampling density is too small to allow for evaluation based solely on numerical averaging or other similar calculations. The estimate of the total UXO in each grid was calculated by dividing the subsurface UXO recovered by the percent of the total anomalies sampled and adding the surface UXO recovered during sampling to the total UXO estimate for each grid. The surface UXO was included in the calculation because the risk presented by surface UXO is at least as great as subsurface UXO. The inclusion of the surface UXO data, in most cases, accounts for the difference in the UXO estimate calculated by GridStats which is also included in the table. The UXO density was calculated by dividing the calculated total UXO by the sampling grid size. The UXO percent of anomalies was obtained by dividing the total UXO (surface and subsurface) by the total number of anomalies identified in each grid. Averages were calculated by dividing the totals for each area by the number of grids in that area.

2.5.2 OE*Cert* Analysis

QuantiTech, Inc., of Huntsville, Alabama, performed an independent risk analysis using their Ordnance and Explosives Cost Effectiveness Tool (OE*Cert*). A copy of this report is included in Appendix K. This program estimates the risk to the public and the environment from the presence of OE. The analysis was based on general site characterization and field sampling data supplied by ESE and USAESCH. The "Sectors" used in the OE*Cert* analysis generally correspond to the EE/CA sampling areas. OE*Cert* estimated a high and low estimate of the ordnance density and the surface percent expected for each of the program sectors. Table 2-5 presents the result of this determination.

2.5.2.1 The OE*Cert* estimated range of 1.8 to 3.9 UXO/acre for all three of the Flamenco Beach sectors is less than half of the 7.5 UXO/acre numerical average derived from the EE/CA sampling, although it is well within the same order of magnitude. The estimate range of 3.3 to 13 for both sectors in the Northwest Peninsula is similarly lower than the 33 UXO/acre EE/CA sampling numerical average, but again it is within the same order of magnitude. The estimated range for the remainder of the sectors includes the EE/CA sampling numerical average.

2.5.2.2 OE*Cert* provides its assessment of risk in terms of a predicted number of yearly exposures. Table 2-6 presents a summary of the results of this analysis. According to the OE*Cert* analysis, the number of exposures progressively decrease as more substantive removal response alternatives are applied to each sector. Generally, when a more substantive alternative fails to substantially reduce potential exposures, then the next lowest alternative would be the choice that is most effective. The exposures for the No Action Alternative provide a baseline for the comparison of progressively more substantive alternatives. With the exception of Flamenco Ridge, OE*Cert* indicated that performing more than surface clearance produced no appreciable risk reduction. For Isla Culebrita, surface clearance produced the most significant reduction but removal to a depth of 1 ft produced some additional reduction.

2.5.3 Overall Evaluation of OE Contamination

2.5.3.1 Flamenco Beach Contamination

The Flamenco Beach area was used primarily as a target area for naval gunfire. The presence of one practice bomb indicates that the area was used to a small degree for bombing practice. Most of the gunfire was probably fired from the water to the east of the peninsula directed at targets located on the eastern portion of the peninsula. The impacts would be easily visible from the observation post located on Pointa Flamenco. Since relatively flat trajectory projectiles (rather than mortars) were generally fired at the targets, it is unlikely that any significant rounds impacted the western slope of the ridge area.

2.5.3.1.1 The use of the western slope as an impact range for gunfire and as a bombing range is very unlikely. There is no evidence that targets were placed on the steep slopes of the western side of the peninsula. Also, the steep slopes would have made the placement and servicing of such targets difficult. Gunfire from ships in the water to the west of the peninsula is unlikely because the waters off the western slope are shallow and relatively restricted by the presence of reefs and small cays. For these reasons, few UXO and ORS would be expected in this area.

2.5.3.1.2 The sampling conducted during the EE/CA field investigation concentrated in the campground area and at the base of the western slope of the ridge area. During this sampling, no UXO was found in the beach and campground area. However, one grid, FB-6, located in the western ridge area, contained UXO. Based on the UXO found at grid FB-6, the ordnance density estimated from the sampling is 7.5 UXO/acre. A significant amount of ORS, mostly fragments of exploded ordnance was found at many of the sampling grids. The highest percentage of ORS was recovered from grids in the beach and campground area.

2.5.3.1.3 During the TCRA, a 3.7 acre portion of the campground area was sampled and 11 UXO were recovered. These UXOs included one practice bomb; two illumination candles; four 40mm projectiles; two 5-inch fuze components; and one live, fuzed, 3-inch HE round. The ordnance density estimated from the TCRA sampling was three UXO/acre.

2.5.3.1.4 Since these areas have had a long history of public access, and since the depth of the soils in the area is shallow, a significant number of UXO have probably been removed from the area. It is therefore likely that ordnance density estimates made based on the EE/CA and TCRA sampling would tend to underestimate the true density of the western part of the Flamenco Beach area.

2.5.3.1.5 Ordnance items fired into the hillside are more likely to remain than in the more heavily traveled areas. However, significantly less ORS was found on the eastern slope of the ridge area than in the campground and beach. This lower density of ORS would indicate that the density of UXO is likely to be less than the density of UXO in the beach and campground.

2.5.3.1.6 Because of the high public use of the beach and campground area and the resulting removal of visible UXO by the public, surface UXO should represent a small fraction of the total UXO remaining in those areas. In the ridge area, where access has been limited, surface UXO should represent a much higher fraction. Based on the UXO recovered in the remainder of the peninsula, the surface fraction for the ridge area is estimated at approximately 40 percent of the total UXO in this area. Allowing for the lower surface UXO in the beach and campground area, the overall fraction of surface UXO in the Flamenco Beach sampling area is therefore estimated at 32 percent.

2.5.3.1.7 For planning and cost estimation purposes, the UXO density for the beach and campground area is estimated to be 5 UXO/acre in the beach, campground, and eastern ridge area. These areas encompass approximately 75 percent of the Flamenco Beach sampling area. The density of ordnance on the western slope of the ridge area is estimated to be 0.5 UXO/acre. The overall density for the Flamenco Beach sampling area is estimated at approximately 4 UXO/acre.

2.5.3.2 Northwest Peninsula Contamination

The historical activity at the Northern Peninsula sampling area was similar to that of the Flamenco Beach area. Most of the gunfire is believed to have been fired from the water to the east of the peninsula and directed at targets located on the eastern slope of the peninsula. These impacts would be easily visible from the observation post located on Pointa Flamenco. Some gunfire was also fired from vessels in the water north and west of the peninsula at targets located on the northern end and western slope of the peninsula. Historical information indicates that the majority of the bombing practice took place in the central part of the sampling area, at or near the top of the ridge. In fact, one historical aerial photograph shows a bulls eye target placed in this area.

2.5.3.2.1 The sampling was conducted throughout the peninsula during the EE/CA field investigation. During the sampling, UXO was found at three of the grids along the target cable, at two of the grids along the central ridge, and at all seven of the grids located on the northeast slope of the peninsula. Most of the UXO were projectiles, illumination candles, and practice bombs. In addition, an 81mm mortar was found.

2.5.3.2.2 Significant amount of ORS, mostly fragments of exploded ordnance was found throughout the peninsula. The highest number of ORS was found at the grids in the central part of the sampling area, particularly in the area where bombing range activity was reported. The greatest weight of ORS, however, is concentrated at the grids on the northeast slope where most of the activity was from naval gunfire.

2.5.3.2.3 During the area's history, access by the public has been limited, so it is likely that few ordnance items have been removed. For planning and cost estimation purposes, the UXO density for the eastern slope of the sampling area is estimated to be 20 UXO/acre. Since the UXO is probably not different throughout the remainder of the peninsula, this same density number can be applied to the entire Northwest Peninsula sampling area. Based on the sampling, approximately 40 percent of the UXO are expected to be found on the surface (6 inches or less below ground surface).

2.5.3.3 Cerro Balcon Contamination

The Cerro Balcon area was used as a mortar practice range. In such ranges, mortars are frequently fired that have inert fill with a small spotting charge. In some instances, however, live mortar round are fired. In the Cerro Balcon area, no explosive ordnance was recovered during the field sampling. Some fragments and two inert 81 and one 76mm mortars were discovered during

the sampling. Historical accounts of finding explosive ordnance items exist. On at least one occasion, injuries resulted when an item was inadvertently detonated. For this reason, it must be assumed that live unexploded ordnance remains in the area, including items filled with high explosives. Ordnance would most likely be found in the primary target area, but could be found anywhere within the range.

2.5.3.3.1 The contaminated portion of the mortar range at Cerro Balcon is estimated to comprise 30 acres. Some contamination should be expected anywhere within this area. The main impact area is estimated to be 20 acres. Most UXO contamination would be expected within this area. The location of the main impact area is unknown but is probably located on the western slope of Cerro Balcon as indicated on Figure 2-8. Access to approximately half of the suspected main impact area could not be obtained during the field sampling effort. For this reason, the sampling of the Cerro Balcon area was insufficient to permit detailed numerical analysis of UXO contamination of the entire impact area. For planning purposes, it is assumed that the sampling area contains approximately 5 UXO/acre in the 20 acres of the main impact area, and 1 UXO/acre in the remainder of the 30 contaminated acres of the range. The overall density of the range is estimated to be 4 UXO/acre. Ten percent of the UXO is expected to be on the surface.

2.5.3.4 Isla Culebrita Contamination

Strafing activity on Isla Culebrita was confined to an 82 acre strafing range located on the western end of the island. During the field investigation, a magnetometer and visual search was conduced in an attempt to locate any unreported ranges on the island. No evidence was uncovered indicating that other target areas existed. It can therefore be assumed that the island's contamination is confined to the 82 acre range.

2.5.3.4.1 Sampling of the strafing range recovered only 20mm projectiles. Many of these projectiles contained high explosive incendiary fill. All were recovered from a depth of less than 6 inches. The UXO density determined from the sampling ranged from 0 to 291 UXO/acre. The average UXO density was 75 UXO/acre. For planning purposes, it is estimated that the overall UXO density of the sampling unit is assumed to be 80 UXO/acre. Sixty percent of the UXO are expected to be on the surface (6 inches or less below the ground surface).

2.5.3.5 Contamination of Other Surrounding Cays

All other surrounding cays were used as target areas for bombing and rocket fire. Grids sampled during the EE/CA field investigation had UXO densities ranging from 0 (for all four of the Cayo Lobo sites) to 373 UXO/acre on Cayo Botello. The numerical average for all of the grids sampled

at the surrounding cays is 74 UXO/acre. For planning purposes, the ordnance density for the unit is assumed to be 80 UXO/acre. At least 50 percent of the UXO is expected to be on the surface (6 inches or less below ground surface).

3.0 Development of Ordnance Operable Units

The SOW for Delivery Order 0026 defined the investigation areas for the former Culebra Island Naval Facility as the following:

- Flamenco (Northwest) Peninsula,
- Culebrita Island (Isla Culebrita)
- Cayo de Agua,
- Cayo Lobo,
- Cayo Alcarraza,
- Los Gemelos,
- Cayo Tiburon,
- Cayos Geniqui, and
- Cayo Botella.

3.0.1 In addition to these areas, an area of Culebra Island known as Cerro Balcon was added to the investigation.

3.0.2 The definition of these units was based primarily on geography and the major prior military use of the areas. To facilitate the EE/CA analysis, however, the sites must be subdivided into ordnance operable units (OOUs). In most cases, the OOUs are the same as the investigation areas. In some cases, individual investigation units have been combined.

3.1 Selection Criteria

OOUs are used to divide a large site into distinct units for analysis. The purpose of this division may be to facilitate either the investigation or the evaluation of removal response alternatives. The units may be defined by common site characteristics, the nature and extent of contamination, similar past land use, current ownership, or current and potential land use.

3.1.1 Common Site Characteristics

Common site conditions may include geography, topography, soils, geology, or ecology. Geography and topography may affect the degree to which the area is accessible to the human population. Decreased accessibility could mean a decreased overall risk to the population. In addition, decreased risk due to geography or topography-limited access would be permanent.

3.1.1.1 The nature of the geology and soils may affect the depth to which OE may be buried. In areas with thick soft soils, OE may be buried to several feet. Burial depth would affect the

excavation methods used in removal actions. Deep burial may decrease the risk to the public and the need for removal actions. In areas where the soil is thin or absent, OE will lie near the surface. Few areas at the site have a soil thickness greater than a few feet.

3.1.1.2 Nature and Extent of Contamination

The nature of the contamination will affect the type of risk-reduction alternative selected. In the case of the former Culebra Island Naval Facility, the primary contaminant is unexploded projectiles up to 6 inches, practice bombs, mortars, and incendiaries. Areas that were used as targets for large-sized ordnance may need special consideration. No CWM is known to exist at the site.

3.1.1.3 Areas that, in general, have a low probability of containing OE should be grouped together because the low probability will affect the recommendation of the selected risk-reduction alternative. Areas that have a history of OE discovery should similarly be grouped.

3.1.1.4 Similar Past Land Use

The historical use of an area is related to the likelihood of encountering contamination. Areas used as observation sites or as staging areas would by unlikely to contain residual OE. Areas that were heavily used as target areas, however, would have a high probability of containing residual OE and should be grouped together.

3.1.1.5 Current Ownership

The current ownership of an area affects primarily the implementability of certain risk-reduction alternatives. Publicly owned land often can be more easily investigated and cleared than privately owned land. Implementation of removal response alternatives on land owned by the U.S. Government may be more implementable than land owned by the Government of Puerto Rico or individuals, although the degree of implementability may not be significant.

3.1.1.6 Current and Potential Land Use

Current and potential land use can affect potential exposure to OE. Areas that are currently used for recreational purposes by the public and areas that are likely to have high public usage should be given special consideration and probably defined as a distinct OOU.

3.1.1.7 Public Accessibility

One of the most important factors defining the degree of risk presented by an area is the potential for access by the public. Accessibility is related to many of the other selection criteria. Land uses that are heavily oriented to the public will result in a high level of potential exposures. Areas difficult to access by the public will result in low probability of potential exposures.

3.2 Definition of EE/CA OOUs

To facilitate the evaluation of risk-reduction alternatives, the former Culebra Naval Facility site has been subdivided into five OOUs (Figure 3-1). The following sections present significant data relating to the OOUs and the criteria used to define each OOU. Table 3-1 presents a summary of the characteristics defining each area as an OOU.

3.2.1 OOU-1 — Flamenco Beach

The Flamenco Beach OOU occupies approximately 300 acres in the southern part of the Flamenco Peninsula of Culebra Island. It is composed of a beach, campground, and interior ridge area. The beach and campground area occupies approximately one quarter of the unit or approximately 75 acres of the eastern portion of the peninsula. The ridge area, which extends to the western shore of the peninsula, occupies approximately 225 acres. Figure 3-1 shows the location of this OOU. Table 3-1 presents characteristics of the area described that define the OOU.

3.2.1.1 The Flamenco Beach OOU is unique because of its geography, past use, level of contamination, current and future use, current ownership, and most importantly its public access. Historical records indicate that the entire peninsula was used as a gunnery range target area on numerous occasions. Landing practice operations were conducted in the beach area and naval bombardment from ships at shore targets located in the beach area were conducted at various times. Miscellaneous explosive ordnance was reportedly used throughout the peninsula, although most of the ordnance used were projectiles from naval gunfire.

3.2.1.2 Sampling was conducted at locations throughout the beach and campground area and along the lower slopes of the ridge area. The sampling recovered only a few intact ordnance items (at Grid FB-6). However, significant ORS including many pieces of shrapnel were recovered at most of the grids, indicating the potential presence of exploded ordnance. No sampling was performed throughout most of the ridge area. During the TCRA, numerous projectiles were recovered from the campground area.

3.2.1.3 Approximately 50,000 persons visit the area yearly, primarily the beach and campground. The beach is wide and picturesque and a popular location for visitors. Access to the beach and campground area is relatively easy. The ridge area, by contrast, is hilly with slopes of between 5 and 10 percent. The area is frequented primarily by hikers. Access to the ridge area is restricted by the presence of thick thorny brush and small trees. The presence of this thick vegetation generally restricts visitors to the cleared trails, although some visitors may venture off the trails.

3.2.1.4 The UXO density for the beach, campground, and eastern ridge areas is estimated to be 5 UXO/acre. The density of the western slope of the ridge area is estimated to be 0.5 UXO/acre. The overall density for the Flamenco Beach sampling area is estimated at approximately 4 UXO/acre. Thirty-two percent of the UXO are expected to be on the surface (6 inches or less).

3.2.2 OOU-2 — Northwest Peninsula

OOU-2 includes all the area of the Flamenco Peninsula north of OOU-1 encompassing 313 acres. OOU-2 is subdivided into two smaller sectors. Sector A, the southernmost portion of the OOU, occupies 150 acres and is administered by the PRDNR. Sector B, the northernmost portion, occupies 163 acres and is administered by the USFWS. Figure 3-1 shows the location of this unit. Table 3-1 presents a summary of the factors that define this unit.

3.2.2.1 OOU-2 is unique because of its past military history, nature and extent of contamination, current ownership and the degree of current public access. The entire area was extensively used as a naval gunfire range and bombing range. Numerous projectiles and a large quantity of fragments was recovered during the EE/CA sampling. Both sectors are used as a wildlife preserve. Public access to both sectors of the unit is restricted. Visitors must obtain a permit to enter the area. A fence has been constructed across the peninsula between the two sectors. This fence further restricts access to Sector B.

3.2.2.2 The EE/CA sampling indicated that the entire OOU is significantly contaminated with UXO. The overall density for OOU-2 is estimated at approximately 20 UXO/acre. Forty percent of the UXO are expected to be on the surface (6 inches or less). Most of the UXO are expected to be projectiles, although a few mortars can be expected.

3.2.3 OOU-3 — Cerro Balcon

The Cerro Balcon OOU is located in the east-central part of Culebra Island on the western slope of the hill named Cerro Balcon. The OOU encompasses approximately 30 acres and extends from the southern part of the San Isidro region of the island to the northern part of the Fraile region. Figure 3-1 shows the location of this unit. Table 3-1 presents a summary of the factors that define this unit.

3.2.3.1 The unit is unique because of its current ownership, past use, accessibility, and potential future land use. All of the unit is privately owned and used primarily for grazing. The area within the unit was used primarily as a mortar firing range. The main impact area of this range is in the central part of the OOU encompassing approximately 20 acres. Part of the unit is fenced. Access by the public is restricted by the landowner, poor roads, thick vegetation, and fencing. Although there are no active plans by the landowner to develop the area, the scarcity of private land on Culebra Island makes the potential for future development significant.

3.2.3.2 Although no UXO was discovered during the field investigation, a large part of the unit, including the main impact area, was not investigated. It must be assumed, therefore, that significant undiscovered OE exists within the unit. For planning purposes it is assumed that the UXO density of the OOU is approximately 4 UXO/acre. Ten percent of the UXO is expected to be on the surface.

3.2.4 OOU-4 — Isla Culebrita

The Isla Culebrita OOU includes an 82 acre portion of Isla Culebrita. This island is located east of Culebra Island and encompasses a total of 266 acres. Figure 3-1 shows the location of OOU-4. Table 3-1 presents a summary of the factors that define this unit.

3.2.4.1 Isla Culebrita is unique because of its geographic isolation, past use, current ownership and by its current and potential land use. The island was used as a strafing practice range. Historical evidence indicates that the strafing fire was limited to small caliber ammunition and 20mm projectiles. The area was also used as an observation point for bombing runs on Cayo Botella. The island is currently administered by the USFWS and is used for recreation, including swimming, boating, and hiking. The island is accessible only by boat. Uses other than those for permitted recreation in designated areas requires a Special Use Permit from USFWS. Approximately 20,800 people visit the island yearly. Future use may include the development of an existing lighthouse into a bed and breakfast.

3.2.4.2 Because of its past use primarily as a strafing range, it is expected that UXO present in the area will be mostly 20 mm. The UXO density of the OOU is expected to be approximately 80 UXO/acre. At least 60 percent of the UXO is expected to be on the surface (6 inches or less).

3.2.5 OOU-5 — Small Cays

The Small Cays OOU consists of all the small cays or islands that were identified by the ASR as being part of the Culebra Island Naval Facility and were included in the SOW for the Delivery Order. The cays include the following:

- Cayo Botella,
- Cayo Alcarraza,
- Los Gemelos,
- Cayo Lobo,
- Cayo de Agua,
- Cayo Tiburon, and
- Cayos Geniqui.

3.2.5.1 Cayo Botella, Cayo Alcarraza, and Los Gemelos are northwest of Culebra Island. Cayo Lobo is west-northwest of the island and Cayo de Agua is west of the island. Cayo Tiburon and Cayos Geniqui are northeast of the island and north of Isla Culebrita. Of the seven cays in this OOU, Cayo Lobo, encompassing 34 acres is the largest.

3.2.5.2 The cays within OOU-5 are unique because of their geographic isolation, topography, past use, current ownership, and the degree of public access. All of the islands have rugged terrain and limited beach areas. Most of the small cays are accessible only during calm seas and good weather. All of the cays are administered by the USFWS and require an entry permit. Access by the public is currently very limited and is expected to be similarly limited in the future.

3.2.5.3 UXO on the cays are expected to include projectiles of various sizes and practice bombs. For planning purposes, it is assumed that the UXO density of the OOU is approximately 80 UXO/acre. Fifty percent of the UXO is expected to be on the surface.

3.3 Streamlined Risk Evaluation

A streamlined risk evaluation is intermediate in scope between the limited risk evaluation undertaken for emergency removal actions and the conventional baseline assessment normally conducted for remedial actions. For this EE/CA, the streamlined risk evaluation will focus on the specific problem that the removal response action is intended to address.

3.3.1 Assessment of Applicable or Relevant and Appropriate Requirements

Applicable or Relevant and Appropriate Requirements (ARARs) are defined as:

> "those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal environmental, state environmental, or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or "Superfund") site." [40 Code of Federal Regulations (CFR) 300.5].

3.3.1.1 ARAR selection depends on the hazardous substances present at the site, site characteristics and location, and the specific actions selected for a remedy. Therefore, these requirements may be chemical-, location-, or action-specific. Chemical-specific ARARs are health- or risk-based concentration limits set for specific hazardous substances, pollutants, or contaminants. Location-specific ARARs address circumstances such as the presence of endangered species on the site or the location of the site relative to a regulated area. Action-specific ARARs control or restrict particular types of remedial actions selected as alternatives for site cleanup.

3.3.1.2 There are no chemical-specific ARARs applicable for the remediation of sites contaminated with OE. Location- and action-specific ARARs applicable for the remediation of the former Culebra Naval Facility are presented in Table 3-2.

3.3.2 Overall Risk Assessment

Section 2.5.2 summarized the statistical analysis performed by QuantiTech, Inc. using their OE*Cert* analysis. OE*Cert* determined that the greatest public exposure potential existed on Isla Culebrita, primarily because of the numerous visitors to the island. While the probability of exposures on the island is high, most of the ordnance that remains at the former strafing range consists of 20mm projectiles. These projectiles can injure or even kill persons if they detonate. However, the damage radius of these relatively small projectiles is small.

3.3.2.1 The area with the next greatest number of potential exposures as determined by the OE*Cert* analysis was the Flamenco Beach and campground area of OOU-1. As with the case of Isla Culebrita, the primary reason for the estimated high number of exposures is the quantity of visitors to the area. The UXOs found on Flamenco Beach are primarily large naval projectiles. The relatively large size of the UXO that are present in this area constitutes a substantial risk to

not only the person disturbing the UXO but potentially others within several hundred feet of the item if it accidentally detonates.

3.3.2.2 OE*Cert* determined that the number of potential exposures for the Northwest Peninsula (OOU-2) was about half that of Flamenco Beach (OOU-1). The risk of serious injury as a result of these exposures could be high because most of the expected UXO in the unit would be relatively large (up to 6-inch) projectiles. These projectiles are capable of injuring persons several hundred feet from the point of detonation. The number of potential exposures at Cerro Balcon (OOU-5) is relatively low since it is not an area frequented by the public. The mortars present in this OOU, as with projectiles in other areas, are capable of injuring persons several hundred feet from the point of detonation.

3.3.2.3 The number of potential exposures determined for the adjacent cays are all relatively low due to the inaccessibility of the islands and the fact that entry is strictly controlled by USFWS. The risk from this exposure, however, is high due to the size of the UXO expected on these cays.

4.0 Identification of Risk Reduction Goals and Objectives

USAESCH has chosen to generally follow EPA guidance for conducting EE/CAs to analyze removal response alternatives for FUDS that may be contaminated by OE. The U.S. Environmental Protection Agency (EPA) promulgated EE/CA guidance to reduce risk of public exposure at hazardous, toxic, and radiological waste (HTRW) sites; however, the general process is well suited to addressing OE sites and is accepted by regulatory agencies. Not all facets of the EE/CA guidance are applicable to OE sites.

4.1 Determination of Risk Reduction Scope

The scope of this EE/CA is to address possible OE contamination at Culebra Island and its surrounding cayos. The following sections of this EE/CA report will specifically address OOU-1, OOU-2, OOU-3, OOU-4, and OOU-5. In this section, goals and objectives for risk reduction are identified and developed.

4.1.1 Risk Reduction Goals and Objectives

The goal of the NTCRA at Culebra Island is to minimize the risk of exposure to OE that could create a threat to public health and the environment, while also minimizing the hazards to personnel performing the risk reduction. The objectives for attaining this goal are as follows:

- Identify and implement the appropriate technologies for risk reduction,
- Minimize the environment damage during risk reduction,
- Detect and dispose of OE where a threat exists to the public health,
- Minimize risk to Culebra Island Natural Wildlife Refuge personnel and to the general public who will use or visit the park, and
- Use appropriate personnel and implement safety measures to reduce the risk of ordnance exposure.

4.1.1.1 If actual OE removal is required, the following methods will be implemented:

- Implement environmental pre-screening of the sites where OE removal is required (pre-screening to occur prior to any OE removal with the required concurrence of USFWS, PRDNR, and USAESCH personnel),
- Provide a clear preference to an in-place disposal method for OE recovered at the site, and
- Use appropriate disposal techniques for the residual waste generated during the removal actions.

4.2 Determination of Schedule

The final schedule for activities associated with risk reduction at Culebra Island will depend on many factors, including the completion date for the EE/CA, the time required to implement the selected alternatives, the nature of the threat, negotiations with regulatory agencies, availability of required resources, weather, and other intangibles. The effort needed to implement each alternative is discussed in Section 6.0 of this report.

4.3 Objectives/Criteria Used in Alternatives Analysis

This section provides a detailed analysis of the removal response alternatives for possible OE contamination. The evaluation criteria outlined in *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (EPA, 1993) serves as the basis for conducting the detailed analysis. The following represent the primary criteria that the analysis considers:

- Effectiveness,
- Implementability, and
- Cost.

4.3.0.1 Each of the evaluation criteria is further divided into specific factors for a complete analysis of the alternatives. These criteria and corresponding factors are discussed in the following paragraphs.

4.3.1 Effectiveness

4.3.1.1 Overall Protection of Public Health and the Environment

The effectiveness criteria are measurements of the ability of an alternative to meet the objective within the scope of the proposed action. Effectiveness is discussed in terms of overall protection of human health and the environment.

4.3.1.2 Long-Term Effectiveness and Permanence

This evaluation criterion addresses the results of an alternative in terms of the risk remaining at the site after risk reduction objectives have been met. The following characterize the potential remaining risk at the site following completion of the implementation phase:

- The magnitude of risk remaining due to unremoved OE contamination following completion of the alternative, and

- The adequacy and reliability of controls that are used to manage unremoved OE contamination remaining at the site.

4.3.1.3 Reduction of Mobility, Toxicity, or Volume (MTV)

This evaluation criterion assesses the level to which the alternative reduces risk by destroying contaminants, reducing the total contaminant mass, reducing the total volume of contaminated media, and/or irreversibly reducing the contaminants' mobility. Although not necessarily applicable to this site, the specific factors typically considered for evaluating a removal response alternative in accordance with EPA guidance for conducting EE/CAs are as follows:

- The treatment processes the remedy would employ and the materials they would treat;
- The amount of hazardous materials that would be destroyed or treated, including how the principal threat(s) would be addressed;
- The degree of expected reduction in MTV measured as a percentage of reduction (or order of magnitude);
- The degree to which the treatment would be irreversible;
- The type and quantity of treatment residuals that would remain following treatment; and/or
- Whether the alternative would satisfy the statutory preference for treatment as a principal element.

4.3.1.3.1 For Culebra Island and the surrounding cayos, this evaluation criterion will assess the level to which the alternative reduces risk by destroying the contaminant (OE), or reducing the total contaminant mass. For OE-contaminated sites, the media surrounding the OE are not typically contaminated, and the OE is not typically mobile.

4.3.1.4 Short-Term Effectiveness

This evaluation criterion addresses the alternative's effect on human health and the environment during construction and implementing the risk reduction action. The implementation phase of an alternative is completed once response objectives are met. The short-term effectiveness is based on the following four factors:

- The potential risk to the community,
- The potential risk to the workers implementing the risk reduction actions,
- The potential for adverse impacts on the environment due to implementing the action, and
- The time required to meet the risk reduction objectives.

4.3.1.5 Compliance With ARARs

This evaluation criterion serves as a check to assess whether each alternative meets the potential federal, state, and local ARARs identified in this EE/CA process.

4.3.1.5.1 No chemical-specific ARARs exist at this time for cleanup of ordnance-contaminated sites. Location- and action-specific ARARs potentially applicable for the proposed alternatives under consideration are discussed in Section 3.3.1.

4.3.2 Implementability

This criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various materials and services required during its implementation. The following factors must be considered during the implementing analysis.

4.3.2.1 Technical Feasibility

This factor evaluates the relative ease of implementing or completing an alternative considering physical constraints and the previous use of established technologies. The following items should be considered:

- Ability to construct and operate the alternative;
- Reliability, or the ability of a technology to meet specified process efficiencies or performance goals;
- Ease of undertaking future risk reduction actions that may be required; and
- Ability to monitor the effectiveness of the remedy.

4.3.2.2 Administrative Feasibility

This factor evaluates activities requiring coordination with other offices and agencies (e.g., obtaining permits for offsite activities or rights-of-way and easements required for construction, or compliance with statutory limits).

4.3.2.3 Availability of Services and Materials

This factor evaluates the availability of the technologies (materials or services) required to implement an alternative. The following items should be considered:

- Availability of adequate offsite treatment, storage capacity, and disposal services;
- Availability of personnel and technology, using the removal action schedule as a guide;

- Availability of prospective technologies; and
- Availability of services and materials required for the alternative.

4.3.2.4 Local Government Acceptance

This factor evaluates the technical and administrative issues and concerns the local government may have regarding each of the alternatives. Local government acceptance will be a factor in the final selection of the alternative in the EE/CA Action Memorandum.

4.3.2.5 Community Acceptance

This factor evaluates the issues and concerns that the public may have regarding each of the alternatives. Community acceptance will be a factor in the final selection of the alternative in the EE/CA Action Memorandum.

4.3.3 Cost

The total estimated cost is used to determine overall cost effectiveness.

5.0 Identification and Development of Removal Response Alternatives

Based on the nature and analysis of contamination and risk reduction goals and objectives discussed in previous sections of this report, a limited number of appropriate alternatives will be evaluated. In this section, the appropriate technologies will be identified and removal response alternatives developed. In the following section, each alternative will be discussed in greater detail and evaluated with respect to specific criteria.

5.0.1 Technologies have been identified and alternatives have been developed for reducing the risk within OOU-1 through OOU-5.

5.1 Identification of Technologies

Technologies for the detection, recovery, and disposal of OE contamination at Culebra Island and surrounding cayos are identified in the following sections.

5.1.1 Detection

Several geophysical methods are available for detecting buried ordnance. These methods are classified based on the type of parameter (physical, electrical, or chemical) they measure. The following are the most commonly used methods and the associated systems for ordnance detection:

- Magnetometer,
- Metal Detector,
- Ground Penetrating Radar (GPR),
- Frequency Domain Electromagnetics (EM) System,
- Resistivity Measurement System, and
- Time Domain EM System.

5.1.1.1 Magnetometers and metal detectors are useful for detecting metallic objects within the ground. The latter four techniques are more applicable for discerning the locations of buried trenches or fills and do not necessarily require the presence of metallic objects to be effective. At Culebra Island and surrounding cayos, confirmed OE has consisted of metallic ordnance items that can be readily detected by metal detection instruments.

5.1.2 Recovery

If OE is detected, it will be excavated and identified and either left in place for later disposal or recovered from the excavation and moved to a safe location for later disposal. If recovered from the soil, OE is separated either mechanically or manually depending on the expected density, type, and size of the OE, and the type and quantity of soil excavated.

5.1.3 Disposal

OE can be disposed of by the following methods:

- *In situ* detonation,
- Offsite detonation, or
- Incineration.

5.1.3.1 *In situ* detonation is destruction of the OE while in the ground. The item is detected, identified, and then detonated in place. Offsite detonation requires that the item be recovered from the excavation site and transported to an approved disposal range for detonation. Incineration involves destruction through combustion. For the sites at Culebra Island and surrounding cayos, it is anticipated that disposal of OE will be either through *in situ* detonation or offsite detonation.

5.2 Development of Alternatives

Based on the previously discussed technologies, alternatives were assembled to address OE contamination at Culebra Island and surrounding cayos. Removal and non-removal alternatives were developed.

5.2.1 Non-Removal Alternatives

Non-removal alternatives include the following:

- Alternative 1: No Further Action, and
- Alternative 2: Institutional Controls.

5.2.2 Removal Alternatives

Removal alternatives include the following:

5.2.2.1 Alternative 3: Surface Clearance, is a removal alternative. However, it is not intended to entirely remove the contamination. It involves removing surface materials (that could

potentially include OE) and/or tree roots (which could result in the unearthing of OE). Therefore, removal action technologies for detection, recovery, and disposal are potentially applicable.

5.2.2.2 Alternative 4: Clearance for use, was developed from the removal action technologies described in Section 5.1. Alternative 4 consists of fully locating, excavating and removing OE to a depth conducive with the anticipated or expected land use and overall health and safety of the affected community. Alternative 4 consists of the following selected removal action technologies that are most commonly used and most appropriately applicable to OE remediation:

- Detection by magnetometer,
- Recovery by excavation, and
- Disposal by detonation or disposal at an appropriate facility.

5.2.2.3 Alternative 5: Complete clearance, was developed from the removal action technologies described in Section 5.1. Alternative 5 consists of locating, excavating, and removing OE to the detection limits of the detection equipment used. Alternative 5 includes the following selected removal action technologies that are most commonly used and most appropriately applicable to OE remediation:

- Detection of magnetometer,
- Recovery by excavation, and
- Disposal by detonation or disposal at an appropriate facility.

5.2.2.4 Alternative 6: Government Buyback, government buyback is not considered to be a feasible or viable option for Culebra Island and surrounding cayos.

6.0 Description and Evaluation of Alternatives

This section describes the general alternative components, followed by an evaluation of the five selected alternatives: No Further Action, Institutional Controls, Surface Clearance, Clearance for Use, and Complete Clearance. For each alternative, it is assumed that the alternative will be used throughout the entire OOU. However, this should not preclude selective implementation of an alternative as required or recommended. Section 7.0 will discuss the application of the alternatives for each OOU.

6.1 Alternative Components

This section describes the components considered for the removal response alternatives, including the following:

- Site Preparation,
- Detection,
- Sifting,
- Excavation,
- Detonation,
- Transportation, and
- Disposal.

6.1.1 Site Preparation

Site preparation includes clearing surface vegetation and other activities required to facilitate the detection and removal of OE from an OOU. Vegetative clearance would be accomplished using gas-powered trimmers with saw blade attachments and using hand-held machetes. The level of effort required for this clearance would vary depending on the density of growth and terrain of each OOU. The level of effort would also vary with the nature of the removal response alternative to be implemented. For example, surface clearance requires less vegetative clearance than complete clearance. Site clearance activities would be completed prior to startup of other activities. The site preparation team would consist of trained personnel and a site safety officer.

Controlled burns will not be permitted at the former Culebra Island Naval Facility, due to environmental concerns, except where approval is given by USFWS. The USFWS may suggest areas where controlled burns may be beneficial to the environment on specific cays. However, this option will not be considered during the development of the cost estimate for this EE/CA.

6.1.2 Detection

After the vegetation clearance is complete, magnetometers would be used for detecting buried ordnance. Most of the OE found in the Former Culebra Island Naval Facility will be detectable by a magnetometer. However, there will be numerous magnetic anomalies caused by the metallic minerals found in many of the rocks in the area.

6.1.3 Sifting

Soil sifting would be required at areas where the expected density of ordnance is high. The purpose of sifting is to mechanically separate ordnance items from the excavated soil. None of the areas (or OOUs) at the former Culebra Island Naval Facility are anticipated to contain high densities of siftable ordnance contamination.

6.1.4 Excavation

After an exclusion zone is established and all required preparatory actions are implemented, excavation activities would be initiated. Excavation up to 3 ft would be accomplished manually by EOD-qualified personnel or using earth-moving machinery (EMM).

EMM can be operated by non-EOD trained personnel under the direct supervision of UXO personnel. All excavation operations would comply with the provisions of 29 CFR 1926 Subpart P; *Safety Concepts and Basic Considerations for UXO Operations* (USACE, 1992a); and *USACE Safety and Health Requirements Manual*, October 1992 (USACE, 1992b).

If the soil excavated along with the OE is determined to be uncontaminated (i.e., not containing OE), it would be stockpiled in the immediate area for later backfilling of excavations. However, if the excavated soil is found to be contaminated with ordnance, the OE must be removed from the soil before backfilling.

No CWM is known to exist at the site and none is expected to be discovered. However, if an item is discovered that is identified as potential CWM, all field operations will be stopped immediately and the area will be evacuated within a 500-meter (m) area secured by two UXO specialists. The USACE safety representative would then be notified immediately, and appropriate direction/action would be taken by USACE. In the interim, the remediation contractor would secure and mark the area and cease operations until receiving further direction.

6.1.5 Detonation

Detonation, when applicable, would be accomplished by the field team using appropriate equipment, as approved by the USAESCH field representative. All detonation activities would be in accordance with an approved OE Operation Plan and conducted by qualified UXO specialists. If special or heavy equipment is required to construct disposal range facilities, formal approval would be obtained from the USAESCH field representative before proceeding with procurement activities. All OE item disposal activities involving detonation or the use of explosives would be completed with a clear preference for inplace or onsite treatment over offsite disposal alternatives. Efforts would be made to reduce noise levels by using damping materials and sand bags. If OE items are determined not to be movable within safety guideline, and the situation precludes detonating the item in-place, the USAESCH field representative would be notified, who in turn, would take appropriate action.

6.1.6 Transportation

All ORS including metallic debris, shrapnel, or fragments discovered during excavation, would be collected, transported, and stored in an approved onsite temporary storage location, and placed in an approved temporary holding container such as a rolloff box within the storage area for later disposal. The transportation would be performed using appropriate containers in accordance with a previously approved OE operational plan.

6.1.7 Disposal

ORS items recovered during excavations at each site would be disposed of in a manner appropriate for the specific site and the nature of the item. Disposal will either be by the local DRMO, located at Roosevelt Roads Naval Station on the main island of Puerto Rico or by recycling by a local scrap metal recycling company.

6.2 Alternative 1: No Further Action

This alternative is no action and is included to provide a baseline comparison with other removal response alternatives. No technologies are associated with this alternative. No risk reduction measure resulting in the treatment, containment, risk reduction, or limited access to OE would be implemented. Therefore, potential OE would not be removed and no restrictions would be placed on access to the site. The no further action alternative is appropriate for sites where no OE contamination has been found or where there is no documented evidence of OE contamination.

6.2.1 Effectiveness

6.2.1.1 Overall Protection of Public Health and the Environment

This alternative implements no risk reduction actions. The potential contaminants remain in place, and there is no reduction of risk to the public of exposure to ordnance.

6.2.1.2 Long-Term Effectiveness and Permanence

With this alternative, contamination would remain in place, and there would not be a long-term change in site conditions. For practical purposes, it is assumed that under the no-action alternative, cleanup at the specific site would never be achieved. The magnitude of the risk would remain undiminished at the conclusion of Alternative 1 activities and would contribute nothing to the future remedial objectives.

6.2.1.3 Reduction of MTV

Since no OE would be treated, removed, or destroyed under this alternative, the MTV of the OE contamination would remain unchanged.

6.2.1.4 Short-Term Effectiveness

Implementing the no-action alternative would result in no short term risk to the surrounding community. No additional adverse environmental impacts from implementing this alternative would occur.

6.2.1.5 Compliance with ARARs

Since no action would be implemented, no location-specific, action-specific, or chemical-specific ARARs are applicable to this alternative. No ARARs are identified for ordnance-related activities.

6.2.2 Implementability

6.2.2.1 Technical Feasibility

This alternative involves no action; therefore, technical feasibility is not applicable to this alternative.

6.2.2.2 Administrative Feasibility

This alternative is administratively feasible.

6.2.2.3 Availability of Service and Materials

No services or materials would be required to implement this alternative.

6.2.2.4 Local Government Acceptance

No permits or approvals would be required from either commonwealth or local authorities to implement this alternative.

6.2.2.5 Community Acceptance

The community may express concerns regarding this alternative, particularly with regard to OOUs that are known to have shown evidence of OE contamination. Therefore, this alternative is generally not be applicable to sites of known or suspected OE contamination.

6.2.3 Cost

There is no cost associated with this alternative.

6.3 Alternative 2: Institutional Controls

Institutional controls is a limited action alternative that uses public information and land use restrictions to minimize public exposure to OE. Implementing this alternative could result in limiting the future use and development of the areas.

6.3.0.1 Institutional controls at the former Culebra Island Naval Facility would consist of the following:

- Educating personnel, surrounding landowners, and visitors to the islands about the potential hazards associated with the sites;
- Posting signs at strategic locations, and/or
- Erecting perimeter fencing around the OOU to physically restrict access to the contaminated sites.

6.3.0.2 Public education would include the following:

- Collateral material development such as brochures and fact sheets. Distribution of such materials to the public could occur through mailings; by making materials available at public places such as churches, libraries, parks, schools, and other public gathering facilities; or by disseminating materials at public information meetings.
- Exhibit design and placement. Exhibits could be designed and placed in areas for public viewing. Permanent or moveable exhibits could be designed for a variety of situations.
- Public notices published in area publications. Public notices could be written and published in area publications, including newspapers, church and civic newsletters, business communications, and other publications.
- Educational videotape production. A videotape could be produced to explain the risks from exposure to OE at the former facility. The tape should be approximately 10 to 15 minutes in length and appeal to audiences from school children to adults.
- Issuance of a "prudent man letter". Such a letter would inform its recipient that a particular area is contaminated and a prudent man would not dig in that area.

6.3.0.3 Sign posting would consist of designing and installing signs at strategic locations frequented by the public, informing the public of potential dangers of contacting ordnance and to prevent or discourage entry into contaminated areas.

6.3.0.4 Fencing would consist of installing a security fence capable of preventing or significantly discouraging entry into contaminated areas. A typical security fence would be chain-link type with strands of barbed wire along the top. Fencing of any currently unfenced areas would restrict access to currently accessible and publicly used areas. Fencing of individual OOUs could be considered and would act to deter trespassers. However, the OOUs may not be appropriate divisions for fence determination. Development of strict rules of entry must also be implemented in conjunction with fence construction.

6.3.0.5 Institutional controls when properly implemented can be an effective alternative to reduce risk at formerly used defense sites. Institutional control is an appropriate alternative where the risk to the public has been documented as low and can be managed without actual removal of OE. This alternative would not remove ordnance contamination from the area.

6.3.0.6 With the exception of digging for sign or fence post installation, no intrusive activity would be associated with this alternative. The technologies associated with this alternative would be advertising, sign posting, and fencing. No risk reduction measure resulting in the removal of OE would be implemented. The quantity of fencing, number of signs to be posted, inspections, perimeter patrols, and other requirements associated with this alternative would be site specific. If

a fence were to be constructed, future use or development of the fenced areas would be restricted without further OE removal.

6.3.0.7 Fence construction, in conjunction with sign posting, issuance of a "prudent man letter," and educating the public, should be considered as a complete institutional control package.

6.3.0.8 A comparative analysis of the removal response alternatives (including elements of the institutional controls alternative) for each OOU is presented in Section 7.0. Recommendations related to this alternative are presented in Section 8.0.

6.3.0.9 Costs for fencing are included in Appendix L. However, institutional controls excluding fencing should also be strongly considered.

6.3.1 Effectiveness

6.3.1.1 Overall Protection of Public Health and the Environment

All portions of former Culebra Island Naval Facility except partially fenced portions of OOU-1, OOU-2, and OOU-3 are generally accessible to the public. Although certain areas are fenced, the fencing is generally inadequate to effectively prevent trespassers from entering. The practical degree of access varies with topography, proximity to trails, or other developed areas.

6.3.1.1.1 Educating the public of the risk of contact with OE would minimize the likelihood that the public would handle OE that they might observe within the former Culebra Island Naval Facility. Education could be accomplished by holding public meetings and presenting printed material to visitors.

6.3.1.1.2 Posting signs at areas of special concern would reinforce warnings regarding risk of exposure to OE at specific areas. There are currently no signs stating "off limits" or "no trespassing" on Culebra Island to the best of our knowledge.

6.3.1.1.3 Erecting a security fence around areas of potential OE contamination would further reduce the potential for public exposure. However, contamination would remain in place and its threat to the environment would remain. Fencing in the area would be subject to corrosion. As a result, this option may be temporary.

6.3.1.1.4 The level of protection would be greater than that provided by Alternative 1 because of informing the public and potential visitors of the dangers related to ordnance. The likelihood of

accidental exposure would be reduced by implementing this alternative, thus reducing the risk. However, the OE would remain in place, and the potential risk would remain.

6.3.1.2 Long-Term Effectiveness and Permanence

Institutional controls would restrict future construction activities and reduce the possibility of exposure to the OE. Fencing would be more restrictive than signage or advertising and would be reliable in achieving the objective of preventing direct public contact with OE. The possibility of accidental exposure would increase if the fence is damaged, signs are removed or deteriorate, and persons are allowed to walk onto the fenced areas.

6.3.1.2.1 Adequate public education would require followup efforts to achieve long-term effectiveness and permanence because of visits by new members of the public and turnover of USFWS employees. Signs and fences would be relatively effective and would be permanent structures that should require minimal maintenance.

6.3.1.3 Reduction of MTV

No contamination would be removed or destroyed under this alternative; therefore, the MTV of the contaminants would remain unchanged.

6.3.1.4 Short-Term Effectiveness

Safety concerns during the implementation period would be associated with the potential for exposure of workers to site contamination during fence and sign installation. Additional safety concerns include steep terrain, water hazards, and dangerous vegetation. This exposure risk is assumed to be low in all OOUs because OE avoidance procedures would be employed and little soil excavation would be required to install the fence and/or signs. There would, therefore, be a minimal risk to the workers during the implementation period. There should be no risk to the affected community and no adverse environmental impacts from implementing this alternative.

6.3.1.5 Compliance with ARARs

No chemical-specific ARARs are associated with OE. The action-specific ARARs potentially applicable to this alternative would include excavation and worker safety. The location-specific ARARs potentially applicable to this alternative would be complied with during site activities.

6.3.2 Implementability

6.3.2.1 Technical Feasibility

The technology associated with implementation of this alternative (i.e., sign posting, advertising, and fence construction) would be reliable, readily accessible, and easily implementable. The technologies associated with this alternative are well proven and have been used at numerous sites under similar conditions. The services of EOD-qualified personnel are not required except to clear sign locations, fence post excavations, and the route of fence lines.

6.3.2.2 Administrative Feasibility

Public education and posting signs would be administratively feasible for all OOUs. With the exception of OOU-3 (Cerro Balcon), all OOUs are publicly owned. Publicly owned lands are under the administrative control of either PRDNR or USFWS. Both agencies have been cooperating with USAESCH. Continuous coordination among USAESCH, USFWS administrators, and local community leaders would be vital to ensure smooth operation during implementation of the alternative.

6.3.2.3 Availability of Service and Materials

Public education requires no special materials or equipment. Required services are easily obtained. The sign posting and fencing alternatives would be easily implemented because no special equipment and/or operators are required. Construction of a perimeter security fence and posting signs requires only conventional construction equipment and techniques in most areas. Some areas may require an all-terrain vehicle or boats for access. During sign installation and/or fence post excavation, however, EOD-trained personnel must clear the area prior to construction and the proper safety precautions must be implemented to prevent untrained personnel from handling OE.

6.3.2.4 Local Government Acceptance

No local government permits are anticipated with this alternative. However, PRDNR may resist accepting the fencing of major portions of Culebra Island. Similarly, National Wildlife Refuge officials of the USFSW would probably not accept fencing major portions of areas under their control. Fencing would restrict public access to an unacceptable degree. However, there may be certain specific areas that PRDNR and USFWS may want to have fenced to assist in their control of those areas.

6.3.2.5 Community Acceptance

It is expected that the local community would accept education and sign posting alternatives. However, restriction of public access by erecting fences around areas frequented by the public would probably meet with opposition. Trespassing into these popular areas will likely be a significant problem.

6.3.3 Cost

Several costs for this alternative are presented in Appendix L. The estimated cost to educate personnel, surrounding land owners, and visitors (i.e., the Education/Information Program) must be considered as a total cost and cannot be broken into individual OOUs.

6.3.3.1 For all OOUs, fencing costs assume that a perimeter fence is constructed around the entire unit. This fence will include placing signs at regular intervals to advise the public that entry into the area is not permitted. Since installing fence posts is an intrusive activity, costs for clearance by EOD-qualified individuals must be included.

6.4 Alternative 3: Surface Clearance

The surface clearance alternative consists of using UXO specialists who are trained in recognition, handling, and disposal of OE to perform a visual survey of the entire surface of each OOU and to remove OE from the ground surface, near surface (less than 6 inches), or any OE that is partially buried. This alternative would be effective in minimizing the risk of the public who may be engaging in nonintrusive activities from having incidental contact with OE.

6.4.0.1 This alternative includes site preparation activities (vegetation clearance) as needed to adequately and completely perform the visual survey. Limited geophysical investigation and removal of surface debris is anticipated. The geophysical investigation is usually conducted using a magnetometer. Surface clearance does require significant clearance of brush and shrubs to ensure that all areas have been adequately examined. Selective probing of the near surface soil up to a depth of 6 inches may be employed to investigate magnetic anomalies and identify near surficial metallic debris that may not be visually apparent.

6.4.0.2 Surface clearance is an appropriate alternative where surface contamination by OE is confirmed, or where surface OE inspections have not been previously performed. A limited number of OE surveys (including geophysical investigation, selective excavation, and a TCRA) were conducted at sites within the former Culebra Island Naval Facility.

6.4.0.3 Within all OOUs, the effort associated with implementing this alternative would vary from one OOU to another and would depend on the topography, vegetation, and current land use. Associated with the surface clearance alternative, the public education portion of Alternative 2 would be required prior to start of work.

6.4.1 Effectiveness

6.4.1.1 Overall Protection of Public Health and the Environment

Surface clearance would be effective in removing those OE items that are most likely to be encountered by the public. Implementing this alternative would greatly reduce the risk of a member of the public accidentally encountering and handling an OE item. Surface clearance would not remove all OE potentially present. Subsurface OE, if present, would remain. As such, only limited protection would be provided for intrusive activities.

Whether surface clearance increases the overall protection of the public is strongly related to the quantity of OE that lies on or near the surface. In OOUs where surface OE is common, considerable increase in protection can result from implementing this alternative.

6.4.1.2 Long-Term Effectiveness and Permanence

Surface clearance would be a reliable means of reducing exposure to members of the public, who are may be engaged in nonintrusive activities, to direct contact with ordnance contamination located on the surface. The possibility of exposure during intrusive activities would remain and, therefore, removal of risk associated with OE would not be fully achieved. Implementing this alternative would not ensure removal of all contamination; therefore, there would be a continuing potential risk to the public and/or the environment.

6.4.1.3 Reduction of MTV

The threats associated with exposure to contamination are partially addressed with this alternative. OE contamination discovered on the surface would be removed under this alternative. However, any subsurface OE would remain and, therefore, the MTV of the buried contaminants would remain unchanged.

6.4.1.3.1 OE items are neither mobile nor toxic. With implementation of this alternative, the volume of OE would be reduced at the surface at all OOUs. The extent of volume reduction would depend on the density of ordnance items present at the OOUs and the extent that these items are found at the surface.

6.4.1.4 Short-Term Effectiveness

Safety concerns during the implementation period would primarily be associated with the potential for exposure of OE specialists during surface clearance. The USACE safety procedures manual, *Safety Concepts and Basic Considerations for UXO Operations* (USACE, 1992a), would be followed, which would significantly limit the actual risk to the workers. There would be limited risk to the affected community resulting from implementing the proposed action. There should be no adverse environmental impacts resulting from implementing this alternative.

6.4.1.5 Compliance with ARARs

No chemical-specific ARARs are associated with OE. The action-specific ARARs potentially applicable to this alternative include excavation, protection of endangered species, and worker safety. The location-specific ARARs potentially applicable to this alternative would be complied with during site activities.

6.4.2 Implementability

6.4.2.1 Technical Feasibility

This alternative would be technically feasible for all OOUs. Efforts associated with implementing this alternative would vary based on the topography, terrain, and vegetation in each OOU. EOD-qualified personnel must be used during implementation of all facets of the surface removal alternative. Public education (see Institutional Controls) should also be conducted as an integral part of the surface removal alternative.

6.4.2.2 Administrative Feasibility

Surface clearance activities would be administratively feasible at most OOUs. However, activities associated with this alternative would require coordination with USAESCH, USFWS, and PRDNR. The only additional permits or waivers anticipated are related to endangered species and possibly wetlands on the Northwest Peninsula. Depending on the extent of the impacts to the ecosystem, this could create an implementability problem. Further studies related to the site-specific ARARs would be required to fully address the administrative feasibility. There should be no need for easements, right-of-way agreements, or zoning variances at any of the OOUs. Right-of entry agreements with several private landowners at Cerro Balcon will be required, which may cause delays in implementing this alternative.

6.4.2.3 Availability of Service and Materials

The special equipment, skills, personnel, and technology associated with this alternative include geophysical investigation, land clearing, and EOD training. The proper safety precautions must be implemented to prevent untrained personnel from handling OE items.

6.4.2.4 Local Government Acceptance

Local government permits or approvals may be required with this alternative at OOU-3 provided that there is no objection by the landowners. Local government acceptance of vegetation clearing is anticipated. USFWS and PRDNR officials would be involved at other OOUs case by case to approve vegetation clearance and the detonation of UXOs, especially where endangered species or archaeologically significant items may be encountered.

6.4.2.5 Community Acceptance

Unless excessive vegetation clearance (to the extent that the overall refuge environment is impacted) or the amount of time a site is closed to the public during clearance is excessive, it is expected that the local community would generally accept this alternative. Implementing this alternative will result in only short-lived disruption to public access.

6.4.3 Cost

The estimated cost to perform surface clearance at the former Culebra Island Naval Facility depends on topography, vegetative cover, and site access. The items included in this cost estimate (Appendix L) are site preparation and clearing, surveying and QC, visual inspection of cleared areas, limited geophysical investigation, removal and disposal of OE, mobilization/demobilization, and sign posting. Signs would be posted to advise the public that there is a potential for encountering OE in the area particularly if they engage in any intrusive activity.

6.4.3.1 The implementation cost of this alternative is based on the estimated density of surface UXO within each OOU. This density is based on the best information available from the EE/CA sampling and effort. The estimated costs are based on ESE's experience in completing similar projects, discussions with EOD-trained personnel, and general knowledge of the site. The vegetation, topography, and site access are expected to vary significantly within the OOUs. Unit costs are assumed to be the average costs across the entire OOU.

6.4.3.2 The education/information program is applicable to all OOUs within the former Culebra Island Naval Facility. This Education/Information Program is considered part of the costs for

implementing Alternative 3 and must be added to the costs developed for implementing this alternative for each OOU.

6.5 Alternative 4: Clearance for Use

This alternative involves all activities necessary to fully locate, excavate, and remove OE to a depth conducive with the expected land use, public access, and overall health and safety of the affected community. Activities could potentially include vegetation clearance as required to geophysically investigate the sites, completion of geophysical investigation(s), excavation of anomalies, and destruction of OE. Technologies that could be used for this alternative include magnetic geophysical investigative methods and handling/disposal of OE (including detonation of UXOs). This alternative includes surface clearance over the entire site and excavation and clearance in areas of known activities.

6.5.0.1 Department of Defense Explosives Safety Board (DDESB) guidelines [in recently approved changes to U.S. Department of Defense (DOD) 6055.9-STD] state that the depth to which UXO should be removed depends on the projected end use of the land and the extent of human exposure. The removal depth may be determined by using site-specific information, including the nature of the site, the types of ordnance expected, and the depths at which such ordnance would most likely be found. Estimates of ordnance burial depths may also be determined by published technical data, historical records, and by data collected during site investigations.

6.5.0.2 For planning purposes, the DDESB suggests that areas subject to limited public access should be cleared to a depth of 1 ft. Areas subject to public access (for activities including agriculture, surface recreation, vehicle parking, or surface supply storage) should be cleared to a depth of 4 ft. Due to the shallow depth to rock in the Former Culebra Island Naval Facility, it is suspected that excavation would not exceed a 3-ft depth. In an area were unusually thick soil is encountered, where unrestricted public access is expected, and/or where construction activity is planned, clearance to a depth of up to 10 ft may be required. In areas where future use and public access is undefined, surface clearance is appropriate. In the construction areas, clearance should be performed to a depth 4 ft deeper than the planned excavation. The actual clearance depth can be modified during the removal action based on actual depths that ordnance is consistently found. This modification requires approval from DDESB.

6.5.0.3 As with Alternative 3, the effort associated with implementing this alternative at an OOU would vary from one OOU to another and the level of effort required for risk reduction would depend on the topography, vegetation, and current land use. The public education portion of yAlternative 2 should be included with implementation of this alternative.

6.5.0.4 All of the technologies identified in Section 5.1 and many of the alternative components discussed in Section 6.1 are applicable to this alternative.

6.5.1 Effectiveness

6.5.1.1 Overall Protection of Public Health and the Environment

In most OOUs, implementing this alternative would significantly reduce the potential for direct contact with OE. This alternative would provide a more effective overall protection of public health and the environment than either Alternative 1 or Alternative 2.

6.5.1.2 Long-Term Effectiveness and Permanence

Implementing this alternative would significantly reduce the potential for exposure to OE contamination. Since most of the OE at the site is located either on the surface or at relatively shallow depths, implementing this alternative would effectively and permanently reduce the risk to the public of exposure to OE. This alternative would not require annual operation and maintenance (O&M) to be permanent and would need to be addressed further only if additional intrusive activities are to be initiated below the depth cleared.

6.5.1.3 Reduction of MTV

Clearance for use would significantly reduce the MTV of the potential OE contaminants in the areas where clearance is performed (i.e. building construction, trails, and other recreational facilities). This alternative does not include clearance of areas where usage is expected.

6.5.1.4 Short-Term Effectiveness

The potential for exposure of OE to workers during clearance and risk reduction activities could be significant. The USACE safety procedures manual, *Safety Concepts and Basic Considerations for UXO Operations*, would be followed. There would be minimal anticipated risk to the affected community resulting from implementing the proposed action. However, if OE is discovered and detonation is the preferred disposal alternative, then the area could be affected by noise and ground shock. There should be no adverse environmental impacts resulting from implementing this alternative at any of the OOUs.

6.5.1.5 Compliance with ARARs

No chemical-specific ARARs are associated with OE. The action-specific ARARs potentially applicable to this alternative would include excavation and worker safety. The location-specific ARARs potentially applicable to this alternative would be complied with during site activities.

6.5.2 Implementability

6.5.2.1 Technical Feasibility

The technology associated with implementing this alternative is reliable, readily accessible, and easily implementable for OE discovered at the site. EOD-qualified personnel must be used during the implementation of all facets of this alternative.

6.5.2.2 Administrative Feasibility

This alternative would be administratively feasible at all OOUs. Activities associated with this alternative would require coordination with USAESCH, the USFWS, PRDNR, and local community leaders. The only additional permits or waivers anticipated are related to endangered species and possibly wetlands on the Northwest Peninsula. Depending on the extent of the impacts to the ecosystem, this could create an implementability problem. There should be no need for easements, right-of-way agreements, or zoning variances at any of the OOUs. Right-of entry agreements with several private landowners at Cerro Balcon will be required, which may cause delays in implementing this alternative.

6.5.2.3 Availability of Service and Materials

The special equipment, skill, personnel, and technology associated with this alternative would include geophysical investigation, site clearing, and OE training. Proper safety precautions must be implemented to prevent untrained personnel from handling these materials.

6.5.2.4 Local Government Acceptance

Local government permits or approvals will be required with this alternative at OOU-3. Local government acceptance of vegetation clearing is anticipated at OOU-3 provided that there is no objection by the landowners. USFWS and PRDNR officials would have to be involved case by case to approve vegetation clearance and the detonation of UXO, especially where endangered species or archaeologically significant items may be encountered.

6.5.2.5 Community Acceptance

Unless excessive vegetation clearance is required (to the extent that the overall refuge environment is impacted), it is expected that the local community would accept this alternative. Implementing this alternative will result in only short-lived disruption to public access.

6.5.3 Cost

The cost estimates (Appendix L) include site preparation and clearing, surveying and quality control, geophysical investigation, excavation of anomalies, removal and disposal of OE, mobilization/demobilization, and sign posting.

6.5.3.1 The estimated density of OEs that would be discovered and would require disposal/ detonation is based on the best information available from the EE/CA sampling and TCRA efforts by MTA in May 1995.

6.5.3.2 The estimated costs to complete the tasks indicated are based on ESE's experience in completing similar projects, discussions with EOD-trained personnel, and knowledge of the site. Due to the large acreage associated with this site, the vegetation, topography, and site access would vary within the OOUs. Most unit costs are assumed to be the average costs across the entire OOU.

6.5.3.3 To account for the variation in the level of effort required to clear area within a particular OOU, two clearance modes are assumed. For areas where little or no public access is anticipated, unit costs for detection, removal, and disposal similar to those used for surface clearance are used. In these areas, it is anticipated that the investigation depth will result in recovery of only a fraction of the UXO expected for the area. For areas where heavy public access is anticipated, the costs for detection, removal, and disposal reflect a more intense effort, which will result in the removal of all UXO expected for the area. In actual field implementation of this alternative, the level of effort is expected to be between these two clearance modes.

6.5.3.4 The education/information program is applicable to all OOUs within the former Culebra Island Naval Facility. The education/information program is considered part of the costs for implementing Alternative 4 and must be added to the costs presented.

6.6 Alternative 5: Complete Clearance

This alternative involves all activities necessary to fully locate, excavate, and remove all anomalies detected. Activities could potentially include vegetation clearance as required to

completely geophysically investigate the sites, completion of the geophysical investigation(s), excavation of all anomalies and destruction of all OE discovered. Technologies that could be used for this alternative include magnetic geophysical investigative methods and handling and disposal of OE (including detonation of UXOs).

6.6.0.1 DDESB guidelines (in recently approved changes to DOD 6055.9-STD) state that the depth to which UXO should be removed depends on the projected end use of the land and the extent of human exposure. The removal depth may be determined by using site-specific information, including the nature of the site, the types of ordnance expected, and the depths at which such ordnance would most likely be found. Estimates of ordnance burial depths can be determined by published technical data, historical records, and by data collected during site investigations.

6.6.0.2 The DDESB suggests areas where unrestricted public access is expected and/or where construction activity is planned should be cleared to rock (an approximate depth of 3 ft).

6.6.0.3 As with Alternative 4, the effort associated with implementation of this alternative would vary from one OOU to another and the level of effort required for risk reduction would depend on the topography, vegetation, and current land use. The public education portion of Alternative 2 should be included with implementation of this alternative.

6.6.0.4 All of the technologies identified in Section 5.1 and many of the alternative components discussed in Section 6.1 are applicable to this alternative.

6.6.1 Effectiveness

6.6.1.1 Overall Protection of Public Health and the Environment

Implementing this alternative would substantially reduce the potential for direct contact with OE. This alternative would provide the greatest overall protection of public health and the environment.

6.6.1.2 Long-Term Effectiveness and Permanence

Implementing this alternative would drastically reduce the potential for exposure to OE contamination. This alternative would not require annual O&M to maintain permanence and would not need to be addressed further regardless of the level of public access or anticipated intrusive activity undertaken at any of the OOUs.

6.6.1.3 Reduction of MTV

Complete clearance would substantially reduce the MTV of the potential contaminants located on the land surface and in the subsurface. To the extent that OE is detectable, it will be permanently removed.

6.6.1.4 Short-Term Effectiveness

The potential for exposure of OE to workers during clearance and risk reduction activities could be significant. The USACE safety procedures manual, *Safety Concepts and Basic Considerations for UXO Operations*, would be followed. There would be minimal anticipated risk to the affected community resulting from implementing the proposed action. However, if OE is discovered and detonation is the preferred disposal alternative, then the area could be affected by noise. There should be no adverse environmental impacts resulting from the implementing this alternative.

6.6.1.5 Compliance with ARARs

No chemical-specific ARARs are associated with OE. The action-specific ARARs potentially applicable to this alternative would include excavation and worker safety. The location-specific ARARs potentially applicable to this alternative would be complied with during site activities.

6.6.2 Implementability

6.6.2.1 Technical Feasibility

The technology associated with implementing this alternative is reliable, readily accessible, and easily implementable for OE discovered at the site. EOD-qualified personnel must be used during the implementation of all facets of this alternative. Public education (Institutional Controls) should also be conducted as an integral part of the risk reduction activity.

6.6.2.2 Administrative Feasibility

This alternative would be administratively feasible at all OOUs. Activities associated with this alternative would require coordination with USAESCH, USFWS, DNER, and local community leaders. The only additional permits or waivers anticipated are related to endangered species and possibly wetlands on the Northwest Peninsula. Depending on the extent of the impacts to the ecosystem, this could create an implementability problem. There should be no need for easements, right-of-way agreements, or zoning variances at any of the OOUs. Right-of entry

agreements with the several private landowners at Cerro Balcon will be required, which may cause delays in implementing this alternative.

6.6.2.3 Availability of Service and Materials

The special equipment, skill, personnel, and technology associated with this alternative would include geophysical investigation, site clearing, and OE training. Proper safety precautions must be implemented to prevent untrained personnel from handling these materials.

6.6.2.4 Local Government Acceptance

Local government permits or approvals will be required with this alternative at OOU-3. Local government acceptance of vegetation clearing is anticipated at OOU-3 provided there is no objection by the landowners. USFWS and PRDNR officials would have to be involved case by case to approve vegetation clearance and the detonation of UXO, especially where endangered species or archaeologically significant items may be encountered.

6.5.2.5 Community Acceptance

Unless excessive vegetation clearance is required (to the extent that the overall refuge environment is impacted), it is expected that the local community would accept this alternative. Implementing this alternative will result in only short-lived disruption to public access.

6.6.3 Cost

The cost estimates (Appendix L) include site preparation and clearing, surveying and quality control, geophysical investigation, excavation of anomalies, removal and disposal of OE, mobilization/demobilization, and sign posting.

6.6.3.1 The estimated density of OE that would be discovered and would require disposal/ detonation is based on the best information available from the EE/CA sampling and TCRA efforts by MTA in May 1995.

6.6.3.2 The estimated costs to complete the tasks indicated are based upon ESE's experience in completing similar projects, discussions with EOD-trained personnel, and knowledge of the site. Due to the large acreage associated with this site, the vegetation, topography, and site access would vary within the OOUs. Unit costs are assumed to be the average costs across the entire OOU.

6.6.3.4 The education/information program is applicable to all OOUs within the former Culebra Island Naval Facility. The education/information program is considered part of the costs for implementing Alternative 4 and must be added to the costs presented.

7.0 Comparative Analysis of Risk-Reduction Alternatives

Section 6.0 presented and evaluated five alternatives. This section presents a comparative analysis of these alternatives for OOU-1 through OOU-5.

7.1 OOU-1 — Flamenco Beach

The Flamenco Beach area is part of Flamenco Peninsula and occupies approximately 300 acres. It is on the northwest end of Culebra Island and is currently administered by PRDNR. Flamenco Beach was primarily used as a Naval Gunfire Range including aerial bombing and strafing ranges. It is currently used as a public beach and camping area.

7.1.0.1 Flamenco Beach includes the ridge area, beach, and campgrounds. The ridge area, which occupies approximately 90 percent of the OOU, is heavily vegetated, and tourists generally stay off this area. The beach and campgrounds, which occupy the remaining 10 percent of the OOU, are sparsely vegetated, and are the most often visited by the tourists.

7.1.0.2 Approximately 50,000 people visit Flamenco Beach every year to participate in outdoor activities including camping, hiking, bird watching, and water sports. Due to thick vegetation, hiking is generally limited to the roadways located in various parts of the park. Future construction is planned for villas on approximately 10 acres of land behind the beach parking area and hiking trails are planned throughout the OOU.

7.1.0.2 During the EE/CA investigation, five UXO items were detected, including two 5-inch illumination candles, one 5-inch barrage rocket, one 37mm projectile, and one 38mm HE. ORS was also detected from heavy projectiles.

7.1.1 Effectiveness

7.1.1.1 Overall Protection of Public Health and the Environment

Alternative 1, No Further Action, provides no additional risk reduction. The potential contaminants remain in place and there is no risk reduction of ordnance exposure.

7.1.1.1.1 Alternative 2, Institutional Controls, would minimize the likelihood that members of the public would handle OE that they might observe within this OOU during outdoor recreational activities. Education could be accomplished by holding public meetings and presenting printed

material to visitors, and members of the public. This education process would be most effectively implemented for the entire site rather than by OOUs.

7.1.1.1.2 Flamenco Beach is administered by PRDNR and is regular patrolled. A security fence exists at the entrance to the OOU and is used to close the beach area. Erecting security fence around the entire OOU could further reduce the exposure potential by restricting access. Sign posting at specific areas would reinforce warnings about risk of exposure to OE. The fence should be constructed to allow access to the current beach and camping areas and the proposed villas, but limit access to all other areas. This alternative would inhibit plans to open hiking trails into the ridge area west of Flamenco Beach.

7.1.1.1.3 The protection level provided by Alternative 2 is expected to be limited but higher than Alternative 1 because of the effects of education programs, sign posting, and fence construction. As with Alternative 1, this alternative leaves contaminants in place and provides little increased protection to the public and the environment.

7.1.1.1.4 Alternative 3, Surface Clearance, would provide protection to the public who are not engaged in intrusive activities. Implementing this alternative would remove surficial OE contaminants, but would leave the potential for public and environmental exposure to buried OE. It is assumed that PRDNR would regulate the intrusive activities at OOU-1, thus reducing the risk of exposure to buried OE. This alternative would provide significant protection to the public and environment.

7.1.1.1.5 Alternative 4, Clearance for use, would reduce the risk of direct contact with OE in areas requiring clearance due to a specific activity. The trails, construction areas, and campground expansion areas (approximately 25 percent of the entire area) which are expected to have high usage and public access would be cleared to the appropriate depth for the expected usage. The ridge area (approximately 75 percent of the total area) which are expected to have low usage and public access will undergo a limited visual inspection, limited geophysical investigation, and UXO disposal. The risk of OE exposure would remain in areas where complete clearing operations were not performed. In most of the low access area, public access is expected to be limited by dense vegetation. Implementing this alternative would provide protection of the public and the environment in areas of greatest exposure.

7.1.1.1.6 Alternative 5, Complete Clearance, would provide only a minimal increase in public protection over Alternatives 3 and 4 but would provide the maximum possible protection to the public and the environment.

7.1.1.2 Long-Term Effectiveness and Permanence

7.1.1.2.1 Alternative 1, No Further Action, implements no action at the site. Therefore, this alternative would have no impact on long-term effectiveness and permanence.

7.1.1.2.2 A fence is currently in place only at the entrance to the beach. With the construction of security fence completely around the OOU, along with sign posting at selected locations and an educational program, Alternative 2 (Institutional Controls) would provide limited effectiveness in the protection of the public. The fence would require periodic repairs due to damage by visitors and from corrosion due to the humidity and salt mist in the air. If properly maintained, the fence would provide a relatively permanent deterrent to visitors wishing to enter the western Flamenco Peninsula.

7.1.1.2.3 There are plans to construct villas on approximately 10 acres of land located behind the beach parking area. With Alternative 2, such future construction activities would not be permitted at this OOU.

7.1.1.2.4 The public information portion of Alternative 2 would be effective if it is maintained through periodic evaluation and reinforcement. However, significant liability and risk would persist because the potential contaminants would not be destroyed and would remain in place.

7.1.1.2.5 Alternative 3, Surface Clearance, would be an effective means of reducing exposure to members of the public who are not engaged in intrusive activities. However, erosion at the beach could unearth OE from the subsurface and the possibility of exposure to the public would increase. In OOU-1, this alternative would provide a relatively permanent solution to protect the public engaged in nonintrusive activities, but would have no permanent effect on buried ordnance. It would provide no protection for activities such as building construction.

7.1.1.2.6 Alternative 4, Clearance for use, would provide an effective and permanent means of reducing exposure in areas that will likely be used by the public for both intrusive and nonintrusive activities. Some risk of OE exposure would remain in areas where complete clearing operations have not been performed, but this risk would be significantly reduced. In most of the low access area, risk is further reduced because public access is limited by dense vegetation.

7.1.1.2.7 Alternative 5, Complete Clearance, would provide little increased risk reduction over Alternative 4. Implementing this alternative, however, would be both effective and permanent.

7.1.1.3 Reduction of MTV

The MTV of the potential OE contamination would remain unchanged with implementation of Alternatives 1 or 2.

7.1.1.3.1 Alternative 3, Surface Clearance, would partially reduce the volume of contaminants within the OOU. UXO discovered on the surface would be removed or destroyed under this alternative. However, any subsurface UXO would remain; therefore, the MTV of the buried contaminants would remain unchanged. Since the percentage of surface UXO within OOU-1 is expected to be 32 percent, a significant reduction in the volume of UXO is anticipated with implementation of Alternative 3.

7.1.1.3.2 Alternative 4, Clearance for Use, would significantly reduce the volume of the potential contaminants in areas where extensive clearing operations are undertaken. In other areas were less extensive clearance is undertaken, there would be less reduction in the MTV.

7.1.1.3.3 Alternative 5, Complete Clearance, would provide a maximum volume reduction of the potential contaminants.

7.1.1.4 Short-Term Effect During Implementation

For Alternative 1, no action would be implemented. No risks are associated with the safety of workers during the implementation period.

7.1.1.4.1 For Alternative 2, Institutional Controls, minimal safety concerns would be associated with the potential for exposure of workers to UXO while posting signs and installing a security fence. No risk would be expected for the affected community and no adverse environmental impacts should result from this alternative.

7.1.1.4.2 For Alternative 3, Surface Clearance, safety concerns would be primarily associated with the potential for exposure by UXO specialists during surface clearance. The degree of exposure risk would vary depending on the clearing and inspection activities of different areas within the OOU. In OOU-1, the potential would exist for exposure to workers to OE; however, little risk would be expected to the affected community. However, the community could be affected by noise or restricted access to the beach during implementation.

7.1.1.4.3 Alternative 4, Clearance for Use, would have a high potential for ordnance exposure during UXO clearance and removal activities. However, this exposure would be limited to

workers who have been trained in handling and disposing of OE. There is a potential for the community to be affected (by noise or restricted access) during the implementation of this alternative.

7.1.1.4.4 Alternative 5, Complete Clearance, would have the greatest potential for exposure during UXO clearance and removal activities. However, this exposure would be limited to workers who have been trained in handling and disposing of OE. The potential for the community to be affected (by noise or restricted access) would be greatest with this alternative.

Alternatives 3, 4, and 5 will require the vegetation clearance. This would be a temporary impact as the vegetation would grow back after the operations. Care would have to be taken to ensure no endangered plant or animal species are affected.

7.1.1.5 Compliance with ARARs

For all alternatives, no chemical-specific ARARs are associated with OE. The action-specific ARARs potentially applicable to Alternatives 2, 3, 4, and 5 include excavation, protection of endangered species and worker safety (Table 3-2). The location-specific ARARs potentially applicable to OOU-1 would be complied with during implementation of any alternative.

7.1.2 Implementability

7.1.2.1 Technical Feasibility

Alternative 1 involves no action at the site.

7.1.2.1.1 Alternative 2, Institutional Controls, would be technically feasible and implementable. The education and public information portion of this alternative would be easily implementable. Sign posting at specific areas of the OOU and fencing would also be technically feasible.

7.1.2.1.2 Alternative 3, Surface Clearance, would be technically feasible. However, clearance of heavy brush and the effect of metallic minerals in the rocks on the magnetometers would make implementing this alternative technically difficult. EOD-trained personnel would be required during implementation of all facets of the surface removal alternative.

7.1.2.1.3 Alternative 4, Clearance for Use, would be technically feasible but the clearance of heavy brush and the interference of heavy minerals in the rocks on the magnetometer will make

implementing this alternative difficult. EOD-trained personnel must be used during implementation of all the facets of the clearance for use alternative.

7.1.2.1.4 Alternative 5, Complete Clearance, would require clearance of all OE items present over the entire OOU. Although this alternative would be technically feasible, the probability of detection and removal of all OE items (100 percent clearance) would be limited due to thick vegetation. Clearance of heavy brush and the effect of metallic minerals in rocks on the magnetometer would also make implementing this alternative difficult. Parts of OOU-1 are easily accessible by vehicle, but most of this OOU would require traversing through thick vegetation. EOD-trained personnel must be used during implementation of all the facets of the clearance for use alternative.

7.1.2.2 Administrative Feasibility

Alternative 1 is administratively feasible.

7.1.2.2.1 For Alternative 2, Institutional Controls, fencing, public education and sign posting would not be administratively feasible at the entire OOU. The fencing of the campground and beach would not be approved.

7.1.2.2.2 Alternative 3, Surface Clearance, would be administratively feasible at OOU-1. A biologist would be required to check for endangered plants and animals. Since some vegetation clearance would be required in some areas, coordination with PRDNR would be required during implementation.

7.1.2.2.3 Alternative 4, Clearance for Use, would be administratively feasible at OOU-1. A biologist would be required to check for endangered plants and animals. Since extensive vegetation clearance would be required in many areas, close coordination with PRDNR would be required during implementation.

7.1.2.2.4 Alternative 5, Complete Clearance, would be administratively feasible at OOU-1. However, more administrative restrictions would be expected on excavation in areas of the OOU than Alternative 4. A biologist would be required to check for endangered plants and animals over the entire OOU. Since extensive vegetation clearance would be required in most areas, close coordination with PRDNR would be required during implementation.

7.1.2.3 Availability of Services and Materials

Alternative 1 requires no services or materials.

7.1.2.3.1 The services and materials required to implement Alternative 2 (Institutional Controls) are available but are costly as transport to Culebra Island may be expensive. During installation of fencing and sign posts, EOD-trained personnel would be required to clear the site where sign and fence posts are installed and along the fencing route.

7.1.2.3.2 For Alternatives 3, 4, and 5, special equipment, skills, personnel, and technology for geophysical investigation would be required. Significant logistics problems in dealing with topography and vegetation will occur for these alternatives.

7.1.2.3.3 For all alternatives, special skills, equipment, and personnel would be needed if buried ordnance is discovered and must be detonated or disposed of. The proper safety precautions would require implementation to prevent untrained personnel from handling these materials.

7.1.2.4 Local Government Acceptance

The need for local government or PRDNR acceptance is not anticipated for Alternative 1.

7.1.2.4.1 For Alternative 2, the need for local government approval is not anticipated. The need for PRDNR acceptance is anticipated and their approval is expected except for the fencing portion of this alternative.

7.1.2.4.2 For Alternative 3, the need for PRDNR approval would be required due to the need for some vegetation clearance. A biological survey may be required prior to vegetation clearance. Approval for clearing limited portions of the area is expected.

7.1.2.4.3 For Alternative 4, approval by PRDNR is anticipated, particularly in areas they wish to open for specific recreational uses (i.e., villa construction, hiking trails). A biological survey may be required prior to vegetation clearance. Approval for areas where endangered plant and animal species exist may include restrictions.

7.1.2.4.4 Approval by PRDNR is anticipated for Alternative 5. A biological survey may be required prior to vegetation clearance. Approval for clearing limited portions of the area is expected.

7.1.2.5 Community Acceptance

The community may express concerns regarding Alternative 1, due to the accessibility of OOU-1 to the public and the evidence of UXO contamination.

7.1.2.5.1 It is expected that the local community, to a large extent, would not accept Alternative 2 for OOU-1 since it would severely restrict public access to this popular area.

7.1.2.5.2 Alternatives 3, 4, and 5 would be received with some resistance by the immediate community, since it will temporarily restrict community activities (e.g., camping, hiking, bird watching, and water sports) and would require excessive vegetation clearance in OOU-1 during implementation.

7.1.3 Cost

Alternative 1 incurs no cost and is therefore the least expensive of the five alternatives. Alternatives 2, 3, 4, and 5 each incur increasing costs, beginning with Alternative 2.

7.1.3.1 The total estimated cost to implement the education/information portion of Alternatives 2, 3, 4, or 5 is $25,000 to $50,000. This encompasses OOU-1 through OOU-5 and cannot effectively be divided among the individual OOUs. To maintain the program, an estimated $2,500 to $5,000 per year is required.

7.1.3.2 The total estimated costs to implement Alternatives 2, 3, 4, and 5 are $331,000, $921,000, $1,540,000, and $2,490,000, respectively, and in addition, the Education/Information Program cost. For Alternative 4 the cost estimates are calculated based on the assumption that 25 percent of the unit will undergo a complete clearance. The remaining 75 percent of the unit will receive limited clearance. This clearance will consist of a limited geophysical investigation, visual inspection, and the removal of surface and near surface OE. All assumptions used in the cost estimates are stated in Appendix L.

7.2 OOU-2 — Northwest Peninsula

Northwest Peninsula is the northwestern portion of the Flamenco Peninsula and is on the northwest end of Culebra Island. The Northwest Peninsula was primarily used as a Naval Gunfire Range and also for aerial bombing and strafing ranges.

7.2.0.1 OOU-2 is defined as the Northwest Peninsula (Sectors A and B), excluding the area occupied by OOU-1 Flamenco Beach. It is comprised of 588 acres and is subdivided into two sectors by usage and administration. Sector A comprises 438 acres and is administered by the PRDNR. It is mostly wooded, densely vegetated terrain with accessibility via one small road or trail. Sector B consists of 150 acres and is administered by the USFWS. It consists of mostly tall grass and thorny brush with public access inhibited by a 6-ft chain-link fence.

7.2.0.2 During the EE/CA investigation, 25 subsurface UXO items and 15 surface UXO items were detected at OOU-2. Several ORS items were also detected.

7.2.1 *Effectiveness*

7.2.1.1 Overall Protection of Public Health and the Environment

Alternative 1, No Further Action, provides no additional risk reduction. The potential contaminants would remain in place and there would be no risk reduction of ordnance exposure.

7.2.1.1.1 Alternative 2, Institutional Controls, would minimize the likelihood that members of the public would handle UXO that they might observe within this OOU. Education could be accomplished by holding public meetings and presenting printed material to visitors, and members of the public. This education process would be most effectively implemented for the entire site, rather than by OOUs.

7.2.1.1.2 Portions of Sector A are frequently used by tourists as hiking and bird watching areas. Many tourists stay on the roads due to the dense vegetation which is difficult to traverse. Only a few tourists hike into the woods. Local residents and tourists also climb the rocks along the coast to fish and hike. The only fence that restricts access to Sector A is located at the entrance to Flamenco Beach (to the south). When the beach is open, there is no restriction of access to Sector A. Sign posting and fencing across main access points along the southern boundary of this OOU (from Flamenco Beach to across the ridge). Additional fence will be installed across small beachs located on the east side of Northwest Peninsula.

7.2.1.1.3 Sector B of the Northwest Peninsula is restricted to public for recreational activities without a permit from the USFWS. A fence was constructed on the south side of this sector by the USFWS to restrict access into this sector. Sign posting and fencing around the entire OOU would further restrict public access to the OOU.

7.2.1.1.4 The protection level provided by Alternative 2 is limited but is higher than Alternative 1 because of the effects of education programs, sign posting, and fence construction. As with Alternative 1, this alternative leaves contaminants in place and provides little increased protection to the public and the environment.

7.2.1.1.5 Alternative 3, Surface Clearance, would provide permanent protection to the public who are not engaged in intrusive activities. Implementing this alternative would remove surficial OE contaminants, but would leave a potential risk of public and environmental exposure to buried OE. This alternative would provide significant protection to the public and environment.

7.2.1.1.6 Sector B is fenced and public access is restricted. Alternative 3, Surface Clearance, would provide a limited increase in risk reduction than Alternative 2. Since the sector is administered by the USFWS, it is anticipated that USFWS will be able to adequately control potential intrusive activities. Implementing this alternative would not include removing buried contaminants, which would leave a potential risk of public and environmental exposure to buried OE. This alternative would provide significant protection of the public and the environment.

7.2.1.1.7 Alternative 4, Clearance for Use, would reduce the risk of direct contact with UXO in areas requiring clearance due to a specific activity. This alternative would slightly reduce the risk or potential for contact in areas not cleared. For cost estimation purposes, ESE anticipates 10 percent of the land (high usage) will require clearing for trails and for constructing a fire break. The other 90 percent of the land (minimal usage) will undergo a limited visual inspection, limited geophysical investigation, and UXO disposal. This alternative will provide protection of public health in areas of greatest exposure.

7.2.1.1.8 Alternative 5, Complete Clearance, would provide only a minimal reduction of risk over Alternative 3 and Alternative 4 but would provide the maximum possible protection to the public and the environment.

7.2.1.2 Long-Term Effectiveness and Permanence

7.2.1.2.1 Alternative 1, No Further Action, implements no action at the site. Therefore, this alternative would have no impact on long-term effectiveness and permanence.

7.2.1.2.2 With sign posting, educational programs, and increased access restriction (fencing), Alternative 2 would be effective in reducing the risk to public. The fence may require periodic repair due to damage by visitors and the corrosion due to humidity and salt mist in the air. If

properly maintained, the fence would provide a relatively permanent deterrent to visitors wishing to enter the Northwest Peninsula.

7.2.1.2.3 The public information portion of Alternative 2 would be effective if it is maintained through periodic evaluation and reinforcement. However, significant liability and risk would persist because the potential contaminants would not be destroyed and would remain in place.

7.2.1.2.4 With Alternative 2, future construction activities would not be permitted within this OOU since no OE items are removed. There have been discussions regarding constructing hiking trails and a firebreak at this OOU. While this alternative would reduce the risk of OE exposure in proposed hiking areas, construction of these would require clearance of buried OE not included in this alternative.

7.2.1.2.5 Alternative 3, Surface Clearance, would be an effective method of reducing exposure to members of the public who are not engaged in intrusive activities. However, the possibility of exposure during intrusive activities would remain. Implementing this alternative would not include removal of buried contaminants, which would leave a potential risk to the public and the environment.

7.2.1.2.6 This alternative would not include clearance to the depth, which would be required for constructing the proposed fire break.

7.2.1.2.7 Alternative 4, Clearance for Use, would provide an effective and permanent means of clearing areas likely to be used by the public. The risk of OE exposure will be slightly reduced in areas where complete clearing operations have not been performed. In most of the low access areas, public access would be limited by dense vegetation.

7.2.1.2.8 Alternative 5, Complete Clearance, would provide little increased risk reduction over Alternatives 3 and 4. Implementing this alternative, however, would be effective and permanent.

7.2.1.3 Reduction of MTV

The MTV of the potential OE contamination would remain unchanged with implementation of Alternatives 1 or 2.

7.2.1.3.1 Alternative 3, Surface Clearance, would partially reduce the volume of contaminants within the OOU. OE discovered on the surface would be removed or destroyed under this

alternative. However, any subsurface OE would remain; therefore, the MTV of the buried contaminants would remain unchanged.

7.2.1.3.2 During the EE/CA field investigation, approximately half the UXO items were detected at the surface in Sector A. No UXO item was detected at the surface in Sector B. Alternative 3 would be expected to provide significant volume reduction of OE contamination in Sector A and little reduction in Sector B.

7.2.1.3.3 Alternative 4, Clearance for Use, would significantly reduce the volume of the potential contaminants since a significant fraction of the subsurface OE as well as the surface OE would be removed.

7.2.1.3.4 Alternative 5, Complete Clearance, would provide a maximum volume reduction of the potential contaminants.

7.2.1.4 Short-Term Effects During Implementation

For Alternative 1, no action would be implemented. No risks are associated with the safety of workers during the implementation period.

7.2.1.4.1 For Alternative 2, Institutional Controls, minimal safety concerns would be associated with the potential for exposure of workers to OE while installing the security fence and while posting signs. No risk would be expected for the affected community and no adverse environmental impacts are expected from this alternative.

7.2.1.4.2 For Alternative 3, Surface Clearance, safety concerns would be primarily associated with the potential for exposure by workers removing the thick vegetation and by UXO specialists during surface clearance. The degree of exposure risk would vary depending on the clearing activities of different areas within the OOU. In OOU-2, the potential exists for exposure of workers to OE. However, the community could be affected by noise or restricted access to the OOU during implementation.

7.2.1.4.3 Alternative 4, Clearance for Use, has higher potential for exposure during OE clearance and removal activities. However, this exposure would be limited to workers who have been trained in handling and disposing of OE. The potential for the community to be affected (by noise or restricted access) would be greatest with this alternative.

7.2.1.4.4 Alternative 5, Complete Clearance, has the greatest potential for exposure during OE clearance and removal activities. However, this exposure would be limited to workers who have been trained in handling and disposing of OE. The potential for the community to be affected (by noise or restricted access) would be greatest with this alternative.

Alternatives 3, 4, and 5 will require the vegetation clearance. This will be a temporary impact as the vegetation would grow back after the operations. Care must be taken to ensure no endangered species will be affected.

7.2.1.5 Compliance with ARARs

For all alternatives, no chemical-specific ARARs are associated with OE. The action-specific ARARs potentially applicable to Alternatives 2, 3, 4, and 5 include excavation and worker safety (Table 3-2). No endangered plants or animals are anticipated in Sector A. However, several endangered nesting birds frequent the tip of the northwest peninsula in Sector B. The location-specific ARARs potentially applicable to Sector B (endangered birds) could limit excavation activities in some areas of Sector B.

7.2.2 Implementability

7.2.2.1 Technical Feasibility

Alternative 1 involves no removal action at the site.

7.2.2.1.1 Alternative 2, Institutional Controls, would be technically feasible and implementable. The education and public information portion of this alternative would be easily implementable. Sign posting and fencing at specific areas of the OOU should also be technically feasible.

7.2.2.1.2 Alternative 3, Surface Clearance, would be technically feasible. However, clearance of heavy brush and the effect of metallic minerals in the rocks on the magnetometers will make implementing this alternative technically difficult. EOD-trained personnel must be used during implementation of all the facets of the surface removal alternative.

7.2.2.1.3 Alternative 4, Clearance for use, would be technically feasible but clearance of heavy brush and the effect of metallic minerals in the rocks on the magnetometers will make implementing this alternative technically difficult. EOD-trained personnel must be used during implementation of all facets of the clearance for use alternative.

7.2.2.1.4 Alternative 5, Complete Clearance, would require clearance of all OE items present over the entire OOU. Although technically feasible, the probability of detection and removal of all OE items (100 percent clearance) would be limited due to thick vegetation. Clearance of heavy brush and the effect of metallic minerals in the rocks on the magnetometers will also make implementing this alternative difficult. EOD-trained personnel must be used during implementation of all the facets of the clearance for use alternative.

7.2.2.2 Administrative Feasibility

Alternative 1 would be administratively feasible.

7.2.2.2.1 For Alternative 2, Institutional Controls, public education, sign posting, and fencing would be administratively feasible at the entire OOU.

7.2.2.2.2 Alternatives 3, 4, and 5 would be administratively feasible. A biologist would be required to check for endangered plant and animal species. Close coordination with PRDNR and USFWS would be required during implementation of this alternative due to the amount of vegetation clearing and possible existence of endangered plant and animal species.

7.2.2.3 Availability of Services and Materials

Alternative 1 require no services or materials.

7.2.2.3.1 The services and materials required to implement Alternative 2 are readily available but are costly as transport to Culebra Island may be expensive. During installation of fencing and sign posts, EOD-trained personnel would be required to clear the site where sign and fence posts are installed and along the fencing route.

7.2.2.3.2 For Alternatives 3, 4, and 5, special equipment, skilled personnel, and technology for geophysical investigation would be required.

7.2.2.3.3 For all alternatives, special skills, equipment, and personnel would be required if buried ordnance is discovered and must be detonated or disposed of. The proper safety precautions would require implementation to prevent untrained personnel from handling these materials.

7.2.2.4 Local Government Acceptance

The need for local government acceptance is not anticipated for Alternative 1.

7.2.2.4.1 For Alternative 2, the need for local government approval is not anticipated. The need for USFWS and PRDNR acceptance is anticipated and their approval is expected.

7.2.2.4.2 PRDNR and USFWS acceptance of Alternatives 3 and 5 will be required prior to implementation. ESE anticipates that permission to clear vegetation and surface ordnance in the Northwest Peninsula will be given only for portions of the area. A biological survey to investigate the existence of endangered plant and animal species would be required prior to the investigation.

7.2.2.4.3 For Alternative 4, Clearance for use, PRDNR and USFWS plan to build hiking trails to make this OOU more accessible to the visitors and a fire break to protect the Sooty Tern nesting area. Therefore, PRDNR and USFWS acceptance of Alternative 4 in selected areas of the OOU is anticipated.

7.2.2.5 Community Acceptance

The community will probably not express concerns regarding Alternative 1, due to very limited accessibility of OOU-2 to the public. However, the community concerns over evidence of OE contamination may increase after construction of the hiking trails.

7.2.2.5.1 It is expected that the community would accept Alternative 2, excluding fencing, for Sector A and B. However, the community would probably object to the construction of a perimeter fence around the OOU. The local community wishes to open up the entire Northwest Peninsula to Hiking Trails. This alternative would not allow hiking in the area.

7.2.2.5.2 Alternatives 3, 4, and 5 would receive some resistance by the immediate community, since it will temporarily restrict access to the area during the clearance operation and create short-term inconvenience (noise and limited access for hiking and bird watching) in selected areas.

Alternatives 3, 4, and 5 are expected to be received favorably in the long term by the community as this alternative will permit opening hiking trails to the public.

7.2.3 Cost

Alternative 1 incurs no cost and would be therefore the least expensive of the five alternatives. Alternatives 2, 3, 4, and 5 each incur increasing costs, beginning with Alternative 2.

7.2.3.1 The total estimated cost to implement the education/information portion of Alternatives 2, 3, 4, or 5 is $25,000 to $50,000. This encompasses OOU-1 through OOU-5 and cannot effectively be divided among the individual OOUs. To maintain the program, an estimated $2,500 to $5,000 per year is expected to be required.

7.2.3.2 The total estimated costs to implement Alternatives 2, 3, 4, and 5 are $112,000, $1,130,000, $2,940,000, and $7,000,000, respectively, and in addition, the Education/Information Program cost. For Alternative 4 the cost estimates are calculated based on the assumption that 10 percent of the unit will undergo a complete clearance. The remaining 90 percent of the unit will receive limited clearance. This clearance will consist of a limited geophysical investigation, visual inspection, and the removal of surface and near surface OE. All assumptions made to determine quantities are stated in Appendix L.

7.3 OOU-3 — Cerro Balcon

Cerro Balcon is located approximately 2.5 miles from the former Lower Camp on Culebra Island. The entire range fan, including impact area, is approximately 80 acres. The impact area is approximately 30 acres and is located at the base of Cerro Balcon. The site was used as a mortar range during the 1930s.

7.3.0.1 The site is privately administered and is currently used for cattle and goat grazing. It is covered with tall grasses and brush with scattered trees. Occasional activities at this OOU may include hiking and horse-back riding.

7.3.0.2 During the EE/CA investigation, OOU-3 was only partially investigated due to one land owner not approving the right-of-entry and the largest portion of the mortar impact area was not investigated. No UXO items were detected at the OOU. The ORS collected included 60mm mortar fragments and other unidentifiable fragments.

Although UXO items were not detected during the EE/CA field investigation, a civilian casualty occurred in 1935 when a boy was playing with UXO items from this mortar range.

7.3.1 Effectiveness

7.3.1.1 Overall Protection of Public Health and the Environment

Alternative 1, No Further Action, provides no additional risk reduction. The potential contaminants remain in place and there would be no risk reduction of ordnance exposure.

7.3.1.1.1 Alternative 2, Institutional Controls, would minimize the likelihood that private owners and visitors would handle OE that might be encountered within this OOU.

7.3.1.1.2 Education could be accomplished by holding public meetings and presenting printed material to visitors and property owners. The education process would be effectively implemented for the entire site rather than individual OOUs. Sign posting at specific areas would reinforce warnings about risk of exposure to OE. Access restrictions (fencing) would not be feasible as the property is privately owned.

7.3.1.1.3 The protection level provided by Alternative 2 would be limited but higher than Alternative 1 because of the effects of education programs and sign posting. As with Alternative 1, this alternative leaves contaminants in place and provides little increased protection to the public and the environment.

7.3.1.1.4 Alternative 3, Surface Clearance, would reduce the risk of UXO exposure to the land owners, visitors, and animals. This alternative would provide significant risk reduction to those who are not engaged in intrusive activities. The possibility of exposure during intrusive activities would remain throughout the entire OOU.

7.3.1.1.5 Alternative 4, Clearance for use, would reduce the risk and potential for direct contact with OE over Alternative 3 in areas requiring clearance due to a specific activity. This alternative would slightly reduce the risk or potential for contact in areas not cleared. For the purpose of cost estimation, ESE anticipates 25 percent of the land (high usage) will require clearing for possible farming and construction. The remaining 75 percent of the land (minimal usage) will undergo visual inspection, limited geophysical investigation and OE disposal. This alternative will provide protection of public health in areas of greatest exposure.

7.3.1.1.6 At this time, there are no plans to build in the impact area, but building construction may be planned for the south and east sides of Cerro Balcon. Although the likelihood of OE in these areas is low, a few ordnance items may have been erroneously fired over the hill. It may be prudent to clear any OE prior to any construction activities in the Cerro Balcon vicinity. Plans for

construction have not been made available to ESE and therefore will not be included in the cost for this Alternative 4.

7.3.1.1.7 Alternative 5, Complete Clearance, would provide only a minimal increase in risk reduction over Alternatives 3 and 4.

7.3.1.2 Long-Term Effectiveness and Permanence

7.3.1.2.1 Alternative 1, No Further Action, implements no action at the site. Therefore, this alternative would have no impact on long-term effectiveness and permanence.

7.3.1.2.2 With the sign posting and educational program components of Alternative 2, Institutional Controls, risk of UXO exposure to the land owners and visitors would be reduced.

7.3.1.2.2.1 Access restrictions (fencing) would not be feasible as the property is privately administered. This alternative would be effective if the integrity of the institutional controls is maintained through periodic evaluation. Liability and risk would persist because the potential contaminants would not be destroyed and would remain in place.

7.3.1.2.4 Alternative 3, Surface Clearance, would be a reliable means of reducing exposure to land owners and visitors who are not engaged in intrusive activities. However, the possibility of exposure during intrusive activities would remain. Implementing this alternative would not ensure removal of all potential contaminants, which would leave a potential risk to the public and the environment.

7.3.1.2.5 Alternative 4, Clearance for use, would significantly reduce the potential for exposure to OE. Implementing this alternative would be effective and permanent in the areas cleared. In areas not cleared, the potential exposure to OE would not be reduced. Future construction activities would be possible at this OOU provided the site is cleared for UXO prior to construction.

7.3.1.2.6 Alternative 5, Complete Clearance, would provide little increased risk reduction over Alternative 4, provided intrusive activities are prohibited at areas not cleared by Alternative 4.

7.3.1.2.6.1 With Alternative 5, future construction activities would be possible anywhere within the OOU.

7.3.1.3 Reduction of MTV

The MTV of the potential OE contamination would remain unchanged with implementation of Alternatives 1 or 2.

7.3.1.3.1 Alternative 3, Surface Clearance, would partially address the threats associated with exposure to possible OE contamination. OE discovered on the surface would be removed or destroyed under this alternative. However, any subsurface OE would remain; therefore, the MTV of the buried contaminants would remain unchanged. Only a small reduction in the volume of OE is anticipated with implementation of Alternative 3.

7.3.1.3.2 Alternative 4, Clearance for Use, would significantly reduce the volume of the potential contaminants in critical use areas (i.e. construction sites, plowed fields).

7.3.1.3.3 Alternative 5, Complete Clearance, would provide a maximum volume reduction of the potential contaminants.

7.3.1.4 Short-Term Effects During Implementation

For Alternative 1, no action would be implemented. No risks are associated with the safety of workers during the implementation period.

7.3.1.4.1 For Alternative 2, Institutional Controls, minimal safety concerns would be associated with the potential for exposure of workers to OE while posting signs and installing fence posts. No risk is expected for the affected property owners and no adverse environmental impacts are expected from this alternative.

7.3.1.4.2 For Alternative 3, Surface Clearance, safety concerns would be primarily associated with the potential for exposure of UXO specialists during surface clearance. The degree of exposure risk would vary depending on the clearing and inspection activities of different areas within the OOU. In OOU-3, the potential exists for worker exposure to OE; however, little risk is expected to the affected property owners. However, the property owners could be affected by noise or restricted access to the OOU during implementation.

7.3.1.4.3 Alternative 4, Clearance for Use, has higher potential for exposure of workers during OE clearance and removal activities. However, this exposure would be limited to workers who have been trained in handling and disposing of OE. The potential for the property owners to be affected (by noise or restricted access) would be greatest with this alternative.

7.3.1.4.4 Alternative 5, Complete Clearance, has the greatest potential for exposure during OE clearance and removal activities. However, this exposure would be limited to workers who have been trained in handling and disposing of OE. The potential for the property owners to be affected (by noise or restricted access) would be greatest with this alternative.

7.3.1.5 Compliance with ARARs

For all alternatives, no chemical-specific ARARs are associated with OE. The action-specific ARARs potentially applicable to Alternatives 2, 3, 4, and 5 include excavation and worker safety (Table 3-2). The location-specific ARARs potentially applicable to OOU-3 (endangered plants and animals) could limit excavation activities in portions of the OOU.

7.3.2 Implementability

7.3.2.1 Technical Feasibility

Alternative 1 involves no removal action at the site.

7.3.2.1.1 Alternative 2, Institutional Controls, would be technically feasible and implementable. The education and public information portion of this alternative would be easily implementable. Sign posting at specific areas of the OOU would also be technically feasible. Fencing would not be feasible as this OOU is privately owned.

7.3.2.1.2 Alternative 3, Surface Clearance, would be technically feasible. However, clearance of heavy brush and the effect of metallic minerals in the rocks on the magnetometers will make implementing this alternative technically difficult. EOD-trained personnel must be used during implementation of all the facets of the surface removal alternative.

7.3.2.1.3 Alternative 4, Clearance for use, would be technically feasible, but clearance of heavy brush and the effect of metallic minerals in the rocks on the magnetometer, will make implementing this alternative technically difficult. EOD-trained personnel must be used during implementation of all facets of the clearance for use alternative. Public education (see Institutional Controls) should be conducted as an integral part of this alternative.

7.3.2.1.4 Alternative 5, Complete Clearance, would require clearance of all OE items present at the entire OOU. Although technically feasible, the probability of detection and removal of all OE items (100 percent clearance) would be limited due to thick brush and thick tall grass. Clearance of heavy brush and the effect of metallic minerals in the rocks on the magnetometer, will also

make implementing this alternative difficult. EOD-trained personnel must be used during implementation of all facets of the clearance for use alternative. Public education (see Institutional Controls) should be conducted as an integral part of this alternative.

7.3.2.2 Administrative Feasibility

Alternative 1 would be administratively feasible.

7.3.2.2.1 For Alternative 2, Institutional Controls, education of the property owners and sign posting would be administratively feasible at the entire OOU. Fencing would not be feasible as this OOU is privately owned.

7.3.2.2.2 Alternative 3, Surface Clearance, may not be administratively feasible in portions of the OOU as it may be difficult to obtain rights-of-entry permits from the property owners. Also, considerable vegetation clearance would be required in portions of the OOU, which may not be acceptable to the property owners. The presence of endangered species would increase the difficulty involved with implementing this alternative administratively.

7.3.2.2.3 Alternative 4, Clearance for Use, may not be administratively feasible in portions of the OOU, as it may be difficult to obtain rights-of-entry permits from the property owners. Also, considerable vegetation clearance would be required in portions of the OOU, which may not be acceptable to the property owners. The presence of endangered species would increase the difficulty involved with implementing this alternative administratively.

7.3.2.2.4 Alternative 5, Complete Clearance, would be expected to be difficult to implement in some areas of the OOU as it may be difficult to obtain rights-of-entry permits from the property owners. Also, this alternative would require considerable vegetation clearance in portions of the OOU, which may not be acceptable to the property owners. The presence of endangered species would increase the difficulty involved with implementing this alternative administratively.

7.3.2.3 Availability of Services and Materials

Alternative 1 requires no services or materials.

7.3.2.3.1 The services and materials required to implement Alternative 2 would be readily available. However, during installation of signs and fencing, EOD-trained personnel would be required to clear the area.

7.3.2.3.2 For Alternatives 3, 4 and 5, special equipment, skilled personnel, and technology for geophysical investigation would be required.

7.3.2.3.3 For all alternatives, special skills, equipment, and personnel would be required if buried ordnance is discovered and must be detonated or disposed of. The proper safety precautions would require implementation to prevent untrained personnel from handling these materials.

7.3.2.4 Local Government Acceptance

The need for local government acceptance is not anticipated for Alternative 1.

7.3.2.4.1 For Alternative 2, no local government permits or approvals are anticipated.

7.3.2.4.2 For Alternative 3, local government approvals are anticipated.

7.3.2.4.3 For Alternative 4, local government approvals are anticipated.

7.3.2.4.4 For Alternative 5, local government approvals are anticipated.

7.3.2.5 Community Acceptance

OOU-3 is privately owned and the community would have no involvement in the approval or disapproval of the alternative. The property owners may express concerns regarding Alternative 1, due to the evidence of OE contamination.

7.3.2.5.1 It is expected that it would be impossible to obtain the property owners approval to implement either sign posting or fencing components of Alternative 2.

7.3.2.5.2 Alternatives 3, 4, and 5 will be well received by some property owners, since it will remove any OE contamination present on their properties. However, it is anticipated that some property owners may deny the rights-of-entry to implement the alternative.

7.3.3 Cost

Alternative 1 incurs no cost and would be therefore the least expensive of the five alternatives. Alternatives 2, 3, 4, and 5 each incur increasing costs, beginning with Alternative 2.

7.3.3.1 The total estimated cost to implement the education/information portion of Alternatives 2, 3, 4, or 5 is $25,000 to $50,000. This encompasses OOU-1 through OOU-5 and cannot effectively be divided among the individual OOUs. To maintain the program, an estimated $2,500 to $5,000 per year is expected to be required. Alternative 4 cost estimates are calculated based on the assumption that 25 percent of the unit will undergo a complete clearance. The remaining 75 percent of the unit will receive limited clearance. This clearance will consist of a limited geophysical investigation, visual inspection, and the removal of surface and near surface OE. All assumptions related to these cost estimations are provided in Appendix K.

7.3.3.2 The total estimated cost to implement Alternatives 2, 3, 4, and 5 is $12,000, $200,000, $298,000, $398,000, respectively, in addition to the Education/Information Program cost.

7.4 OOU-4 - Isla Culebrita

Isla Culebrita comprises approximately 366 acres and is approximately 1 mile east of Culebra Island. The strafing range of the OOU comprises approximately 82 acres. Isla Culebrita has sandy beaches, a rocky shoreline, moderate to steep hills, and light to dense vegetation.

7.4.0.1 Isla Culebrita is administered by USFWS. Approximately 20,800 people visit the island each year to participate in hiking and water activities. There are currently plans to convert the lighthouse located on the island into a bed and breakfast establishment.

7.4.0.2 During the EE/CA investigation, 16 UXO items were excavated and 23 UXO items were collected from the land surface (all 20mm HEI). Several ORS including a mortar fragment were also detected.

7.4.1 Effectiveness

7.4.1.1 Overall Protection of Public Health and the Environment

Alternative 1, No Further Action, provides no additional risk reduction. The potential contaminants remain in place and there would be no risk reduction of ordnance exposure.

7.4.1.1.1 Alternative 2, Institutional Controls, would minimize the likelihood that the public would handle OE that they might observe within this OOU during hiking and water activities. Education could be accomplished by holding public meetings and presenting printed material to visitors and other members of the public. This education process would be most effectively implemented for the entire site rather than by individual OOUs.

7.4.1.1.2 Isla Culebrita is administered by the USFWS and access restrictions (e.g., regular patrolling) are already in place for this OOU. Sign posting and fencing at specific areas would further reinforce warnings about risk of exposure to OE.

7.4.1.1.3 The protection level provided by Alternative 2 is limited but is higher than Alternative 1 because of the effects of education programs, sign posting, and fence construction. As with Alternative 1, this alternative leaves contaminants in place and provides little increased protection to the public and the environment.

7.4.1.1.4 Alternative 3, Surface Clearance, would provide an increased risk reduction to public who are not engaged in intrusive activities. The possibility of exposure during intrusive activities would remain at the entire OOU. Since the OOU is administered by the USFWS, it is anticipated that the potential intrusive activities could be easily controlled. Implementing this alternative would not ensure removal of all contaminants, which would leave a potential risk to the public and the environment.

7.4.1.1.5 Alternative 4, Clearance for Use, would slightly reduce the risk and potential for direct contact with OE over Alternative 3. For the purpose of cost estimation, ESE anticipates 25 percent of the land (high usage) will require clearing for trails. The remaining 75 percent (minimal usage) will undergo visual inspection, geophysical investigation, and limited excavation to 6-inch depth. This alternative will provide protection of public health in areas of greatest exposure.

7.4.1.1.6 Alternative 5, Complete Clearance, would provide only a minimal increase in risk reduction to the public over Alternatives 3 and 4.

7.4.1.2 Long-Term Effectiveness and Permanence

7.1.1.2.1 Alternative 1, No Further Action, implements no action at the site. Therefore, this alternative would have no impact on long-term effectiveness and permanence.

7.4.1.2.2 With the sign posting, fencing, and educational program components of Alternative 2 (Institutional Controls), risk to the public visiting the island would be reduced. Future construction activities would be possible with the implementation of Alternative 2 provided the site is cleared for UXO prior to construction.

7.4.1.2.3 Alternative 2 would be effective if the integrity of the institutional controls is maintained through periodic evaluation. However, liability and risk would persist because the potential contaminants would not be destroyed and would remain in place.

7.4.1.2.4 Alternative 3, Surface Clearance, would be a reliable means of reducing exposure to members of the public who are not engaged in intrusive activities. However, the possibility of exposure during intrusive activities would remain. Implementing this alternative would not ensure removal of all potential contaminants, which would leave a potential risk to the public and the environment.

7.4.1.2.5 Alternative 4, Clearance for Use, would significantly reduce the potential for exposure to OE. Implementing this alternative would be effective and permanent, unless intrusive activities are initiated below the depth cleared.

7.1.1.2.6 Alternative 5, Complete Clearance, would provide little increased risk reduction over Alternative 4, provided intrusive activities are prohibited at areas not cleared with Alternative 4.

Since the OOU is administered by USFWS, it is anticipated that the potential intrusive activities could be easily controlled.

7.4.1.3 Reduction of MTV

The MTV of the potential OE contamination would remain unchanged with implementation of Alternatives 1 or 2.

7.4.1.3.1 Alternative 3, Surface Clearance, would partially address the threats associated with exposure to possible OE contamination. OE discovered on the surface would be removed or destroyed with this alternative. However, any subsurface OE would remain; therefore, the MTV of the buried contaminants would remain unchanged. Only a small reduction in the volume of OE is anticipated with implementation of Alternative 3.

7.4.1.3.2 Alternative 4, Clearance for Use, would slightly reduce the volume of potential contaminants.

7.4.1.3.3 Alternative 5, Complete Clearance, would provide a maximum volume reduction of potential contaminants. The maximum volume reduction will be only slightly greater than that of Alternative 3.

7.4.1.4 Short-Term Effects During Implementation

For Alternative 1, no action would be implemented. No risks are associated with worker safety during the implementation period.

7.1.1.4.1 For Alternative 2, Institutional Controls, minimal safety concerns would be associated with the potential for worker exposure to OE while posting signs and installing fences. No risk would be expected for the affected community and no adverse environmental impacts are expected from this alternative.

7.4.1.4.3 For Alternative 3, Surface Clearance, safety concerns would be primarily associated with the potential for exposure to UXO specialists during surface clearance. The degree of exposure risk would vary depending on the clearing and inspection activities of different areas within the OOU. In OOU-4, the potential exists for worker exposure to OE; however, little risk would be expected for the affected community. However, the community could be affected by restricted access to the OOU during implementation. Noise effects associated with disposing of OE items is expected to be minimal since the cay is located far from inhabited areas.

7.4.1.4.4 Alternative 4, Clearance for Use, has higher potential for exposure during OE clearance and removal activities. However, this exposure would be limited to workers who have been trained in handling and disposing of OE. The potential for the community to be affected (by restricted access) would be greatest with this alternative. Noise effects associated with the disposal of OE items is expected to be minimal since the cay is located far from inhabited areas.

7.4.1.4.5 Alternative 5, Complete Clearance, has the greatest potential for worker exposure during OE clearance and removal activities. However, this exposure would be limited to workers who have been trained in handling and disposing of OE. The potential for the community to be affected (by restricted access) would be greatest with this alternative. Noise effects associated with the disposal of OE items is expected to be minimal since the cay is located far from inhabited areas.

7.4.1.4.6 Various types of sea turtles nest in the beach area during different times of the year. During nesting season, the beaches of concern are off limits to visitors. Some endangered birds use brush on sandy beaches for nesting areas. The USFWS must be notified prior to activities in and around the beaches. The activities associated with implementing Alternatives 2, 3, 4, or 5 should be coordinated with the USFWS and should not be performed during turtle nesting season.

7.4.1.4.7 Several times a year, rough seas make access to the cay difficult. Winter swells can reach 5 to more than 10 ft. The activities associated with implementing Alternatives 2, 3, 4, or 5 should be carefully coordinated to avoid bad weather.

7.4.1.5 Compliance with ARARs

For all alternatives, no chemical-specific ARARs are associated with OE. The action-specific ARARs potentially applicable to Alternatives 2, 3, 4, and 5 include excavation and worker safety (Table 3-2). The location-specific ARARs potentially applicable to OOU-4 (endangered animals) could limit excavation activities to specific areas of the OOU.

7.4.2 Implementability

7.4.2.1 Technical Feasibility

Alternative 1 involves no removal action at the site.

7.4.2.1.1 Alternative 2, Institutional Controls, would be technically feasible and implementable. The education and public information portion of this alternative would be easily implementable. Sign posting and fencing at specific areas of the OOU should also be technically feasible.

7.4.2.1.2 Alternative 3, Surface Clearance, would be technically feasible. However, clearance of heavy brush will make implementing this alternative technically difficult in some areas. EOD-trained personnel must be used during implementation of all the facets of the surface removal alternative. Public education (see Institutional Controls) should also be conducted as an integral part of this alternative.

7.4.2.1.3 Alternative 4, Clearance for use, would be technically feasible but clearance of heavy brush and magnetic rocks will make implementing this alternative technically difficult in some areas. EOD-trained personnel must be used during implementation of all the facets of the clearance for use alternative. Public education (see Institutional Controls) should be conducted as an integral part of this alternative.

7.4.2.1.4 Alternative 5, Complete Clearance, would require clearance of all OE items present at the entire OOU. Although technically feasible, the probability of detection and removal of all OE items (100 percent clearance) would be limited due to thick vegetation and the effect of magnetic rocks on the magnetometers. Sea conditions can severely limit the activities.

7.4.2.1.6 EOD-trained personnel must be used during implementation of all the facets of the clearance for use alternative. Public education (see Institutional Controls) should be conducted as an integral part of this alternative.

7.4.2.1.7 OOU-4 cannot be accessed by land. Therefore, implementation of Alternatives 2, 3, 4, or 5 would be difficult since transportation of the services and material to and from the OOU can be achieved only by boat and will depend on the condition of the seas.

7.4.2.2 Administrative Feasibility

Alternative 1 would be administratively feasible.

7.4.2.2.1 For Alternative 2, Institutional Controls, public education, fencing, and sign posting would be administratively feasible at the entire OOU.

7.4.2.2.2 Alternative 3, Surface Clearance, would be administratively feasible at OOU-4. However, close coordination with USFWS would be required during implementation. The activities should be carefully planned to avoid rough sea conditions and the sea turtle nesting season. Some resistance from the community during implementation of this alternative should be expected as access to the site will be prevented.

7.4.2.2.3 Alternative 4, Clearance for Use, would be administratively feasible at OOU-4. Close coordination with USFWS would be required during implementation. The activities should be carefully planned to avoid rough sea conditions and the sea turtle nesting season. Some resistance from the community during implementation of this alternative should be expected as access to the site will be prevented. Some location-specific ARARs (endangered animals and birds) may restrict excavation activities at some areas.

7.4.2.2.4 Alternative 5, Complete Clearance, would be expected to receive more administrative restrictions to excavate in some areas of the OOU than Alternative 4. Close coordination with USFWS would be required during implementation. The activities should be carefully planned to avoid rough sea conditions and the sea turtle nesting season. Some resistance from the community during implementation of this alternative should be expected as access to the site will be prevented. Location-specific ARARs (endangered animals and birds) may restrict excavation activities at some areas of the OOU.

7.4.2.3 Availability of Services and Materials

Alternatives 1 require no services or materials.

7.4.2.3.1 The services and materials required to implement Alternative 2 are readily available. During installation of signs and fencing, EOD-trained personnel should clear the area. However, there could be significant logistic problems to implement fencing and sign posting components of the alternative.

7.4.2.3.2 The services and materials required to implement Alternatives 3, 4, or 5 are readily available. However, there could be significant logistic problems to implement certain components (material and worker transportation to the island by boats) of these alternatives. These alternatives would require land clearing prior to implementation. They would also require special equipment and skilled personnel (EOD training).

7.4.2.3.3 For all alternatives, special skills, equipment, and personnel would be needed if buried ordnance is discovered and must be detonated or disposed of. The proper safety precautions would require implementation to prevent untrained personnel from handling these materials.

7.4.2.4 Local Government Acceptance

The need for local government acceptance is not anticipated for Alternative 1.

7.4.2.4.1 For Alternative 2, no local permits or approvals are anticipated. However, USFWS acceptance would be required to implement Alternative 2. USFWS approval to implement the alternative is anticipated. However, the agency could restrict activities during certain periods of the year (e.g., sea turtle breeding off-season) and in certain areas.

7.4.2.4.2 For Alternative 3 or 4, local and USFWS acceptance is anticipated. However, the agency could restrict activities during certain periods of the year.

7.4.2.4.3 For Alternative 5, local and USFWS acceptance is not readily anticipated since some location-specific ARARs (endangered animals and birds) could limit excavation activities in specific areas of the OOU. The agency could also restrict activities during certain periods of the year.

7.4.2.5 Community Acceptance

The community may express concerns regarding Alternative 1, due to the accessibility of OOU-4 to the public and the evidence of OE contamination.

7.4.2.5.1 It is expected that the local community, to a large extent, would accept all components of Alternative 2, except fencing, unless an injury occurred as a result of contact with OE. Fencing would severely limit the access of the site to the tourists. The community may express concerns due to the accessibility of OOU-4 to the public and the evidence of OE contamination.

7.4.2.5.2 Alternatives 3, 4, and 5 will be received with some resistance by the immediate community, since it will restrict community activities (e.g., hiking and water activities) in OOU-4 during implementation.

7.4.3 Cost

Alternative 1 incurs no cost and would be therefore the least expensive of the five alternatives. Alternatives 2, 3, 4, and 5 each incur increasing costs, beginning with Alternative 2.

7.4.3.1 The total estimated cost to implement the education/information portion of Alternatives 2, 3, 4, or 5 is $25,000 to $50,000. This encompasses OOU-1 through OOU-5 and cannot effectively be divided among the individual OOUs. To maintain the program, an estimated $2,500 to $5,000 per year is expected to be required. The cost estimates are calculated based on the assumption that 95 percent of the unit will undergo a complete clearance. The remaining 5 percent of the unit will receive limited clearance. This clearance will consist of a limited geophysical investigation, visual inspection, and the removal of surface and near surface OE. All assumptions made to determine quantities are provided in Appendix J.

7.4.3.2 The total estimated costs to implement Alternatives 2, 3, 4, and 5 are $378,000, $678,000, $2,060,000, and $2,120,000, respectively, in addition to the Education/Information Program cost.

7.5 OOU-5 — Other Surrounding Cays

OOU-5 consists of several surrounding cays including Geniqui, Botella, Tiburon, del Agua, Lobo, Alcarraza, and Gemelos. These cays are located in a radius less than 3 miles from Culebra Island and vary in size from 1 to 20 acres. Tiburon is the smallest and Lobo is the largest cay.

7.5.0.1 All cays are administered by USFWS and access is regulated. Access to the cays is difficult due to rocky shores and shallow reefs. However, approximately 200 people (primarily poachers) visit these cays every year.

7.5.0.2 The cays were used for various purposes including bombing range, aerial targets, and torpedo targets. During the EE/CA investigation, 11 UXO items were detected in the subsurface and 9 UXO items were detected on the surface. Several ORS items were also detected at the cays.

7.5.1 Effectiveness

7.5.1.1 Overall Protection of Public Health and the Environment

Alternative 1, No Further Action, provides no additional risk reduction. The potential contaminants remain in place and there would be no risk reduction to ordnance exposure.

7.5.1.1.1 The cays are off limits to the general public without a permit. However, people illegally visiting the cays would be at risk of ordnance exposure. The sign posting component of Alternative 2 reduces the likelihood that people would handle OE that they might observe within this OOU. Institutional controls through fencing would be the most effective deterrent to unauthorized visitors. Education could be accomplished by holding public meetings and presenting printed material to visitors and other members of the public. This education process would be most effectively implemented for the entire site rather than by individual OOUs.

7.5.1.1.3 The protection level provided by Alternative 2 is expected to be significant because of the effects of education programs, sign posting, and fence construction, because the cays are off limits to the general public without a permit. Also, the cays can only be accessed by water. As with Alternative 1, this alternative leaves contaminants in place and provides little increased protection to the public and the environment.

7.5.1.1.4 Alternative 3, Surface Clearance, would provide an increased risk reduction to public illegally visiting the cays and the USFWS personnel who are not engaged in intrusive activities. The possibility of exposure during intrusive activities would remain at the entire OOU. Since the OOU is administered by USFWS, it is anticipated that it would be easier to control potential intrusive activities. Implementing this alternative would not ensure removal of all contaminants, which would leave a potential risk to the public and the environment.

7.5.1.1.5 Alternative 4, Clearance for Use, would slightly reduce the risk and potential for direct contact with OE over Alternative 3. This alternative will provide protection of public health in areas of greatest exposure.

7.5.1.1.6 Alternative 5, Complete Clearance, would provide only a minimal increase in risk reduction to public over Alternatives 3 and 4 for direct contact with OE, since the potential for intrusive activities at the cays would be minimal.

7.5.1.2 Long-Term Effectiveness and Permanence

7.5.1.2.1 Alternative 1, No Further Action, implements no action at the site. Therefore, this alternative would have no impact on long-term effectiveness and permanence.

7.5.1.2.2 The sign posting and educational program components of Alternative 2, Institutional Controls, would not effectively deter unauthorized visitors to the cays, but would inform them of the dangers associated with UXO items. Access restriction through fencing would have a long-term effect in discouraging unauthorized visitors to the cays.

7.5.1.2.3 Alternative 2 would be effective if the integrity of the institutional controls is maintained through periodic evaluation. However, liability and risk would persist because the potential contaminants would not be destroyed and would remain in place.

7.5.1.2.4 Alternative 3, Surface Clearance, would be a reliable means of reducing exposure to members of the public who are not engaged in intrusive activities. Intrusive activities are not expected since the cays are patrolled and visitors are not allowed without a permit. Implementing this alternative would not ensure removal of all potential contaminants, which would leave a potential risk to the public and the environment. This alternative would reduce the risk of ordnance exposure to USFWS personnel and volunteers who monitor the wildlife.

7.5.1.2.5 Alternative 4, Clearance for Use, would provide only a slight increase in risk reduction over Alternative 4 since little intrusive activity is expected at the cays.

7.5.1.2.6 Alternative 5, Complete Clearance, would provide little increased risk reduction over Alternative 4, since most of the OE is expected to be found near the surface and little intrusive activity would be expected.

7.5.1.3 Reduction of MTV

The MTV of the potential OE contamination would remain unchanged with implementation of Alternatives 1 or 2.

7.5.1.3.1 Alternative 3, Surface Clearance, would partially address the threats associated with exposure to possible OE contamination. OE discovered on the surface would be removed or destroyed under this alternative. However, any subsurface OE would remain; therefore, the MTV of the buried contaminants would remain unchanged. Major reduction in the volume of OE is anticipated with implementation of Alternative 3.

7.5.1.3.2 Alternative 4, Clearance for Use, would reduce the volume of the potential contaminants.

7.5.1.3.3 Alternative 5, Complete Clearance, would significantly reduce the volume of the potential contaminants.

7.5.1.4 Short-Term Effectiveness

For Alternative 1, no action would be implemented. No risks are associated with the safety of workers during the implementation period.

7.5.1.4.1 Since access to most of the cays is hazardous because of surrounding reefs and rocky conditions, implementing Alternatives 2, 3, 4, or 5, would cause significant safety concerns to workers.

7.5.1.4.2 Potential for exposure of workers to OE while posting signs and installing fence would exist. However, no risk would be expected for the affected community and no adverse environmental impacts are expected from this alternative.

7.5.1.4.3 For Alternative 3, Surface Clearance, safety concerns would be primarily associated with the potential for exposure to UXO specialists during surface clearance. The degree of exposure risk would vary depending on the clearing and inspection activities of different areas within the OOU. In OOU-5, the potential exists for worker exposure to OE; however, little risk would be expected to the affected community. Noise effects associated with the disposal of OE items is expected to be minimal since the cay is located far from inhabited areas.

7.5.1.4.4 Alternative 4, Clearance for Use, has higher potential for exposure to workers during OE clearance and removal activities. However, this exposure would be limited to workers who have been trained in handling and disposing of OE. The potential for the community to be affected (by restricted access) would be greatest with this alternative. Noise effects associated with the disposal of OE items is expected to be minimal since the cays are located far from inhabited areas.

7.5.1.4.5 Alternative 5, Complete Clearance, has the greatest potential for exposure during OE clearance and removal activities. However, this exposure would be limited to workers who have been trained in handling and disposing of OE. The potential for the community to be affected (by restricted access) would be greatest with this alternative. Noise effects associated with the disposal of OE items is expected to be minimal since the cay is located far from inhabited areas.

7.5.1.4.6 Some endangered birds commonly use cays in the spring and summer. Therefore, any activities must be coordinated with USFWS.

7.5.1.4.7 Several times a year, access to the cays is difficult due to rough sea conditions and high tides reaching more than 10 ft. The activities associated with implementing Alternatives 2, 3, or 4 should be carefully coordinated to avoid bad weather.

7.5.1.5 Compliance with ARARs

For all alternatives, no chemical-specific ARARs are associated with OE. The action-specific ARARs potentially applicable to Alternatives 2, 3, 4, and 5 include excavation and worker safety (Table 3-2). The location-specific ARARs potentially applicable to OOU-5 (endangered animals) could limit excavation activities to specific areas of the OOU.

7.5.2 Implementability

7.5.2.1 Technical Feasibility

Alternative 1 involves no removal action at the site.

7.5.2.1.1 Alternative 2, Institutional Controls, would be technically feasible and implementable. The education and public information portion of this alternative would be easily implementable. Sign posting and fencing at specific areas of the OOU should also be technically feasible.

7.5.2.1.2 Alternative 3, Surface Clearance, would be technically feasible. However, clearance of heavy brush will make implementing this alternative technically difficult in some areas. EOD-trained personnel must be used during implementation of all the facets of the surface removal alternative. Public education (see Institutional Controls) should also be conducted as an integral part of this alternative. Sea conditions can severely limit the activities.

7.5.2.1.3 Alternative 4, Clearance for Use, would be technically feasible but clearance of brush and the effects of magnetic rocks on the magnetometer will make implementing this alternative technically difficult in some areas. Sea conditions can severely limit the activities.

7.5.2.1.4 EOD-trained personnel must be used during implementation of all the facets of Alternative 4. Public education (see Institutional Controls) should be conducted as an integral part of this alternative.

7.5.2.1.5 Alternative 5, Complete Clearance, would require clearance of all OE items present at the entire OOU. Although technically feasible, the probability of detection and removal of all OE items (100 percent clearance) is not high. Clearance of brush and the effects of magnetic rocks on the magnetometer will make implementing this alternative difficult. Sea conditions can severely limit activities.

7.5.2.1.6 EOD-trained personnel must be used during implementation of all the facets of Alternative 5. Public education (see Institutional Controls) should be conducted as an integral part of this alternative.

7.5.2.1.7 OOU-5 cannot be accessed by land; therefore, implementation of Alternatives 2, 3, 4, or 5 would be difficult transporting services and material to and from the OOU can be achieved only by boat.

7.5.2.2 Administrative Feasibility

Alternative 1 would be administratively feasible.

7.5.2.2.1 For Alternative 2, Institutional Controls, public education, fencing, and sign posting would be administratively feasible at the entire OOU.

7.5.2.2.2 Alternative 3, Surface Clearance, would be administratively feasible at OOU-5. However, close coordination with USFWS would be required during implementation. The activities should be carefully planned to avoid rough sea conditions.

7.5.2.2.3 Alternative 4, Clearance for Use, would be administratively feasible at OOU-5. Close coordination with USFWS would be required during implementation. The activities should be carefully planned to avoid rough sea conditions. Some location-specific ARARs (endangered animals and birds) may restrict excavation activities at some areas.

7.5.2.2.4 Alternative 5, Complete Clearance, is expected to be more restricted in some areas of the OOU than Alternative 4. Close coordination with USFWS would be required during implementation. Activities should be carefully planned to avoid rough sea conditions. Some location-specific ARARs (endangered animals and birds) may restrict excavation activities at some areas.

7.5.2.3 Availability of Services and Materials

Alternatives 1 require no services or materials.

7.5.2.3.1 The services and materials required to implement Alternative 2 are readily available. During installation of signs, EOD-trained personnel should clear the area. However, there could be significant logistic problems to implement fencing and sign posting components of the alternative.

7.5.2.3.2 The services and materials required to implement Alternative 3 are readily available; however, there could be significant logistic problems (material and worker transportation to the island by boats) in implementing certain components of the alternative. This alternative would require land clearing prior to implementation, and would also require special equipment and skilled personnel (EOD training).

7.5.2.3.3 The services and materials required to implement Alternative 4 are readily available; however, there could be significant logistic problems (material and worker transportation to the island by boats) to implement certain components of the alternative. This alternative would require land clearing prior to implementation, and would also require special equipment and skilled personnel (EOD training). Alternative 4 would require more time to implement than Alternative 3.

7.5.2.3.4 The services and materials required to implement Alternative 3 are readily available; however, there could be significant logistic problems (material and worker transportation to the island by boats) to implement certain components of the alternative. This alternative would require land clearing prior to implementation, and would also require special equipment and

skilled personnel (EOD training). Alternative 5 would require more time to implement than Alternative 4.

7.5.2.3.5 For Alternatives 3, 4, and 5, special skills, equipment, and personnel would be required if buried ordnance is discovered and must be detonated or disposed of. The proper safety precautions would require implementation to prevent untrained personnel from handling these materials.

7.5.2.4 Local Government Acceptance

The need for Local Government acceptance is not anticipated for Alternative 1.

7.5.2.4.1 For Alternative 2, no Local Government permits or approvals are anticipated. However, USFWS acceptance would be required to enforce Alternative 2. USFWS approval to implement this alternative is anticipated.

7.5.2.4.2 For Alternative 3, Local Government and USFWS acceptance is not readily anticipated since some location-specific ARARs (endangered animals and birds) could limit excavation activities in specific areas of the OOU.

7.5.2.4.3 For Alternative 4, Local Government and USFWS acceptance is not readily anticipated since some location-specific ARARs (endangered animals and birds) could limit excavation activities in specific areas of the OOU.

7.5.2.4.4 For Alternative 5, Local Government and USFWS acceptance is not readily anticipated since some location-specific ARARs (endangered animals and birds) could limit excavation activities in specific areas of the OOU.

7.5.2.5 Community Acceptance

The community may express concerns regarding Alternative 1, due to the evidence of OE contamination.

7.5.2.5.1 It is expected that the local community, to a large extent, would accept all components of Alternative 2 since the cays are off limits to public.

7.5.2.5.2 It is expected that the local community, to a large extent, would accept Alternatives 2, 3, 4, or 5 since the cays are off limits to public.

7.5.3 Cost

Alternative 1 incurs no cost and would therefore be the least expensive of the five alternatives. Alternatives 2, 3, 4, and 5 each incur increasing costs, beginning with Alternative 2.

7.5.3.1 The total estimated cost to implement the education/information portion of Alternatives 2, 3, 4, or 5 is $25,000 to $50,000. This encompasses OOU-1 through OOU-5 and cannot effectively be divided among the individual OOUs. To maintain the program, an estimated $2,500 to $5,000 per year is expected to be required. Alternative 4 the cost estimates are calculated based on the assumption that 25 percent of the unit will undergo a complete clearance. The remaining 75 percent of the unit will receive limited clearance. This clearance will consist of a limited geophysical investigation, visual inspection, and the removal of surface and near surface OE. Assumptions made to determine quantities are provided in Appendix L.

7.5.3.2 The total estimated costs to implement Alternatives 2, 3, 4, and 5 are $85,900, $315,000, $574,000, and $873,000, respectively, and the addition of the Education/Information Program cost.

8.0 Recommended Removal Response Alternatives and Priority Ranking

Section 7.0 presented a comparative analysis of removal response alternatives for OOU-1 through OOU-5 at the Culebra Island Archipelago. This section recommends alternatives for each area selected based on the description and evaluation of removal response alternatives presented in Section 6.0, the comparative analysis of removal response alternatives presented in Section 7.0, and an overall knowledge of the site and conditions. Table 8-1 presents a summary of the analysis of the five alternatives and the chosen alternative at each OOU.

The cost for implementing an information/education program for one OOU is only slightly greater than the cost of implementing the program for all OOUs. ESE recommends the information/ education program be developed for all OOUs. The estimated cost to develop and implement an information/education program applicable to all OOUs within the Culebra Island Archipelago is $25,000 to $50,000. The estimated annual cost to administer the program is $2,500 to $5,000.

8.1 Risk Reduction Analysis

The Quantitech OE*Cert* (Quantitech, 1996) report presents the TEAE after implementation (based on the high and low density estimate) for several alternatives for each OOU. This analysis was broken down by individual sectors within each OOU. The TEAE values presented in the OE*Cert* report were produced using a statistical model software created by Quantitech. ESE believes the model to be a conservative estimate of the site conditions. ESE used the values from the OE*Cert* report to calculate the Estimated Risk Reduction (yearly exposures) for each OOU. The TEAE for each sector of an individul OOU was averaged to provide an estimated expected annual exposure (EEAE) for the entire OOU. The TEAE for 10 ft removal was used to calculate the EEAE for Alternative Number 5, Complete Clearance. The No Action Alternative provided the greatest EEAE for each OOU. The Estimated Risk Reduction (high and low estimate) was calculated by subtracting the EEAE of each alternative from that of the EEAE from Alternative Number 1, No Action.

8.1.1 The Quantitech OE*Cert* report did not provide analysis for Alternative Number 2, Institutional Controls. According to Quantitech, The Institutional Controls are ineffective and will not decrease the number of exposures as the fences and signs do not provide a reliable deterrant to access into a contaminated area. ESE does not share this opinion. Therefore, the the estimated risk reduction (yearly exposures) for Alternative Number 2, Institutional Controls, was not calculated for this report.

Table 8-1 Cost Estimate and Risk Reduction (Yearly Exposures) of Operable Units at the Former Culebra Naval Facility, Culebra Island, Puerto Rico

Location	Alternative Number and Description	Cost	Estimated Risk Reduction (Reduction in Yearly Exposures)	
			High	Low
OOU-1 Flamenco Beach	1 No Action	$0	0	0
	2 Institutional Controls	$331,000	NC	NC
	3 Surface Clearance	$921,000	9,607	0
	4 Clearance For Use	$1,536,000	9,695	23
	5 Complete Clearance	$2,488,000	9,961	90
OOU-2 Northwest Peninsula	1 No Action	$0	0	0
	2 Institutional Controls	$112,000	NC	NC
	3 Surface Clearance	$1,127,000	6,941	4,275
	4 Clearance For Use	$2,945,000	6,941	4,275
	5 Complete Clearance	$6,996,000	6,941	4,275
OOU-3 Cerro Balcon	1 No Action	$0	0	0
	2 Institutional Controls	$12,000	NC	NC
	3 Surface Clearance	$199,000	2,389	0
	4 Clearance For Use	$298,000	2,389	0
	5 Complete Clearance	$398,000	2,389	0
OOU-4 Isla Culebrita	1 No Action	$0	0	0
	2 Institutional Controls	$378,000	NC	NC
	3 Surface Clearance	$678,000	173,202	106,448
	4 Clearance For Use	$2,060,000	173,643	106,718
	5 Complete Clearance	$2,120,000	173,666	106,733
OOU-5 Surrounding Cays	1 No Action	$0	0	0
	2 Institutional Controls	$85,900	NC	NC
	3 Surface Clearance	$315,000	2,032	60
	4 Clearance For Use	$574,000	2,032	60
	5 Complete Clearance	$873,000	2,032	60

Source (ESE, Quantitech)

NC = Risk Reduction Values Not Calculated (see text)

Estimated Risk Reduction (yearly exposures) values are calculated from total expected annual exposures presented in the Quantitech *OECert* Report (Quantitech, 1996). These data are conservative estimates produced by Quantitech's Risk Assessment Model. Highlighted fields indicate the chosen alternatives

8.1.2 The Quantitech OE*Cert* report did not provide a TEAE analysis for Alternative Number 4, Clearance for Use. To calculate the the estimated risk reduction (yearly exposures) for clearance for use, ESE estimated the percent of the total area that will require complete clearance due to construction activities and multiplied this value by the estimated risk reduction (yearly exposures) determined for the complete clearance alternative. The estimated risk reduction (yearly exposures) for the rest of the OOU was similarly calculated based on the area of surface clearance and the estimated risk reduction (yearly exposures) for the surface clearance alternative. The resulting values were added together to calculate the estimated risk reduction for Alternative Number 4, Clearance for Use.

The results of the analysis show there is little difference between the Estimated Risk Reduction of Alternatives 3 through 5 (Surface Clearance, Clearance for Use, and Total Clearance). This is most likely due to the fact that most UXOs were found close to the surface. The thin soil cover over the rock at most of the sample areas was a major contributor to the shallowness of UXOs.

The analysis of both the cost and Estimated Risk Reduction would indicate that the alternative of Surface clearance would be the best choice for all OOUs. However, since there are construction activities planned for Flamenco Beach, and Northwest Peninsula, ESE suggests that additional clearance to below the excavation depth, estimated to be approximately 4 feet, should be required in construction areas. Therfore, the Alternative 4, Clearance for Use, will be required for only portions of Flamenco Beach and the Northwest Peninsula where construction will occur.

8.2 OOU-1 — Flamenco Beach

Alternative 4, Clearance for Use, is the recommended alternative at Flamenco Beach based on the following rationale:

- OOU-1 is extensively visited by the tourists (approximately 50,000 visit every year).
- UXO and ORS items were detected during the EE/CA investigation.
- Erosion at the beach may unearth subsurface UXO.
- Alternative 4 reduces the likelihood that members of the public would encounter OE.
- Alternative 4 is administratively feasible, but will require addressing environmental concerns.
- Implementing Alternative 4 would meet the clearance to depth requirements of the various land uses.
- Alternative 4 is technically feasible.

8.2.1 The estimated cost to implement Alternative 4 at Flamenco Beach is $1,536,000.

8.3 OOU-2 — Northwest Peninsula

Alternative 4, Clearance for Use, is the recommended alternative for the Northwest Peninsula. This alternative was selected based on the following rationale:

- OOU2 may be visited by increasing numbers of tourists.
- UXO and ORS items were detected at the OOU during the EE/CA investigation.
- Alternative 4 reduces the likelihood that members of the public would encounter OE.
- Alternative 4 is administratively feasible, but will require addressing environmental concerns.
- Implementating Alternative 4 would meet the clearance to depth requirements of the varied land usages in OOU2.
- Alternative 4 is technically feasible.

8.3.1 The estimated cost to implement Alternative 4 at the Northwest Peninsula is $2,944,880.

8.4 OOU-3 - Cerro Balcon

Alternative 3, Surface Clearance, is recommended for the Cerro Balcon mortar range. This alternative was selected based on the following rationale:

- Cerro Balcon is privately owned property and intrusive activities would be difficult to control at the OOU.
- UXO collected from the OOU critically injured civilians during 1930s.
- The presence of OE is likely in the impact area.
- Alternative 3 reduces the likelihood that members of the public would encounter OE.
- Alternative 3 is administratively feasible.
- OOU3 is owned by several property owners. Alternative 3 would be implementable on portions of the OOU; however, right-of-entry may not be obtainable on the entire OOU.
- OOU3 is currently zoned for agricultural use; therefore, any new construction will be minimal.

8.4.1 The estimated cost to implement Alternative 3 at Cerro Balcon is $199,000.

8.5 OOU-4 - Isla Culebrita

Alternative 3, Surface Clearance, is the recommended alternative for the strafing fire range (82 acres) portion at Isla Culebrita. This alternative was selected based on the following rationale:

- The area outside the strafing fire range was used only as an observation point during target practice.

- The ASR reported no evidence of activities that indicate the presence of UXO items in the area outside the firing range.
- During the EE/CA field investigation, all UXO items were detected within 6 inches of the ground surface in the strafing fire range.
- Isla Culebrita is used for recreational activities, including swimming and hiking, which do not involve intrusive activities. These activities are seldom performed in the former strafing range.
- Intrusive activities are not anticipated since the OOU is monitored by USFWS personnel.
- Alternative 3 is administratively feasible.
- Alternative 3 would be easily implemented.
- Alternative 3 is technically feasible.
- Alternative 3 would reduce the likelihood that members of the public would encounter OE.

8.5.1 The estimated cost to implement Alternative 3 at Isla Culebrita is $678,400.

8.6 OOU-5 - Other Surrounding Cays

Alternative 3, Surface Clearance, is the recommended alternative for the Surrounding Cays. This alternative was selected based on the following rationale:

- OOU5 may be visited by increasing numbers of tourists.
- UXO and ORS items were detected at several of the cays in this OU during the EE/CA investigation.
- The shallow rock on several of the cays should have inhibited the penetration of most OE devices into subsurface and therefore Surface Clearance will be effective in removing OE.
- Alternative 3 reduces the likelihood that members of the public would encounter OE.
- Alternative 3 is administratively feasible, but will require addressing environmental concerns.
- The cays currently encounter light traffic mostly from USF&W personnel. This alternative will allow safety for their access to these cays.
- Although the sea conditions may be hazardous during certain times of the year, this alternative can be technically feasible for all but the smallest cays.

8.6.1 The estimated cost to implement Alternative 3 at the other surrounding cays is $315,160.

8.7 Priorities For Removal Actions

The expected annual exposures for the high density estimate provided in the OE*Cert* report (Appendix K), is used by ESE to rank the OOUs in terms of exposure potential. This value is based on the highest expected ordnance density and the number of visitors to each site. This number does not take into account the degree of hazard from the specific types of ordnance found at each site. The OOU exhibiting the highest expected annual exposures for the high density estimate is given the highest ranking for exposure potential with one (1) being the highest ranking and five (5) being the lowest ranking. Table 8-2 presents each OOU and the ranking based on the expected annual exposures for the high density estimate.

Table 8-2. Ranking of Exposure Potential

LOCATION	PRIORITY
Culebrita (OOU-4)	1
Flamenco Beach (OOU-1)	2
Northwest Peninsula (OOU-2)	3
Surrounding Cays (OOU-5)	4
Cerro Balcon (OOU-3)	5

8.7.1 ESE used the ranking of the sites based on the expected number of exposures for the high density estimate from the OE*Cert* report along with information collected during the EE/CA evaluation to provide a priority ranking for removal actions for each OOU. The types of ordnance used at each OOU along with what was recovered during the EE/CA site investigation were reviewed for the analysis to determine the potential hazard at each site. The resulting recommended priority for removal actions is included in Table 8-3.

8.7.2 Culebrita (OOU-4) has the highest ranking in terms of exposure potential (Table 8-2). However, only 20mm HEI straffing rounds were found at Culebrita. The hazard from exposure to these rounds are not as great as the hazard associated with bombs or naval projectiles. Because the straffing rounds are less hazardous than most ordnance items found elsewhere, the priority for a removal action at the site was reduced.

8.7.3 The items found at Flamenco Beach (OOU-1) are generally naval projectiles, a 5-inch Barrage Rocket, a 5-inch MK 50 projectile, and illumination candles. These items have a higher degree of hazard associated with them than 20mm HEI. This site has the highest priority for

removal actions as there is a large visiting population and the degree of hazard of the items found at this site is high.

8.7.4 The items found at Northwest Peninsula (OOU-2) include items listed for Flamenco Beach and assorted other projectiles, bombs, aerial rockets, mortars, and grenades. An unexploded "Tiny Tim" rocket warhead was previously found and disposed of onsite. This site has the second highest priority for removal actions as there is a high degree of hazard but less visitors than Flamenco Beach.

8.7.5 The surrounding cays (OOU-5) have varying amounts of bombs, rockets, and projectiles. This OOU has the greatest diversity of ordnance items, but is remote and inaccessible to most people. Even though the hazard of each individual ordnance item may be as high as the Northwest Peninsula, the remoteness of the cays and the low volume of visitors will make this OOU a lower priority for removal action.

8.7.6 Cerro Balcon (OOU-3) was used as a mortar range. The hazard of live mortars is high, but the remoteness of the site and lack of mortars found during the investigation lead ESE to place this site at lowest priority for removal action of the five OOUs.

Table 8-3. Priority for Removal Action

LOCATION	PRIORITY
Flamenco Beach (OOU-1)	1
Northwest Peninsula (OOU-2)	2
Culebrita (OOU-4)	3
Surrounding Cays (OOU-5)	4
Cerro Balcon (OOU-3)	5

9.0 References

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Table 2-1. Endangered and Threatened Species of Culebra Island and Vicinity

Classification	Common Name	Species	Status
Mammals	Sperm Whale	Physter catodon	Endangered
	Humpback Whale	Megaptera novaeangliae	Endangered
	West Indies Manatee	Trichechus manatus	Endangered
Birds	West Indies Brown Pelican	Pelicanus occidentalis	Endangered
	Peregrine Falcon	Falco peregrinus	Endangered
	Roseate Tern	Sterna dougalli	Threatened
	Masked Duck	Oxyura dominica	Threatened*
	Ruddy Duck	Oxyura jamaicensis	Threatened*
	Caribbean Coot	Fulica Caribaea	Threatened*
Reptiles	Hawksbill Sea Turtle+	Eretmochelys imbricata	Endangered
	Leatherback Sea Turtle+	Dermochelys coriacea	Endangered
	Green Sea Turtle+	Clelonia mydas	Threatened
	Loggerhead Sea Turtle	Caretta caretta	Threatened***
	Virgin Island Tree Boa+	Epicrates monensis granti	Endangered
	Puerto Rican Tree Boa	Epicrates inornatus	Endangered
	Sloan's Skink	Mabuya sloanei	Threatened*
	Least Grebe	Tachybaptus dominicus	Threatened*
	Culebra Giant Anole	Anolis Roosvelti	Endangered**
Plants	Wheeler's Peperomia+	Peperomia wheeleri	Endangered
	Square Stem Cactus+	Leptocereus grantianus	Endangered

* Declared threatened by Commonwealth of Puerto Rico.
** Has been thought to be extinct.
***Not known to nest in area.
\+ Species of potential concern.

Table 2-2. UXO Recovery Data (Page 1 of 2)

Area	Quantity/Type	Depth (inches)
FB-6	One 5-inch NGF One 37mm One 5-inch RKT Warhead Two Illuminating candles out of 5*	8 5 4 4
BO-1	Four MK76 w/MK4 Spotting Cart. One 6-inch NGF	Approx. 3 2
BO-2	Three MK76 w/MK4 Spotting Cart. Three MK76 w/MK4 Spotting Cart.	3 2
AQ-1	Five MK76 w/MK4 Spotting Cart.	Approx. 3
IC-4	Five 20mm HEI	Approx. 4
IC-5	Two 20mm HEI Three 20mm HEI	3 2
IC-6	Two 20mm HEI Four 20mm HEI	3 2
NP-3	Two 3-inch NGF	6
NP-4	One 3-inch NGF	5
NP-12	Two 3-inch NGF One 20mm HEI	4 and 5 3
NP-15	Three 5-inch Illum. Candles One MK23 w/ MK4 Cartridge One MK76 w/ MK4 Cartridge	All 6 3 2
NP-16	Two 6-inch NGF One 81mm Mortar One 5-inch NGF One 3-inch NGF	5 7 7 6
NP-17	One 3-inch NGF One 5-inch NGF Two 5-inch NGF One 6-inch NGF	4 5 6 6

Table 2-2. UXO Recovery Data (Page 2 of 2)

Area	Quantity/Type	Depth (inches)
NP-18	Two 5-inch NGF	Both 5
NP-20	One 5-inch NGF (Broken Open)	4

Note: OE Type
Cart = Cartridge.
HEI = High Explosive Incendiary.
mm = millimeter.
NGF = Naval Gun Fire.
RKT = Rocket.

Area Abbreviations
AQ = Cayo del Agua.
BO = Cayo Botella.
FB = Flamenco Beach.
IC = Isla Culebrita.
NP = Northwest Peninsula.

Table 2-3. Sampling Results (Page 1 of 2)

Sampling Grid	Grid Placement	Date Cleared	Mag & Flag		Sampling							Remarks
							ORS Recovered		UXO Recovered		False	
			Date	Anomolies	Date	Anomalies Sampled	Number	Wt (lbs)	Subsurface	Surface	Postives	
FB-1	15 NOV 95	18 DEC 95	12 DEC 95	116	20 DEC 95	40	28	63	0	0	12	
FB-2	15 NOV 95	19 DEC 95	20 DEC 95	64	20 DEC 95	22	18	38	0	0	4	
FB-3	15 NOV 95	12 DEC 95	14 DEC 95	28	19 DEC 95	10	3	10	0	0	7	
FB-4	15 NOV 95	11 DEC 95	13 DEC 95	49	14 DEC 95	31	14	34	0	0	17	
FB-5	16 NOV 95	28 DEC 95	28 DEC 95	148	29 DEC 95	50	3	5	0	0	47	
FB-6	16 NOV 95	26 DEC 95	27 DEC 95	117	27 DEC 95	40	3	5	5	0	32	
FB-7	16 NOV 95	12 DEC 95	27 DEC 95	126	27 DEC 95	45	8	62	0	0	37	
FB-8	05 DEC 95	28 DEC 95	28 DEC 95	411	29 DEC 95	140	4	59	0	0	136	
FB-9	3 JAN 96	**	4 JAN 96	288	5 JAN 96	95	67	84	0	0	28	
FB-10	20 FEB 96	20 FEB 96	20 FEB 96	34	20 FEB 96	15	3	6	0	0	12	
BO-1	20 NOV 95	**	26 DEC 95	532	26 DEC 95	93	12	12+1200*	5	2	76	
BO-2	20 NOV 95	**	26 DEC 95	788	26 DEC 95	60	11	10+800*	6	7	43	
LO-1	21 NOV 95	**	3 JAN 96	25	3 JAN 96	12	0	0	0	0	12	
LO-2	21 NOV 95	**	2 JAN 96	45	3 JAN 96	15	0	0	0	0	15	
LO-3	21 NOV 95	2 JAN 96	2 JAN 96	51	3 JAN 96	17	4	24	0	0	13	
LO-4	21 NOV 95	2 JAN 96	2 JAN 96	120	3 JAN 96	40	13	50	0	0	27	
AQ-1	27 NOV 95	4 JAN 96	4 JAN 96	570	4 JAN 96	100	26	81	5	11	69	
AQ-2	27 NOV 95	4 JAN 96	4 JAN 96	23	4 JAN 96	10	2	< 1	0	0	8	
IC-2	27 NOV 95	11 DEC 95	20 DEC 95	512	21 DEC 95	170	4	1	0	0	166	
IC-3	27 NOV 95	12 DEC 95	20 DEC 95	368	21 DEC 95	120	0	0	0	0	120	
IC-4	28 NOV 95	19 DEC 95	20 DEC 95	460	21 DEC 95	85	4	< 1	5	0	76	
IC-5	28 NOV 95	18 DEC 95	20 DEC 95	116	21 DEC 95	60	5	< 1	5	0	50	
IC-6	28 NOV 95	13 DEC 95	13 DEC 95	545	14 DEC 95	49	13	3	6	23	30	
CB-1	30 NOV 95	3 JAN 96	3 JAN 96	45	4 JAN 96	15	0	0	0	0	15	
CB-2	30 NOV 95	2 JAN 96	3 JAN 96	32	4 JAN 96	13	0	0	0	0	13	
CB-3	30 NOV 95	29 DEC 95	3 JAN 96	36	4 JAN 96	13	3	5	0	0	10	
CB-4	07 DEC 95	29 DEC 95	3 JAN 96	17	4 JAN 96	17	9	22	0	0	8	
CB-5	8 FEB 96	13 FEB 96	19 FEB 96	7	19 FEB 96	7	2	5	0	0	5	
CB-6	8 FEB 96	13 FEB 96	19 FEB 96	12	19 FEB 96	12	5	10	0	0	7	
NP-1	3 JAN 96	8 JAN 96	15 JAN 96	307	15 JAN 96	100	23	88	0	1	77	

Table 2-3. Sampling Results (Page 2 of 2)

Sampling Grid	Grid Placement	Date Cleared	Mag & Flag		Sampling							Remarks
							ORS Recovered		UXO Recovered			
			Date	Anomolies	Date	Anomalies Sampled	Number	Wt (lbs)	Subsurface	Surface	False Postives	
NP-2	3 JAN 96	11 JAN 96	15 JAN 96	605	15 JAN 96	200	25	51	0	0	175	
NP-3	3 JAN 96	11 JAN 96	16 JAN 96	143	16 JAN 96	62	27	24	2	0	33	
NP-4	16 JAN 96	15 JAN 96	16 JAN 96	109	16 JAN 96	47	10	40	1	2	36	
NP-5	3 JAN 96	9 JAN 96	17 JAN 96	209	18 JAN 96	80	44	55	0	0	36	
NP-6	3 JAN 96	10 JAN 96	17 JAN 96	265	18 JAN 96	90	32	108	0	0	58	
NP-7	3 JAN 96	8 JAN 96	6 FEB 96	92	7 FEB 96	30	16	95	0	0	14	
NP-8	3 JAN 96	8 JAN 96	6 FEB 96	74	7 FEB 96	25	13	10	0	0	12	
NP-9	5 JAN 96	20 JAN 96	17 JAN 96	202	17 JAN 96	65	44	45	0	0	21	
NP-10	5 JAN 96	29 JAN 96	6 FEB 96	165	7 FEB 96	54	37	55	0	0	17	
NP-11	5 JAN 96	30 JAN 96	6 FEB 96	54	8 FEB 96	17	1	1	0	1	16	
NP-12	5 JAN 96	30 JAN 96	6 FEB 96	146	8 FEB 96	29	11	85	5	1	13	
NP-13	9 JAN 96	31 JAN 96	6 FEB 96	53	8 FEB 96	20	0	0	0	0	20	
NP-14	9 JAN 96	5 FEB 96	6 FEB 96	89	8 FEB 96	31	15	51	0	0	16	
NP-15	9 JAN 96	1 FEB 96	6 FEB 96	79	8 FEB 96	22	9	64	5	0	8	
NP-16	29 NOV 95	31 JAN 96	12 FEB 96	140	14 DEC 95	28	6	125*	5	0	17	
NP-17	29 NOV 95	1 FEB 96	12 FEB 96	128	14 DEC 95	18	10	170*	5	2	3	
NP-18	29 NOV 95	1 FEB 96	12 FEB 96	51	15 DEC 95	23	10	125*	2	0	11	
NP-19	29 NOV 95	**	12 FEB 96	103	15 DEC 95	36	3	131	0	1	33	
NP-20	7 FEB 96	8 FEB 96	8 FEB 96	131	14 FEB 96	44	9	30*	0	1	35	
NP-21	7 FEB 96	13 FEB 96	13 FEB 96	61	19 FEB 96	21	10	10*	0	4	11	
NP-22	7 FEB 96	13 FEB 96	13 FEB 96	91	15 FEB 96	35	3	70*	0	2	32	
NP-23	7 FEB 96	13 FEB 96	19 FEB 96	52	19 FEB 96	18	10	58	0	0	8	
NP-24	16 JAN 96	14 FEB 96	19 FEB 96	86	19 FEB 96	28	16	43	0	0	12	
NP-25	7 FEB 96	13 FEB 96	20 FEB 96	140	20 FEB 96	45	18	52	0	0	27	
NP-26	7 FEB 96	15 FEB 96	20 FEB 96	83	21 FEB 96	27	16	15	0	0	11	
NP-27	12 FEB 96	19 FEB 96	21 FEB 96	70	21 FEB 96	25	19	55	0	0	6	
NP-28	12 FEB 96	19 FEB 96	21 FEB 96	97	21 FEB 96	32	12	15	0	0	20	

Notes:
* Estimated weight of ORS left at site.
** Did not require clearing

Table 2-4. Analysis of Field Data

Grid No.	Date Completion	Site Acreage	Anomalies			UXO Items Recovered		UXO Estimate				Remarks
			Total	Sampled	Percent	Subsurface	Surface	Gridstals Subsurface	Total UXOs *	Percent of Anomalies	Density (UXO/acre)	
Flamenco Beach Area												
FB-1	12/20/95	0.23	116	40	34%	0	0	0	0	0.0%	0	
FB-2	12/20/95	0.23	64	22	34%	0	0	0	0	0.0%	0	
FB-3	12/19/95	0.23	28	10	36%	0	0	0	0	0.0%	0	
FB-4	12/13/95	0.23	49	31	63%	0	0	0	0	0.0%	0	
FB-5	12/29/95	0.06	148	50	34%	0	0	0	0	0.0%	0	
FB-6	12/27/95	0.23	117	40	34%	5	0	18	15	12.5%	64	
FB-7	12/27/95	0.23	126	45	36%	0	0	0	0	0.0%	0	
FB-8	12/29/95	0.23	411	140	34%	0	0	0	0	0.0%	0	
FB-9	01/04/96	0.23	288	95	33%	0	0	0	0	0.0%	0	
FB-10	02/20/96	0.06	34	15	44%	0	0	0	0	0.0%	0	
Totals		1.95	1381	488		5	0	18	15			
Averages		0.20	138	49	35%	0.50	0		1.5	1.1%	7.5	10 grids averaged
Northwest Peninsula Area												
NP-1	01/15/96	0.06	307	100	33%	0	1	0	1	0.3%	17	
NP-2	01/15/96	0.23	605	200	33%	0	0	0	0	0.0%	0	
NP-3	01/16/96	0.06	143	62	43%	2	0	5	5	3.2%	77	
NP-4	01/16/96	0.06	109	47	43%	1	2	2	4	4.0%	72	
NP-5	01/17/96	0.23	209	80	38%	0	0	0	0	0.0%	0	
NP-6	01/17/96	0.06	265	90	34%	0	0	0	0	0.0%	0	
NP-7	02/06/96	0.06	92	30	33%	0	0	0	0	0.0%	0	
NP-8	02/06/96	0.06	74	25	34%	0	0	0	0	0.0%	0	
NP-9	01/17/96	0.11	202	65	32%	0	0	0	0	0.0%	0	
NP-10	02/06/96	0.23	165	54	33%	0	0	0	0	0.0%	0	
NP-11	02/07/96	0.06	54	17	31%	0	1	0	1	1.9%	17	
NP-12	02/06/96	0.23	146	29	20%	5	1	25	26	17.9%	114	
NP-13	02/06/96	0.11	53	20	38%	0	0	0	0	0.0%	0	

Table 2-4. Analysis of Field Data (Continued, Page 2 of 4)

Grid No.	Date Completion	Site Acreage	Anomolies			UXO Items Recovered		UXO Estimate				Remarks
			Total	Sampled	Percent	Subsurface	Surface	Gridstats Subsurface	Total UXOs *	Percent of Anomalies	Density (UXO/acre)	
NP-14	02/06/96	0.11	89	31	35%	0	0	0	0	0.0%	0	
NP-15	02/06/96	0.23	79	22	28%	5	0	18	18	22.7%	78	
NP-16	02/12/96	0.23	140	28	20%	5	0	25	25	17.9%	109	
NP-17	02/12/96	0.23	128	18	14%	5	2	36	38	29.3%	163	
NP-18	02/12/96	0.23	51	23	45%	2	0	4	4	8.7%	19	
NP-19	02/12/96	0.23	103	36	35%	0	1	0	1	1.0%	4	
NP-20	02/08/96	0.23	131	44	34%	0	1	0	1	0.8%	4	
NP-21	02/13/96	0.23	61	21	34%	0	4	0	4	6.6%	17	
NP-22	02/13/96	0.23	91	35	38%	0	2	0	2	2.2%	9	
NP-23	02/19/96	0.06	52	18	35%	0	0	0	0	0.0%	0	
NP-24	02/19/96	0.06	86	28	33%	0	0	0	0	0.0%	0	
NP-25	02/20/96	0.11	140	45	32%	0	0	0	0	0.0%	0	
NP-26	02/20/96	0.06	83	27	33%	0	0	0	0	0.0%	0	
NP-27	02/21/96	0.06	70	25	36%	0	0	0	0	0.0%	0	
NP-28	02/21/96	0.11	97	32	33%	0	0	0	0	0.0%	0	
Totals		3.97	3825	1252		25	15	115	130			
Averages		0.14	137	45	33%	0.89	0.54		4.6	3.4%	33	28 grids averaged
Cerro Balcon Area												
CB-1	01/04/96	0.23	45	15	33%	0	0	0	0	0.0%	0	
CB-2	01/04/96	0.23	32	13	41%	0	0	0	0	0.0%	0	
CB-3	01/04/96	0.23	36	13	36%	0	0	0	0	0.0%	0	
CB-4	01/04/96	0.23	17	17	100%	0	0	0	0	0.0%	0	
CB-5	02/19/96	0.06	7	7	100%	0	0	0	0	0.0%	0	
CB-6	02/19/96	0.06	12	12	100%	0	0	0	0	0.0%	0	
Totals		1.03	149	77		0	0	0	0			
Averages		0.17	25	13	52%	0	0	0	0	0.0%	0	6 grids averaged

Table 2-4. Analysis of Field Data (Continued, Page 3 of 4)

Grid No.	Date Completion	Site Acreage	Anomolies			UXO Items Recovered		UXO Estimate				Remarks
			Total	Sampled	Percent	Subsurface	Surface	Gridstats Subsurface	Total UXOs *	Percent of Anomalies	Density (UXO/acre)	
Isla Culebrita Area												
IC-2	12/20/95	0.23	512	170	33%	0	0	0	0	0.0%	0	
IC-3	12/20/95	0.23	368	120	33%	0	0	0	0	0.0%	0	
IC-4	12/20/95	0.23	460	85	18%	5	0	27	27	5.9%	118	
IC-5	12/20/95	0.23	116	60	52%	5	0	10	10	8.3%	42	
IC-6	12/13/95	0.23	545	49	9%	6	23	67	90	16.5%	390	
Totals		1.15	2001	484		16	23	104	126			
Averages		0.19	334	81	24%	2.7	3.8		21	6.3%	110	6 grids averaged
Cayo Del Agua Area												
AQ-1	01/04/96	0.23	570	100	18%	5	11	29	40	6.9%	172	
AQ-2	01/04/96	0.04	23	10	43%	0	0	0	0	0.0%	0	
Totals		0.27	593	110		5	11	29	40			
Averages		0.13	297	55	19%	2.5	5.5		20	6.7%	148	2 grids averaged
Cayo Botella Area												
BO-1	12/26/95	0.23	532	93	17%	5	2	29	31	5.8%	133	
BO-2	12/26/95	0.23	788	60	8%	6	7	79	86	10.9%	373	
Totals		0.46	1320	153		11	9	108	116			
Averages		0.23	660	77	12%	5.5	4.5		58	8.8%	0	2 grids averaged
Cayo Lobo Area												
LO-1	01/03/96	0.23	25	12	48%	0	0	0	0	0.0%	0	
LO-2	01/02/96	0.23	45	15	33%	0	0	0	0	0.0%	0	
LO-3	01/03/96	0.23	51	17	33%	0	0	0	0	0.0%	0	
LO-4	01/02/96	0.23	120	40	33%	0	0	0	0	0.0%	0	

Table 2-4. Analysis of Field Data (Continued, Page 4 of 4)

Grid No.	Date Completion	Site Acreage	Anomolies			UXO Items Recovered		UXO Estimate				Remarks
			Total	Sampled	Percent	Subsurface	Surface	Gridstats Subsurface	Total UXOs *	Percent of Anomalies	Density (UXO/acre)	
Totals		0.92	241	84		0	0	0	0			
Averages		0.23	60	21	35%	0	0		0	0.0%	0	4 grids averaged

06/07/96

Table 2-5. OECert Predicted UXO Density					
	Low Estimate			High Estimate	
Sector	UXO Density (UXO/acre)	Percent Surface	Point Density Estimate*	UXO Density (UXO/acre)	Percent Surface
Northwest Peninsula A	3.3	30.8%	5	6.7	30.8%
Northwest Peninsula B	11	50.0%	12	13	50.0%
Flamenco Beach	1.8	0.0%	2.6	3.9	30.8%
Flamenco Campground	1.8	0.0%	2.6	3.9	30.8%
Flamenco Ridge	1.8	0.0%	2.6	3.9	30.8%
Cerro Balcon	0	0.0%	na	0.75	30.8%
Isla Culebrita	59	59.0%	78	96	59.0%
Cayo Botello	136	45.0%	212	288	45.0%
Cayo del Agua	47	68.8%	103	160	68.8%
Cayo Lobo	0	0.0%	na	24	68.8%

*Point density estimate is the median value of the estimate range.

Source: QuantiTech, 1996

Table 2-6. OECert Predicted Exposures			
Sector	Predicted Exposures for Risk Reduction Alternatives (low/high)		
	No Action	Surface Removal	1 Foot Removal
Northwest Peninsula A	3,679 / 7,576	184 / 380	184 / 380
Northwest Peninsula B	5,320 / 7,037	267 / 353	267 / 353
Flamenco Beach	1 / 15,860	1 / 794	1 / 794
Flamenco Campground	3 / 13,529	3 / 627	3 / 626
Flamenco Ridge	18 / 1,955	18 / 124	1 / 100
Cerro Balcon	0 / 2,528	0 / 139	0 / 139
Isla Culebrita	112,052 / 182,407	5,604 / 9,215	5,604 / 9,117
Cayo Botello	493 / 1,045	25 / 53	25 / 53
Cayo del Agua	1,402 / 4,806	71 / 241	71 / 241
Cayo Lobo	0 / 568	0 / 29	0 / 29

Note: Shading indicates alternative required for maximum risk reduction

Source: QuantiTech, 1996.

Table 3-1. Summary of OOU Characteristics

SELECTION CRITERIA	ORDNANCE OPERABLE UNIT (OOU)				
	OOU-1 Flamenco Beach	**OOU-2 Northwest Peninsula**	**OOU-3 Cerro Balcon**	**OOU-4 Culebrita Island**	**OOU-5 Other Surrounding Cays**
SITE CHARACTERISTICS					
Geography	Northwestern part of Culebra Island. 300 acres of the Flamenco Peninsula	Northwestern part of Culebra Island. 313 acres of the Flamenco Peninsula. 150 acres in Sector A.163 acres in Sector B.	Culebra Island 30 acres. 20 acres comprising the main target area.	Culebrita Island 1 mile east of Culebra Island. Unit comprised 82 acres of the 266 acres of the island.	Various isolated, small islands 39.5 acres
Topography	Extremely variable, flat to hilly	Extremely variable, flat to hilly.	Extremely variable, flat to hilly.	Extremely variable, flat near beaches, rugged coastlines, gently sloping to steep hills.	Mostly rocky, rugged, with very small beaches.
Soils	Sand in beach area. Thin, saprolitic soils in ridge area. Average 2.5 feet thick.	Thin, saprolitic soils in ridge area. Average 2.5 feet thick.	Thin, saprolitic soils in ridge area. Average 2.5 feet thick.	Thin, saprolitic soils in ridge area. Average 2.5 feet thick.	Thin, saprolitic soils in ridge area. Average 2.5 feet thick.
Vegetation	Low grasses, vines and sea grapes in beach area. Trees and thick brush in ridge area.	Sector A - Mostly wooded. Dense vegetation. Sector B - Tall grasses and thorny brush.	Tall grasses and thorny brush. Pasture.	Light to dense. Tall grasses, thorny brush.	Light vegetation, tall grasses, thorny bushes.
Public Accessibility	High access, particularly in the beach and campground areas. Approximately 50,000 visitors per year. Hiking mostly limited to trails.	Controlled. Few visitors.	Privately owned. Casual public entry.	Access only by boat through tour guides and by private boats. No permit required to access the beaches and hiking trails. A Special Use Permit is necessary for activities other than those permitted under refuge guidelines. Approximately 20,800 visitors per year.	Difficult. Access by permit only from USF&WS. Cays are regularly patrolled by boat. Average 200 visitors per year to each of the cays.

Table 3-1. Summary of OOU Characteristics

SELECTION CRITERIA	ORDNANCE OPERABLE UNIT (OOU)				
	OOU-1 Flamenco Beach	OOU-2 Northwest Peninsula	OOU-3 Cerro Balcon	OOU-4 Culebrita Island	OOU-5 Other Surrounding Cays
LAND USE					
Past Use	Gunnery range target area.	Gunnery and bombing range target area.	Mortar range. Range fan 80 acres total. Impact area 30 acres.	Observation point for activities on Cayo Botella. 82 acres on western side used for strafing fire practice. Torpedo range at Marc Point.	Bombing range. Air-to-ground gunnery range (rockets). Observation post formerly located on Cayo Lobo. Torpedos observed offshore from Cayo Alcarraza.
Present Use	Recreation, including beach activities and camping.	Wildlife preserve. Hiking, wildlife observation.	Pasture for cattle. Hiking, wildlife observation.	Recreation, including beach activities, hiking wildlife observation. turtle and bird nesting	Wildlife preserve. Bird and turtle nesting.
Potential Future Use	Recreation, including beach activities and camping. 10 acres to be developed into housing.	Wildlife preserve. Hiking, wildlife observation.	Pasture for cattle. Potential for further development, including construction.	Recreation, including beach activities, hiking wildlife observation. turtle and bird nesting	Wildlife preserve. Bird and turtle nesting.
NATURE AND EXTENT OF PRESENT CONTAMINATION					
Ordnance	Pyrotechnics, projectiles, rockets, and mortars.	Aircraft cannon and gun projectiles. Bombs, pyrotechnics, and rockets.	Mortars.	Aircraft cannon and gun projectiles.	Aircraft cannon and gun projectiles. Bombs and rockets.
Density	Estimated 4 UXO items per acre. 32% on surface. Significant HE rounds expected.	Estimated 20 UXO items per acre. 40% on surface. Significant HE rounds expected.	Estimated 4 UXO items per acre. 10% on surface. Significant HE rounds expected.	Estimated 80 UXO items per acre. % on surface. No rounds larger than 20 mm expected.	Estimated 80 UXO items per acre. 50 % on surface. Significant HE rounds expected.
CURRENT OWNERSHIP	P.R. DNR (all)	Sector A - P.R. DNR Sector B - USF&WS.	Private owners.	USF&WS.	USF&WS.
PROPERTY OWNERSHIP/ MANAGEMENT					

Table 3-2. ARARs

Activity	ARAR	Citation	Applicability or Relevance
Action-Specific			
Excavation	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	40 CFR 264	Establishes minimum standards that define the acceptable management of hazardous waste for owners and operators of facilities that treat, store, or dispose of hazardous waste.
	Standards Applicable to Generators of Hazardous Waste	40 CFR 262	Establishes standards for generators of hazardous waste. Applicable to remedial alternatives involving landfilling of hazardous soil and debris.
Waste Classification	Identification and Listing of Hazardous Waste	40 CFR 261	Provides for proper classification of wastes under guidelines for RCRA.
Treatment	National Primary and Secondary Ambient Air Quality Standards	40 CFR 50	Establishes ambient air quality standards for particulate matter, sulfur dioxides, carbon monoxide, ozone, nitrogen dioxide, and lead.
	National Emission Standards for Hazardous Air Pollutants	40 CFR 61	Provides a list of substances designated as hazardous air pollutants. Regulations apply to potential emissions from treatment, or other operations, of any hazardous air pollutant for which a standard is prescribed under this part.
Disposal of Wastes and Treatment Residues	RCRA and Puerto Rico Disposal Restrictions	40 CFR 241 40 CFR 268	Land disposal restrictions may be triggered if excavated soils or treatment residuals exhibit
	Puerto Rico Regulations	PR Rg HNH/ Se 503	RCRA hazardous waste characteristics.
	Criteria for classification of solid waste disposal facilities and practices	40 CFR 257	Establishes criteria for use in determining that solid waste disposal facilities and practices pose a reasonable probability of adverse effects on health or the environment.

Disposal of Wastes and Treatment Residues, continued	Notification procedures in event of hazardous substance spill, release, fire, or explosion.	PR RgHNH/ Se1-803(E)	Procedures under CERCLA for notification to Puerto Rico Environmental Quality Board in the event of hazardous substance spill, release, fire, or explosion.
Worker Safety	Occupational Safety and Health Act (OSHA)	29 USC ss. 651-678	Provides workers with personal protection equipment during all phases of remediation. Provides adequate protection to the community by reducing dust potentially generated during material excavation and handling activities.
Surface water control	Sediment and erosion controls and best management practices to control runoff from construction activities.	40 CFR 122 PR RgHNH/Se1107/ ah, Attachment C-6	Stormwater discharges associated with construction activities at industrial sites that result in a disturbance of greater than 5 acres of total land area. Puerto Rico does not have NPDES permitting authority. The NPDES stormwater program will be administered by EPA Region 2 in New York.
Location-Specific			
Presence of endangered or threatened species or critical habitat of such species as designated in 50 CFR 17, 50 CFR 226, or 50 CFR 227	Endangered Species Act of 1973 as amended (latest amendment June 1986). Puerto Rico Endangered Species Prohibition	50 CFR 402 40 CFR 6.302(b) PR Rg HNH/ Se 304(B)	Actions which jeopardize species/habitat must be avoided or appropriate mitigation measures taken. Offsite actions which affect species/habitat require consultation with DOI, USFWS, NMFS, and/or state agencies, as appropriate, to ensure that proposed actions do not jeopardize the continued existence of the species or adversely modify or destroy critical habitat. Consultation with the responsible agency is also strongly recommended for onsite actions.

National Historic and Cultural Resources	National Historic Preservation Act of 1966; 1906 Antiquities Act; Archaeological Resources Protection Act of 1979; Archaeological and Historic Preservation Act of 1974; and Historic Sites Act of 1935.	36 CFR 60.9 - 36 CFR 800.1 36 CFR 800.4 and 800.5 ACT 16 USC 470-470w-6 - 16 USC 470(b)(2)(4) USC 470ii 32 CFR 229 Revised Statue	Facility must regulate the excavation of archaeological sites on federal lands.
National Historic and Cultural Resources (continued)	Puerto Rico Laws	PR Ti 12/ Se 1123	Puerto Rican policy preserves the important historical, cultural, and natural aspects of their heritage; and maintains, where possible, an environment which offers to the individual selection, diversity, and variety. The Puerto Rico Historic Preservation Officer must be contacted. Integrates requirements of federal laws and regulations dealing with historic properties including historic and prehistoric district sites, buildings, structures, and objects.
Delineation of the landward extent of wetlands and surface waters	Wetlands Protection	40 CFR 6.302(a)	Actions should be avoided that have adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands if a practicable alternative exists.

Note: Excavation and material handling operations will be conducted in accordance with the OE/UXO safety specifications described in the U.S. Army Corps of Engineers, Huntsville Division, *Safety Concepts and Basic Considerations for Unexploded Explosive Ordnance (UXO) Operations (revised 16 Dec 92)*.

CFR = Code of Federal Regulations.
DOI = U.S. Department of Interior.
NMFS = National Marine Fisheries Service.
PL = Public Law.
PR = Puerto Rico.
RCRA = Resource Conservation and Recovery Act.
USC = United States Code.
USFWS = U.S. Fish and Wildlife Service.

Source: ESE.

Table 8-1. Analysis of Removal Response Alternatives

OOU-1 — FLAMENCO BEACH					
Risk Reduction Component	**Alternative 1 No Further Action**	**Alternative 2 Institutional Controls**	**Alternative 3 Surface Clearance**	**Alternative 4 Clearance for Use (RECOMMENDED)**	**Alternative 5 Complete Clearance**
EFFECTIVENESS					
Overall Protection of Public Health and the Environment	No additional protection.	Limited protection to public but higher than Alternative 1. Little increase in protection to the environment.	Protection to public not engaged in intrusive activities.	Significant increased protection over surface clearance in beach and campground areas. Little increase in protection over surface clearance in ridge area.	Little increase in protection over clearance for use.
Long-term Effectiveness	No impact on long-term effectiveness and permanence.	Limited effectiveness; liability and risk would persist; contaminants would remain	Effective for non-intrusive activities. Erosion at the beach may unearth subsurface UXO.	Effective for all activities at cleared areas.	Little increase in effectiveness for all activities.
Permanence	Not applicable	Permanent, provided fences are maintained and access restrictions effectively enforced.	Limited permanence. Erosion may unearth buried OE.	Permanent.	Permanent.
Reduction of MTV	Remains unchanged.	No MTV reduction.	Limited volume reduction.	Significant volume reduction.	Maximum volume reduction.
Short-Term Effect During Implementation	No risk to safety of workers.	Limited risk to workers while posting signs and fence posts, no risk to public.	Limited risk to workers. No risk to public but could be affected by noise and restricted access.	Risk to workers. No risk to public but could be affected by noise and restricted access.	Risk to workers. No risk to public but could be affected by noise and restricted access.
Compliance with ARARs	None applicable.	No chemical-specific ARARs. Action- and location-specific ARARs would be complied with.	No chemical-specific ARARs. Action- and location-specific ARARs would be complied with.	No chemical-specific ARARs. Action- and location-specific ARARs would be complied with.	No chemical-specific ARARs. Action- and location-specific ARARs would be complied with.

Table 8-1. Analysis of Risk Reduction Alternatives (Page 2 of 12)

OOU-1 -- FLAMENCO BEACH					
Risk Reduction Component	**Alternative 1 No Further Action**	**Alternative 2 Institutional Controls**	**Alternative 3 Surface Clearance**	**Alternative 4 Clearance for Use (RECOMMENDED)**	**Alternative 5 Complete Clearance**
IMPLEMENTABILITY					
Technical Feasibility	Feasible.	Feasible.	Feasible. Clearance of heavy brush will make implementation difficult.	Feasible. Clearance of heavy brush will make implementation difficult.	Feasible. Clearance of heavy brush will make implementation difficult.
Administrative Feasibility	Feasible.	Fencing and access restriction not feasible in beach and campgrounds.	Feasible. Work on the beach and in campground areas will require close coordination with PRDNR.	Feasible. Species protection may restrict excavation in some areas.	Feasible. Expect greater administrative restrictions on excavations in some areas to protect species.
Availability of Services and Materials	None required.	Services and materials available but costly.	Available, special skills required. Significant logistics problems.	Available, special skills required. Significant logistics problems.	Available, special skills required. Significant logistics problems.
Local Government Acceptance	None required.	Need for local government and PRDNR acceptance anticipated. Partial approval anticipated.	Need for local government acceptance anticipated. Partial approval anticipated.	Need for local government acceptance anticipated. Partial approval anticipated.	Need for local government acceptance anticipated. Partial approval anticipated.
Community Acceptance	Community may express concerns.	Community acceptance to access restriction (fencing) of beach and campgrounds is not anticipated.	Some temporary resistance expected by the public during implementation. Partial approval is anticipated.	Some temporary resistance by the public during implementation. Partial approval is anticipated.	Some temporary resistance by the public during implementation. Partial approval is anticipated.
COST	No cost.	$330,000	$920,000	$1,540,000	$2,490,000

Table 8-1. Analysis of Risk Reduction Alternatives (Page 3 of 12)

OOU-2 — Northwest Peninsula					
Risk Reduction Component	**Alternative 1 No Further Action**	**Alternative 2 Institutional Controls (RECOMMENDED)**	**Alternative 3 Surface Clearance**	**Alternative 4 Clearance for Use**	**Alternative 5 Complete Clearance**
EFFECTIVENESS					
Overall Protection of Public Health and the Environment	No risk reduction.	Limited risk reduction. Fencing and signs would increase protectiveness.	Some increased risk reduction over institutional controls. Surface clearance would increase protection for hikers and campers.	Little increased risk reduction over surface clearance. Limited intrusive activities expected.	Little increased risk reduction over clearance for use.
Long-term Effectiveness	Not effective in reducing risk.	Effective, if access restrictions are enforced.	Effective for non-intrusive activities. Ineffective for intrusive activities. (little expected).	Effective for all activities.	Little increase in effectiveness over clearance for all activities.
Permanence	Not applicable.	Permanent, if fences are maintained and access restrictions enforced.	Limited permanence. Erosion may unearth buried OE.	Permanent.	Permanent.
Reduction of MTV	None applicable.	No MTV reduction.	Limited volume reduction.	Significant volume reduction.	Maximum volume reduction.
Short-Term Effects During Implementation	No short-term effects.	Limited risk to workers while posting signs and fence posts. No risk to public.	Limited risk to workers. No risk to public.	Limited risk to workers. No risk to public.	Limited risk to workers. No risk to public.
Compliance with ARARs	No chemical-specific ARARs. Action- and location-specific ARARs would be complied with.	No chemical-specific ARARs. Action- and location-specific ARARs would be complied with.	No chemical-specific ARARs. Action- and location-specific ARARs would be complied with.	No chemical-specific ARARs. Action- and location-specific ARARs would be complied with.	No chemical-specific ARARs. Action- and location-specific ARARs would be complied with.

Table 8-1. Analysis of Risk Reduction Alternatives (Page 4 of 12)

OOU-2 — Northwest Peninsula					
Risk Reduction Component	**Alternative 1 No Further Action**	**Alternative 2 Institutional Controls (RECOMMENDED)**	**Alternative 3 Surface Clearance**	**Alternative 4 Clearance for Use**	**Alternative 5 Complete Clearance**
IMPLEMENTABILITY					
Technical Feasibility	Feasible	Feasible	Feasible. Clearance of heavy brush will make implementation difficult.	Feasible. Clearance of heavy brush will make implementation difficult.	Feasible. Clearance of heavy brush will make implementation difficult.
Administrative Feasibility	Feasible.	Feasible.	Feasible. Will require close coordination with PRDNR.	Feasible. Endangered bird protection may restrict excavation in some areas.	Feasible. Expect significant administrative restrictions on the extent of the excavations required.
Availability of Services and Materials	None required.	Available. Some logistical problems to implement fencing and sign installation.	Available, special skills required.	Available, special skills required. Significant logistical problems.	Available, special skills required. Significant logistical problems.
Local Government Acceptance	None required.	Need for local government and USFWS acceptance anticipated. Approval expected.	Need for local government and USFWS acceptance anticipated. Partial approval expected.	Need for local government and USFWS acceptance anticipated. Partial approval expected.	Need for local government and USFWS acceptance anticipated. Partial approval expected.
Community Acceptance	None required.	Generally expected. Resistance expected from hikers.	Some temporary resistance by the public during implementation. Partial approval is expected.	Some temporary resistance by the public during implementation. Partial approval is expected.	Some temporary resistance by the public during implementation. Partial approval is expected.
COST	No cost.	$112,000	$1,130,000	$294,000	$7,000,000

Table 8-1. Analysis of Risk Reduction Alternatives (Page 5 of 12)

OOU-3 — Cerro Balcon					
Risk Reduction Component	**Alternative 1 No Further Action**	**Alternative 2 Institutional Controls**	**Alternative 3 Surface Clearance**	**Alternative 4 Clearance for Use (RECOMMENDED)**	**Alternative 5 Complete Clearance**
EFFECTIVENESS					
Overall Protection of Public Health and the Environment	No additional protection.	Limited protection. Public awareness would decrease risk to a limited degree.	Increased protection. Surface clearance would increase protection for landowner and visitors to site.	Significant increased protection over surface clearance.	Little increased protection over clearance for use.
Long-term Effectiveness	Not effective in reducing risk	Limited effectiveness. Access restrictions and fencing not possible.	Effective for non-intrusive activities. Ineffective for intrusive activities.	Effective for all activities.	Little increase in effectiveness for all activities.
Permanence	No effect.	Not permanent.	Limited permanence. Erosion may unearth buried OE.	Permanent.	Permanent.
Reduction of MTV	None.	None.	Limited volume reduction.	Significant volume reduction.	Maximum volume reduction.
Short-Term Effects During Implementation	No short term risk.	Limited risk to workers while posting signs. No risk to public.	Limited risk to workers. No risk to public.	Limited risk to workers. No risk to public.	Limited risk to workers. No risk to public.
Compliance with ARARs	None	No chemical-specific ARARs. Action- and location-specific ARARs would be complied with.	No chemical-specific ARARs. Action- and location-specific ARARs would be complied with.	No chemical-specific ARARs. Action- and location-specific ARARs would be complied with.	No chemical-specific ARARs. Action- and location-specific ARARs would be complied with.

Table 8-1. Analysis of Risk Reduction Alternatives (Page 6 of 12)

OOU-3 — Cerro Balcon					
Risk Reduction Component	**Alternative 1 No Further Action**	**Alternative 2 Institutional Controls**	**Alternative 3 Surface Clearance**	**Alternative 4 Clearance for Use (RECOMMENDED)**	**Alternative 5 Complete Clearance**
IMPLEMENTABILITY					
Technical Feasibility	Feasible	Feasible	Feasible. Clearance of heavy brush will make implementation difficult.	Feasible. Clearance of heavy brush will make implementation difficult.	Feasible. However, detection and removal of all OE unlikely. Clearance of heavy brush will make implementation difficult.
Administrative Feasibility	Feasible.	Limited feasibility. Property is privately owned. Fencing not feasible.	Limited feasibility. Access permission required.	Limited feasibility. Access permission required. Some limitations on excavation expected from landowner.	Limited feasibility. Some limitations on excavation expected from landowner.
Availability of Services and Materials	None required.	Available. Some logistical problems to implement fencing and sign installation.	Available, special skills required.	Available, special skills required. Significant logistical problems.	Available, special skills required. Significant logistical problems.
Local Government Acceptance	None required.	Need for local government acceptance is not anticipated.	Need for local government acceptance anticipated. Approval expected.	Need for local government acceptance anticipated. Approval expected.	Need for local government acceptance anticipated. Approval expected.
Community Acceptance	None required.	Private property. Sign posting and fencing acceptance not anticipated.	Private property. Acceptance expected on portions of the OOU. Rights-of-entry difficult to obtain on the entire OOU.	Private property. Acceptance expected on portions of the OOU. Rights-of-entry difficult to obtain on the entire OOU.	Private property. Acceptance expected on portions of the OOU. Rights-of-entry difficult to obtain on the entire OOU.
COST	No cost.	$12,100	$199,000	$298,000	$398,000

Table 8-1. Analysis of Risk Reduction Alternatives (Page 7 of 12)

OOU-4 — Culebrita					
Risk Reduction Component	**Alternative 1 No Further Action**	**Alternative 2 Institutional Controls**	**Alternative 3 Surface Clearance (RECOMMENDED)**	**Alternative 4 Clearance for Use**	**Alternative 5 Complete Clearance**
EFFECTIVENESS					
Overall Protection of Public Health and the Environment	No additional protection.	Limited protection. Access restrictions already in place. Island regularly patrolled. Fencing and signs would increase public awareness.	Increased protection. Most OE lies 6 inches or less below the surface. Surface clearance would increase protection for visitors.	Limited increased protection over surface clearance. Few OE deeper than 6 inches. Areas where development is expected should be cleared to an appropriate depth.	Little increased protection over clearance for use.
Long-term Effectiveness	Not effective in reducing risk.	Limited effectiveness. Access restrictions difficult to enforce.	Effective for non-intrusive activities due to depth of ordnance. Most ordnance will be closed using this alternative.	Effective for all activities. Little increase in effectiveness over surface clearance.	Little increase in effectiveness over clearance for use for all activities.
Permanence	Not applicable.	Permanent if fences are maintained and access restrictions enforced.	Limited permanence. Erosion may unearth buried OE.	Permanent.	Permanent.
Reduction of MTV	No significant volume reduction.	No significant volume reduction.	Significant volume reduction.	Limited additional reduction since most OE lies 6 inches or less below the surface.	Limited additional reduction since most OE lies 6 inches or less below the surface.
Short-Term Effects During Implementation	No short-term risk.	Limited risk to workers posting signs and fenceposts. No risk to public.	Limited risk to workers. No risk to public.	Limited risk to workers. No risk to public.	Limited risk to workers. No risk to public.
Compliance with ARARs	None.	No chemical-specific ARARs. Action- and location-specific ARARs would be complied with.	No chemical-specific ARARs. Action- and location-specific ARARs would be complied with.	No chemical-specific ARARs. Action- and location-specific ARARs would be complied with.	No chemical-specific ARARs. Action- and location-specific ARARs would be complied with.

Table 8-1. Analysis of Risk Reduction Alternatives (Page 8 of 12)

OOU-4 — Culebrita					
Risk Reduction Component	**Alternative 1 No Further Action**	**Alternative 2 Institutional Controls**	**Alternative 3 Surface Clearance (RECOMMENDED)**	**Alternative 4 Clearance for Use**	**Alternative 5 Complete Clearance**
IMPLEMENTABILITY					
Technical Feasibility	Feasible.	Feasible.	Feasible. Clearance of heavy brush will make implementation difficult in some areas. Weather and sea conditions may limit activities.	Feasible. Clearance of heavy brush will make implementation difficult in some areas. Weather and sea conditions may limit activities.	Feasible. Detection and removal of all OE unlikely. Clearance of heavy brush will make implementation difficult in some areas. Weather and sea conditions may limit activities.
Administrative Feasibility	Feasible.	Fencing and access restriction feasible in many areas. Enforcement of access restrictions very difficult due to remoteness of location.	Feasible. Will require close coordination with PRDNR.	Feasible. Species protection may restrict excavation in some areas.	Feasible. Expect greater administrative restrictions on excavations in some areas to protect species.
Availability of Services and Materials	None required.	Available. Significant logistical problems to implement fencing and sign installation. There will be a greater cost for transportation of materials.	Available, special skills required. Boats required to mobilize men and equipment.	Available, special skills required. Boats required to mobilize men and equipment.	Available, special skills required. Boats required to mobilize men and equipment.
Local Government Acceptance	None required.	Need for local government and USFWS acceptance anticipated. Some restrictions anticipated.	Need for local government and USFWS acceptance anticipated. Acceptance expected.	Need for local government and USFWS acceptance anticipated. Acceptance expected.	Need for local government and USFWS acceptance anticipated. Acceptance expected.
Community Acceptance	None required.	Generally expected. Some resistance expected from tourists.	Expected. Some resistance by the public during implementation.	Expected. Some resistance by the public during implementation.	Expected. Some resistance by the public during implementation.

Table 8-1. Analysis of Risk Reduction Alternatives (Page 9 of 12)

OOU-4 — Culebrita					
Risk Reduction Component	**Alternative 1 No Further Action**	**Alternative 2 Institutional Controls**	**Alternative 3 Surface Clearance (RECOMMENDED)**	**Alternative 4 Clearance for Use**	**Alternative 5 Complete Clearance**
COST	No cost.	$378,000	$678,000 Significant costs for daily mobilization to site.	$2,060,000 Significant costs for daily mobilization to site.	$2,120,000 Significant costs for daily mobilization to site.

Table 8-1. Analysis of Risk Reduction Alternatives (Page 10 of 12)

OOU-5 — Other Surrounding Cays					
Risk Reduction Component	**Alternative 1 No Further Action**	**Alternative 2 Institutional Controls (RECOMMENDED AS "PHASE I")**	**Alternative 3 Surface Clearance (RECOMMENDED AS "PHASE II")**	**Alternative 4 Clearance for Use**	**Alternative 5 Complete Clearance**
EFFECTIVENESS					
Overall Protection of Public Health and the Environment	No protection.	Significant protection. Access restrictions already in place. Cays are regularly patrolled. Fencing and signs would increase protection.	Some increased risk reduction to visitors to cays. Surface clearance would increase protection to visitors.	Little increased risk reduction over surface clearance. Little possibility of intrusive activities on any of the small cays.	Little increased risk reduction over clearance for use.
Long-term Effectiveness	Not effective in reducing risk.	Effective, if access restrictions are enforced.	Effective Intrusive activities not expected. Would result in almost complete clearance.	Little increase in effectiveness over surface clearance since intrusive activities are not expected and OE expected to be near surface.	Little increase in effectiveness over clearance for use.
Permanence	Not applicable.	Permanent, if fences are maintained and access restrictions enforced.	Limited permanence. Erosion may unearth buried OE.	Permanent.	Permanent.
Reduction of MTV	None.	None.	Significant volume reduction.	Limited additional reduction over Alternative 3.	Limited additional reduction over Alternative 4.
Short-Term Effects During Implementation	No short term effects.	Significant risk to workers if fencing is installed. Access to most of the small cays is hazardous. No risk to public.	Significant risk to workers. Access to most of the small cays is hazardous. No risk to public.	Significant risk to workers. Access to most of the small cays is hazardous. No risk to public.	Significant risk to workers. Access to most of the small cays is hazardous. No risk to public.
Compliance with ARARs	None.	No chemical-specific ARARs. Action- and location-specific ARARs would be complied with.	No chemical-specific ARARs. Action- and location-specific ARARs would be complied with.	No chemical-specific ARARs. Action- and location-specific ARARs would be complied with.	No chemical-specific ARARs. Action- and location-specific ARARs would be complied with.

Table 8-1. Analysis of Risk Reduction Alternatives (Page 11 of 12)

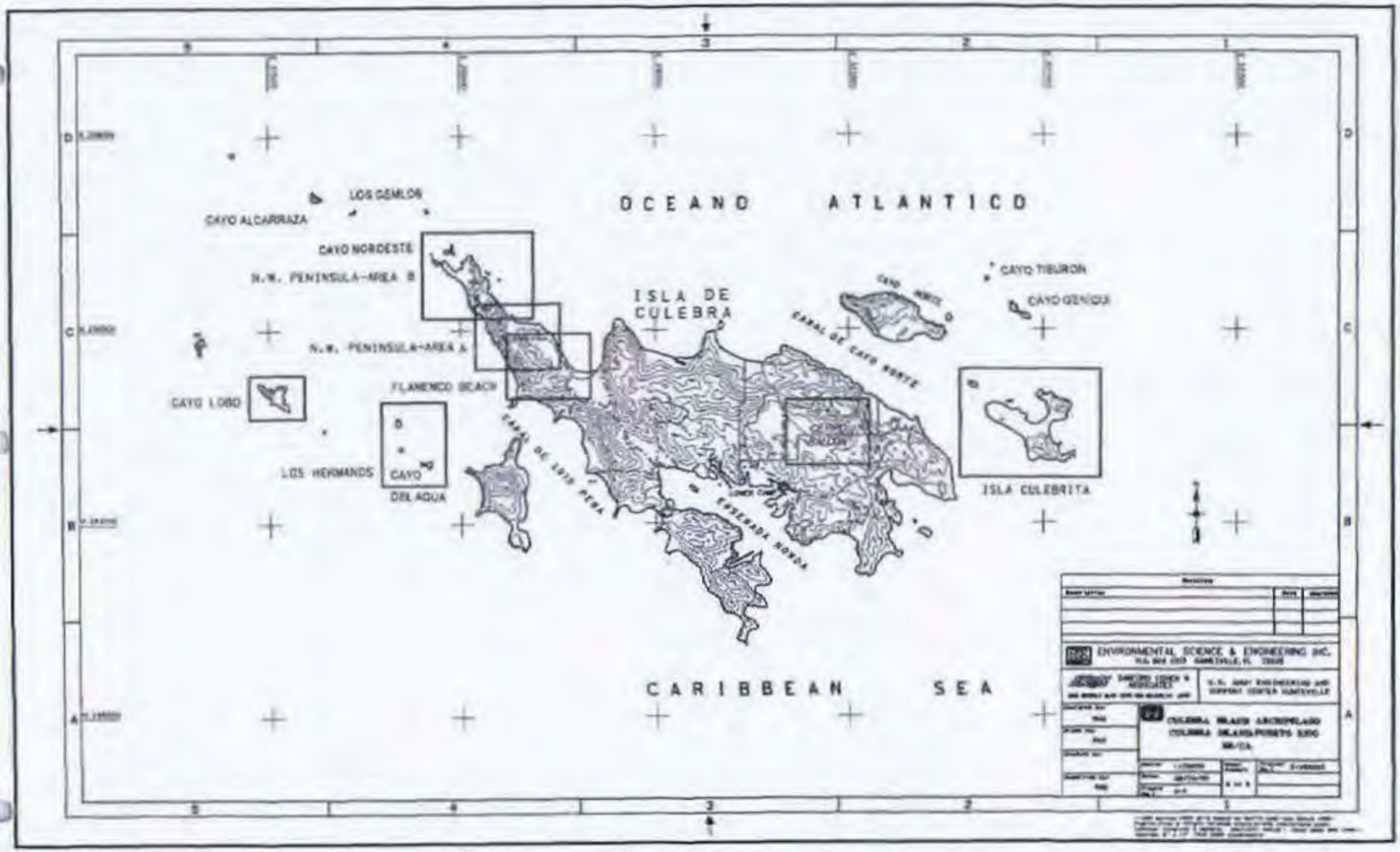
OOU-5 — Other Surrounding Cays					
Risk Reduction Component	**Alternative 1 No Further Action**	**Alternative 2 Institutional Controls (RECOMMENDED AS "PHASE I")**	**Alternative 3 Surface Clearance (RECOMMENDED AS "PHASE II")**	**Alternative 4 Clearance for Use**	**Alternative 5 Complete Clearance**
IMPLEMENTABILITY					
Technical Feasibility	Feasible.	Feasible.	Feasible. Clearance of heavy brush will make implementation difficult on larger cays. Weather and sea conditions may limit activities. Implementation difficult as the OOU is not accessible by land.	Feasible. Magnetic rocks will produce numerous false positives. Clearance of heavy brush will make implementation difficult on larger cays. Weather and sea conditions may limit activities. Implementation difficult as the OOU is not accessible by land.	Feasible. Detection and removal of all OE unlikely. Clearance of heavy brush will make implementation difficult on larger cays. Weather and sea conditions may limit activities. Implementation difficult as the OOU is not accessible by land.
Administrative Feasibility	Feasible.	Fencing not required due to remoteness of location. Enforcement of access restrictions difficult due to remoteness of location.	Partially feasible. Will require close coordination with USFWS.	Partially feasible. Species protection may restrict excavation in some areas. Will require close coordination with USFWS.	Partially feasible. Expect greater administrative restrictions. Will require close coordination with USFWS.
Availability of Services and Materials	None required.	Available. Significant logistical problems to implement sign installation. Boats required to mobilize men and equipment.	Available, special skills required. Significant logistics problems. Boats required to mobilize men and equipment.	Available, special skills required. Significant logistics problems. Boats required to mobilize men and equipment.	Available, special skills required. Significant logistics problems. Boats required to mobilize men and equipment.
Local Government Acceptance	None required.	Need for local government and USFWS acceptance anticipated. General acceptance is expected.	Need for local government and USFWS acceptance anticipated. Partial acceptance is expected.	Need for local government and USFWS acceptance anticipated. Partial acceptance is expected.	Need for local government and USFWS acceptance anticipated. Partial acceptance is expected.

Table 8-1. Analysis of Risk Reduction Alternatives (Page 12 of 12)

OOU-5 — Other Surrounding Cays					
Risk Reduction Component	**Alternative 1 No Further Action**	**Alternative 2 Institutional Controls (RECOMMENDED AS "PHASE I")**	**Alternative 3 Surface Clearance (RECOMMENDED AS "PHASE II")**	**Alternative 4 Clearance for Use**	**Alternative 5 Complete Clearance**
Community Acceptance	None required.	OOU off limits to public. None required.	OOU off limits to public. None required.	OOU off limits to public. None required.	OOU off limits to public. None required.
COST	No cost.	$85,900	$315,000 Significant costs for daily mobilization to site.	$574,000 Significant costs for daily mobilization to site.	$873,000 Significant costs for specialized equipment and daily mobilization to site.

Note: An education/information program is applicable to all OOUs within the former Culebra Naval Facility. The total estimated cost to develop and implement this program is $25,000 to $50,000. This cost has not been distributed among the OOUs. The estimated annual cost to administer the education/information program is $2,500 to $5,000.

Source: ESE.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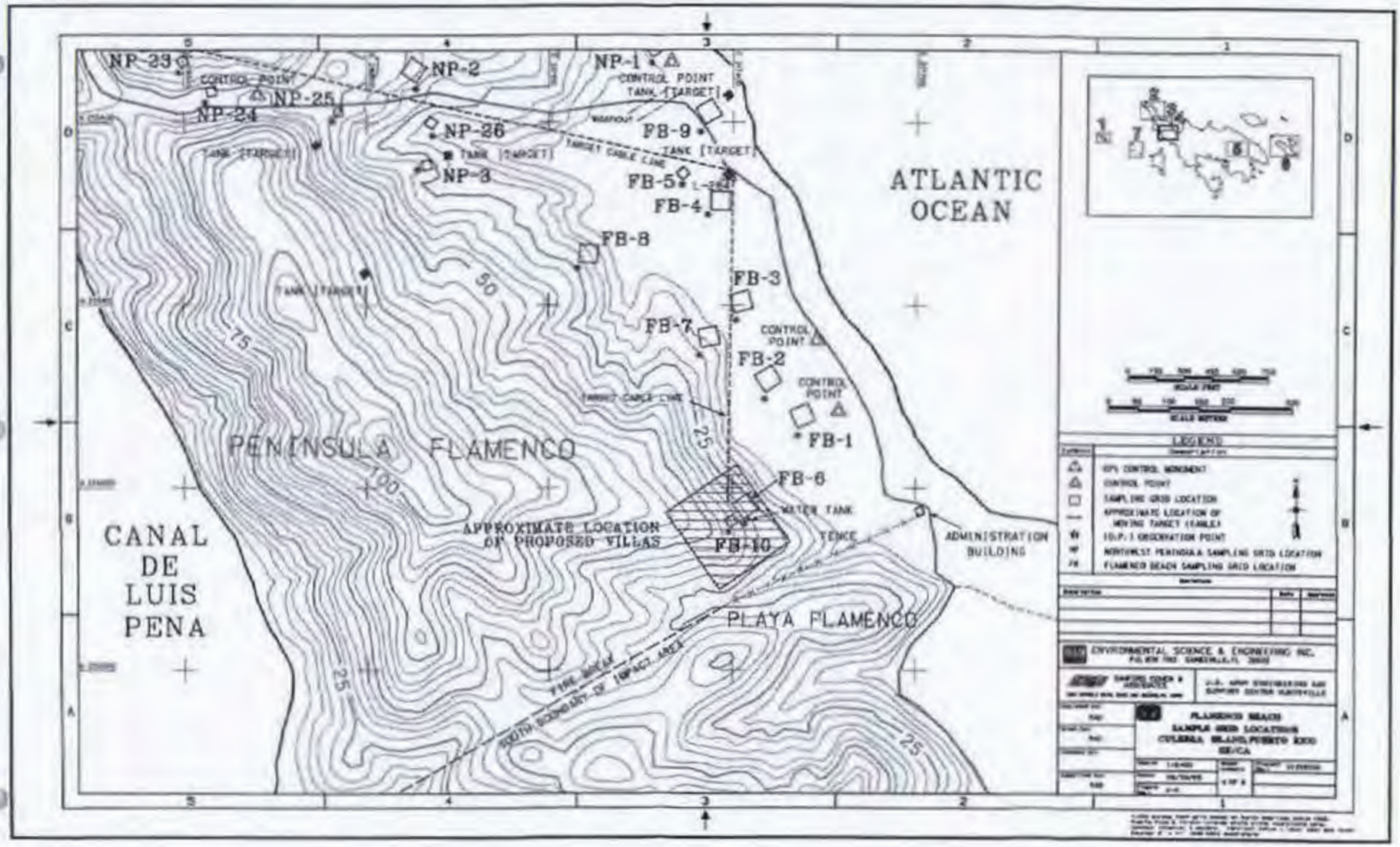
LOS GEMELOS
CAYO ALCARRAZA
CAYO NORDESTE
N.W. PENINSULA-AREA B
N.W. PENINSULA-AREA A
ISLA DE CULEBRA
CAYO TIBURON
CAYO GENIQUI
CAYO NORTE
CANAL DE CAYO NORTE
FLAMENCO BEACH
CAYO LOBO
LOS HERMANOS
CAYO DEL AGUA
CANAL DE LUIS PEÑA
ENSENADA HONDA
ISLA CULEBRITA
CARIBBEAN SEA
ENVIRONMENTAL SCIENCE & ENGINEERING INC.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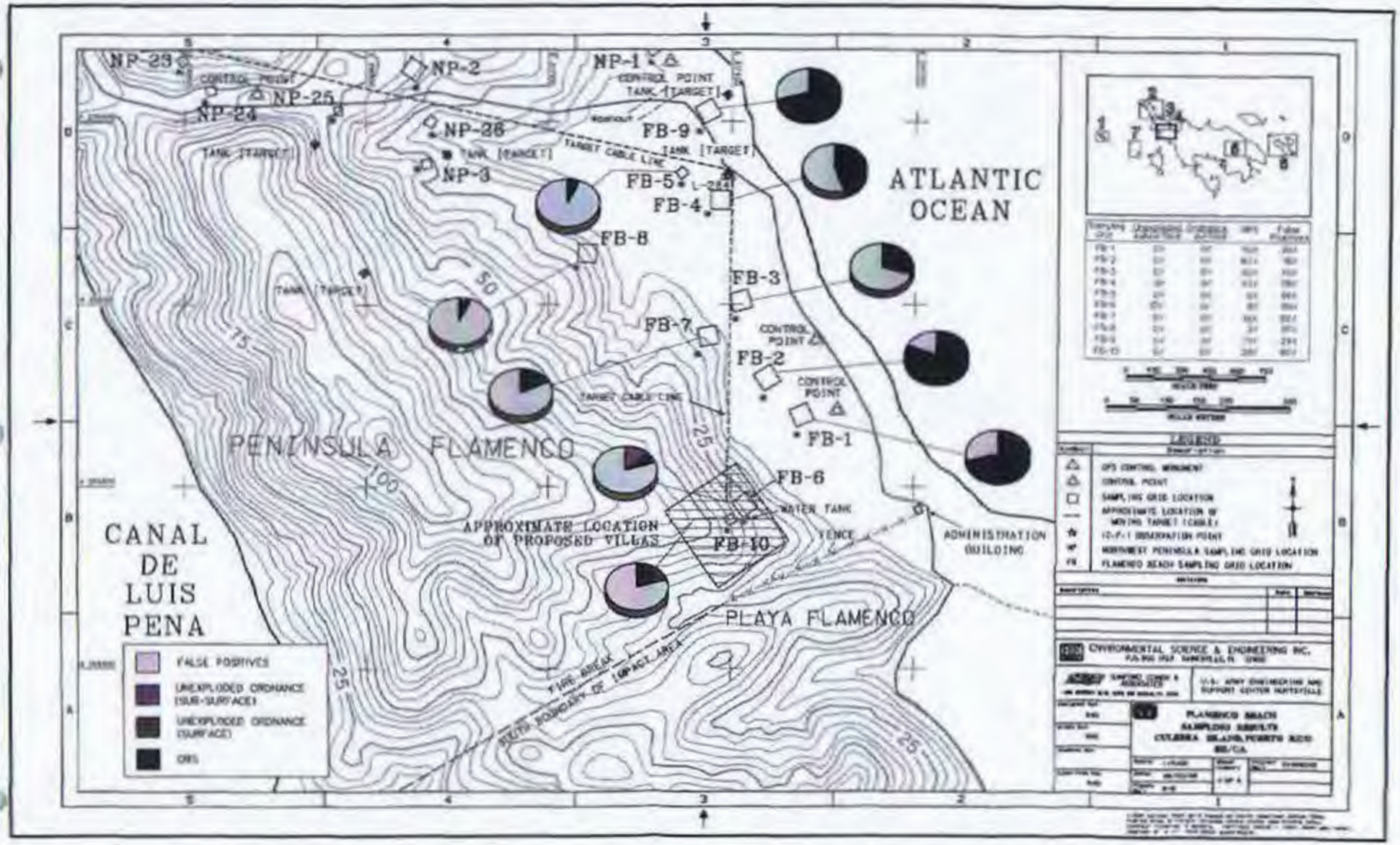
NP-2
NP-1
CONTROL POINT
NP-25
NP-24
NP-26
TANK (TARGET)
NP-3
FB-9
FB-5
FB-4
FB-8
FB-3
FB-7
FB-2
FB-1
FB-6
FB-10
ATLANTIC OCEAN
PENINSULA FLAMENCO
CANAL DE LUIS PENA
APPROXIMATE LOCATION OF PROPOSED VILLAS
WATER TANK
FENCE
ADMINISTRATION BUILDING
PLAYA FLAMENCO
TREE BREAK
SOUTH BOUNDARY OF IMPACT AREA
TARGET CABLE LINE
50
75
100
25
LEGEND
ENVIRONMENTAL SCIENCE & ENGINEERING INC.
FLAMENCO BEACH
SAMPLE GRID LOCATIONS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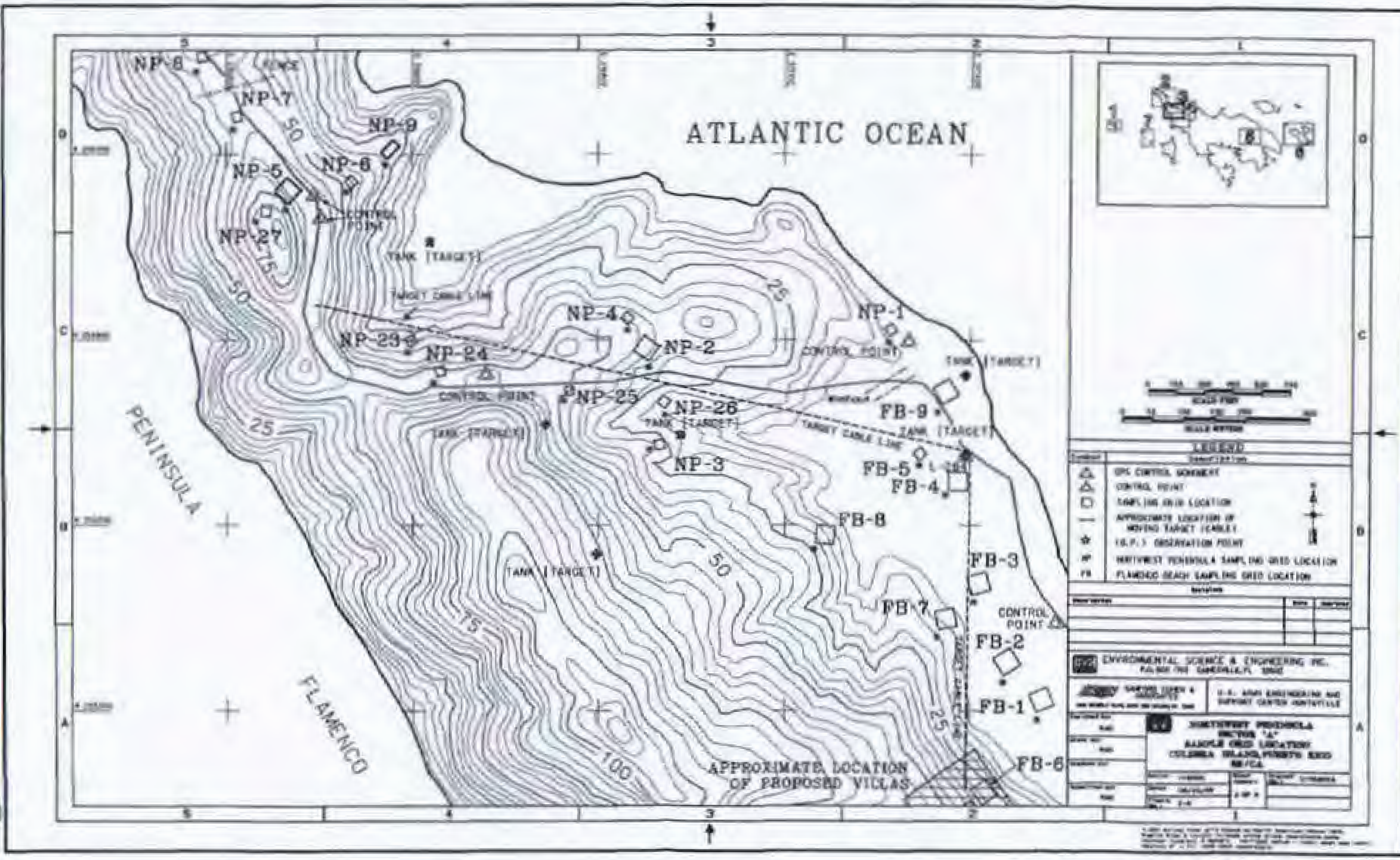
NP-2
NP-1
CONTROL POINT
TANK (TARGET)
NP-25
NP-24
NP-26
FB-9
TANK (TARGET)
TARGET CABLE LINE
NP-3
FB-5
FB-4
ATLANTIC OCEAN
FB-8
FB-3
50
FB-7
CONTROL POINT
FB-2
75
CONTROL POINT
FB-1
PENINSULA FLAMENCO
100
25
FB-6
WATER TANK
APPROXIMATE LOCATION OF PROPOSED VILLAS
FB-10
FENCE
ADMINISTRATION BUILDING
CANAL DE LUIS PENA
PLAYA FLAMENCO
FALSE POSITIVES
UNEXPLODED ORDNANCE (SUB-SURFACE)
UNEXPLODED ORDNANCE (SURFACE)
ORS
LEGEND
GPS CONTROL MONUMENT
CONTROL POINT
SAMPLING GRID LOCATION
APPROXIMATE LOCATION OF MOVING TARGET CABLE
OBSERVATION POINT
NORTHWEST PENINSULA SAMPLING GRID LOCATION
FLAMENCO BEACH SAMPLING GRID LOCATION
ENVIRONMENTAL SCIENCE & ENGINEERING INC.
U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE
FLAMENCO BEACH
SAMPLING RESULTS
CULEBRA ISLAND, PUERTO RICO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PENINSULA
FLAMENCO
NP-1
NP-2
NP-3
NP-4
NP-5
NP-6
NP-7
NP-8
NP-9
NP-23
NP-24
NP-25
NP-26
NP-27
FB-1
FB-2
FB-3
FB-4
FB-5
FB-6
FB-7
FB-8
FB-9
CONTROL POINT
TANK (TARGET)
TARGET CABLE LINE
25
50
75
100
APPROXIMATE LOCATION OF PROPOSED VILLAS
LEGEND
CONTROL POINT
SAMPLING GRID LOCATION
APPROXIMATE LOCATION OF MOVING TARGET (CABLE)
(O.P.) OBSERVATION POINT
NORTHWEST PENINSULA SAMPLING GRID LOCATION
FLAMENCO BEACH SAMPLING GRID LOCATION
ENVIRONMENTAL SCIENCE & ENGINEERING INC.
U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE
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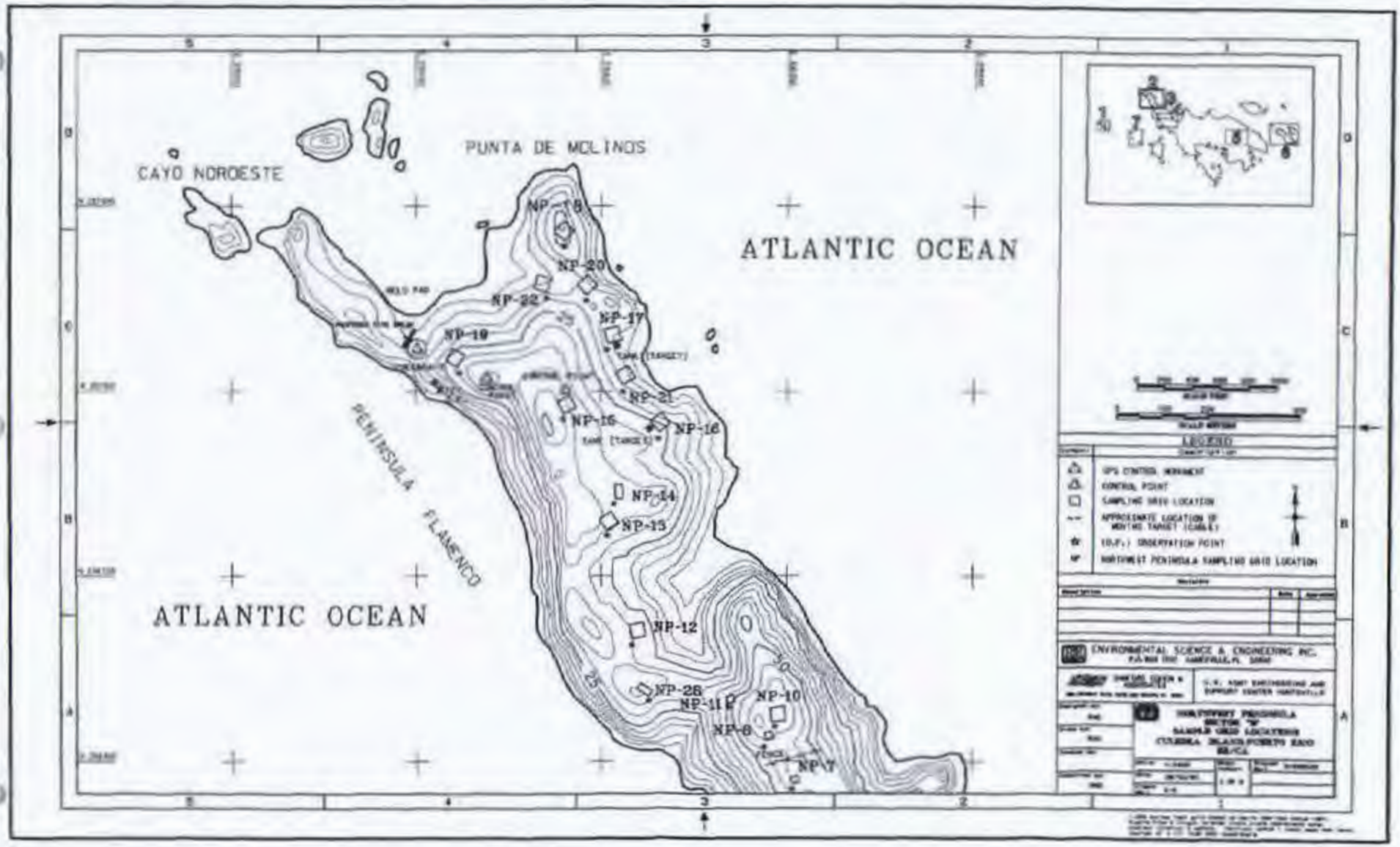
SECTOR "A"
SAMPLE GRID LOCATION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PUNTA DE MOLINOS
ATLANTIC OCEAN
ATLANTIC OCEAN
PENINSULA FLAMENCO
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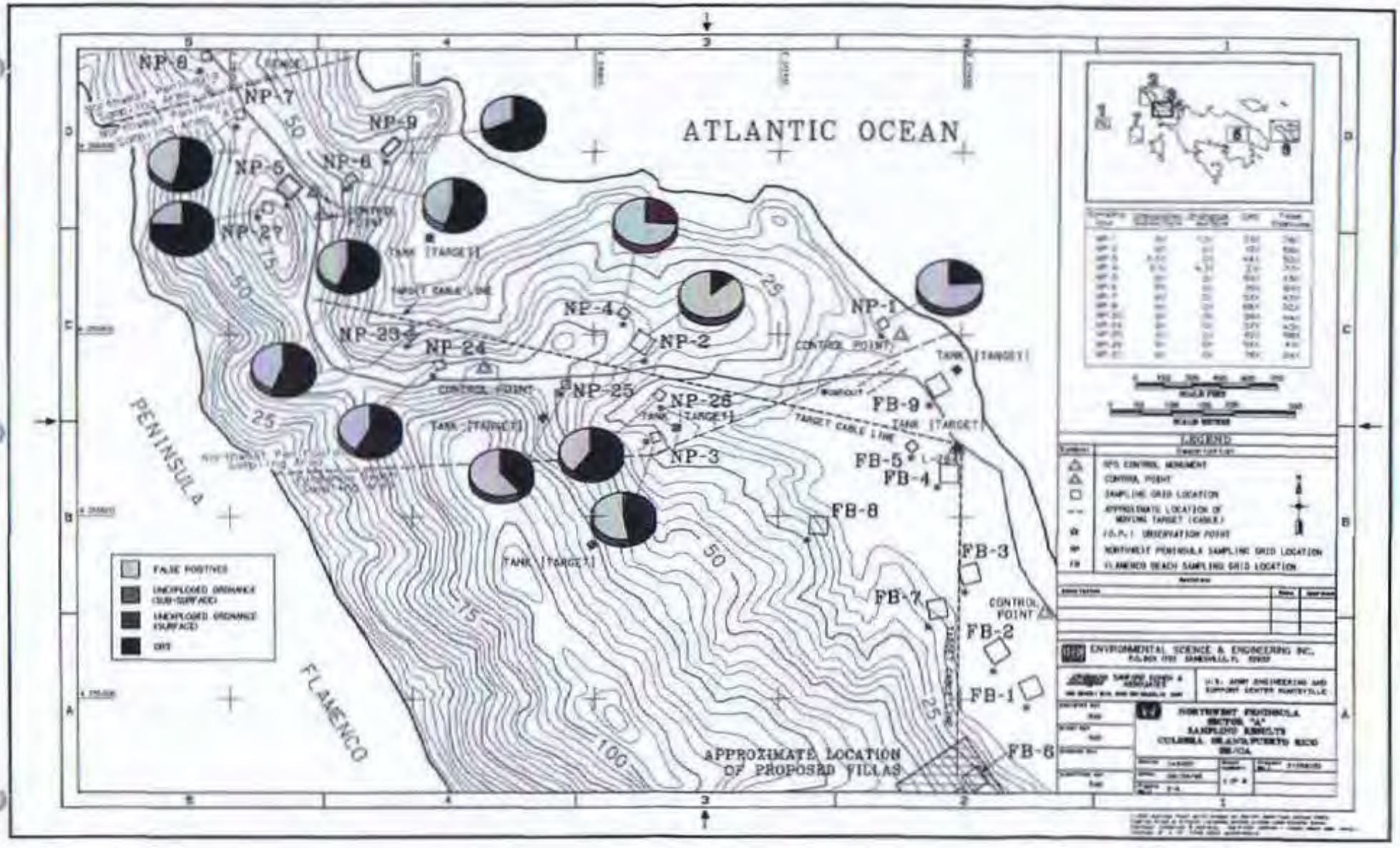
NP-20
NP-22
NP-17
NP-19
NP-21
NP-15
NP-16
NP-14
NP-13
NP-12
NP-26
NP-11
NP-10
NP-8
NP-7
LEGEND
GPS CONTROL MONUMENT
CONTROL POINT
SAMPLING GRID LOCATION
APPROXIMATE LOCATION OF MOVING TARGET (CABLE)
(O.P.) OBSERVATION POINT
NORTHWEST PENINSULA SAMPLING GRID LOCATION
ENVIRONMENTAL SCIENCE & ENGINEERING INC.
NORTHWEST PENINSULA
SECTOR "A"
SAMPLE GRID LOCATIONS
CULEBRA ISLAND,PUERTO RICO
92/CA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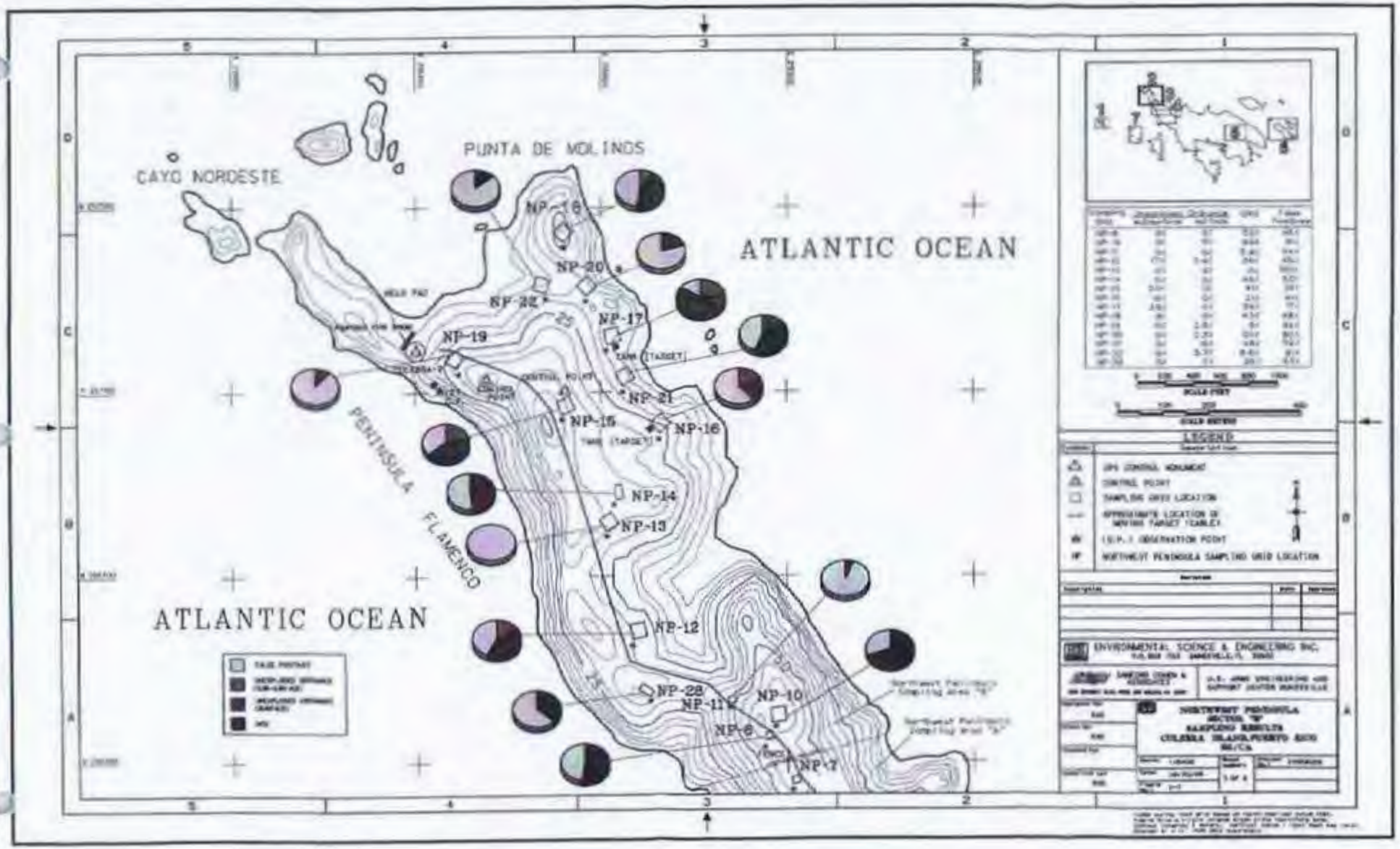
PENINSULA
FLAMENCO
NP-1
NP-2
NP-3
NP-4
NP-5
NP-6
NP-7
NP-8
NP-9
NP-22
NP-23
NP-24
NP-25
NP-26
FB-1
FB-2
FB-3
FB-4
FB-5
FB-6
FB-7
FB-8
FB-9
CONTROL POINT
TANK (TARGET)
TARGET CABLE LINE
APPROXIMATE LOCATION OF PROPOSED VILLAS
FALSE POSITIVES
UNEXPLODED ORDNANCE (SUB-SURFACE)
UNEXPLODED ORDNANCE (SURFACE)
GRID
LEGEND
SAMPLING GRID LOCATION
ENVIRONMENTAL SCIENCE & ENGINEERING INC.
U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE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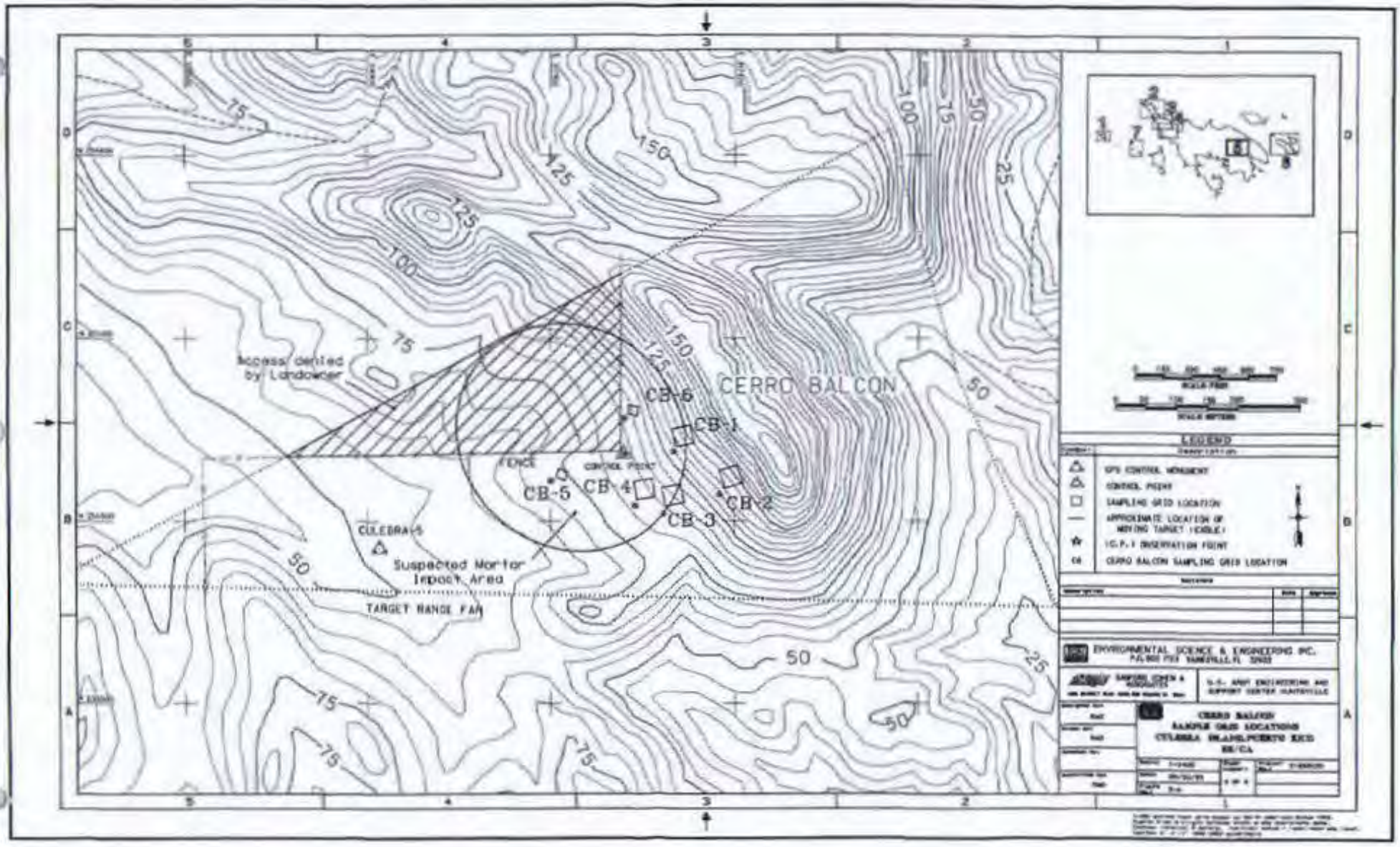
CAYO NORDESTE
ATLANTIC OCEAN
ATLANTIC OCEAN
PENINSULA FLAMENCO
NP-16
NP-20
NP-22
NP-17
NP-19
NP-21
NP-15
NP-18
NP-14
NP-13
NP-12
NP-28
NP-11
NP-10
NP-6
NP-7
LEGEND
ENVIRONMENTAL SCIENCE & ENGINEERING INC.


CERRO BALCON
CB-1
CB-2
CB-3
CB-4
CB-5
CB-6
Access denied by Landowner
Suspected Mortar Impact Area
TARGET RANGE FAN
CULEBRA-5
FENCE
CONTROL POINT
LEGEND
GPS CONTROL MONUMENT
CONTROL PIECES
SAMPLING GRID LOCATION
APPROXIMATE LOCATION OF MOVING TARGET CABLE
I.C.P.I OBSERVATION POINT
CB CERRO BALCON SAMPLING GRID LOCATION
ENVIRONMENTAL SCIENCE & ENGINEERING INC.
U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE
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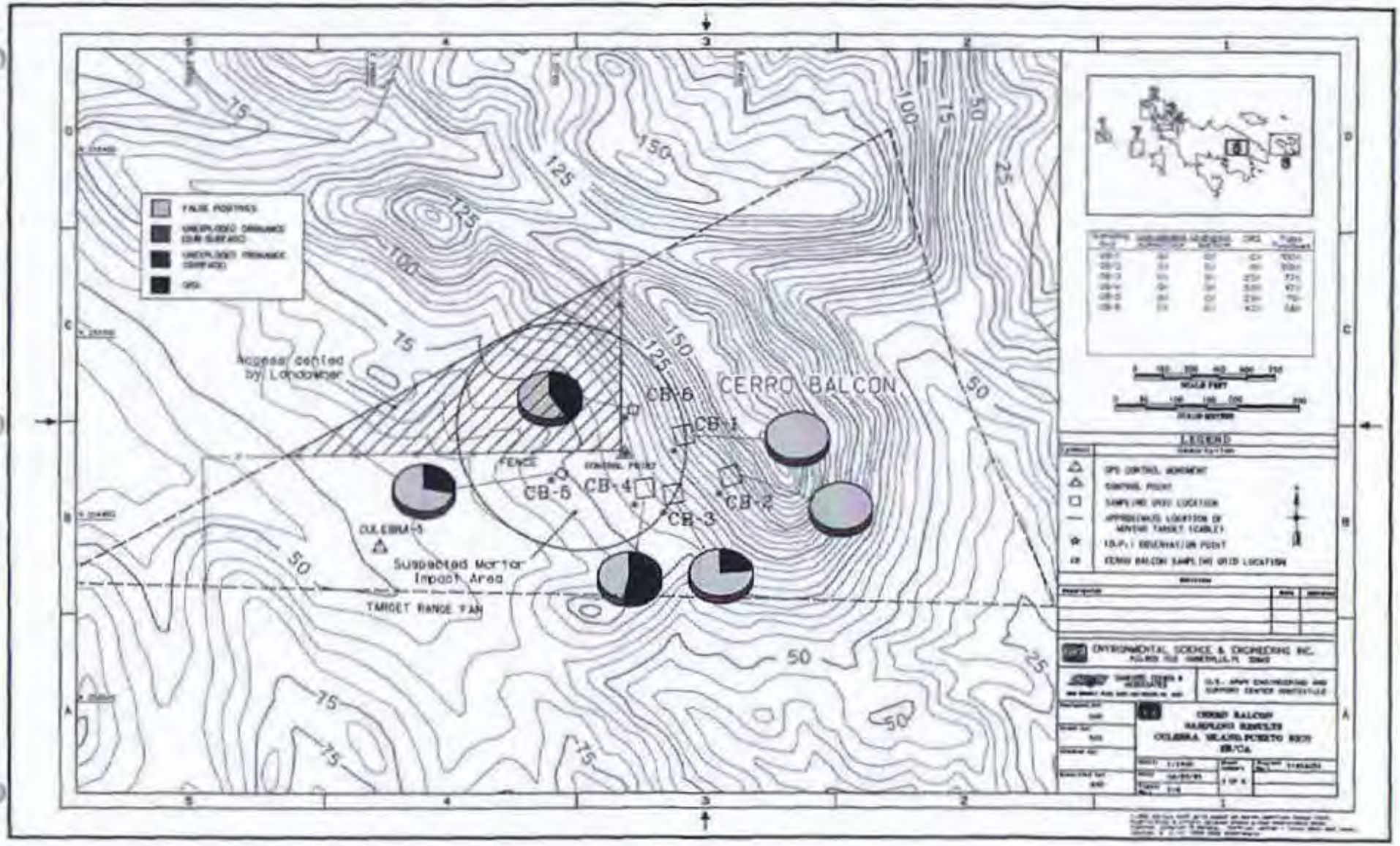
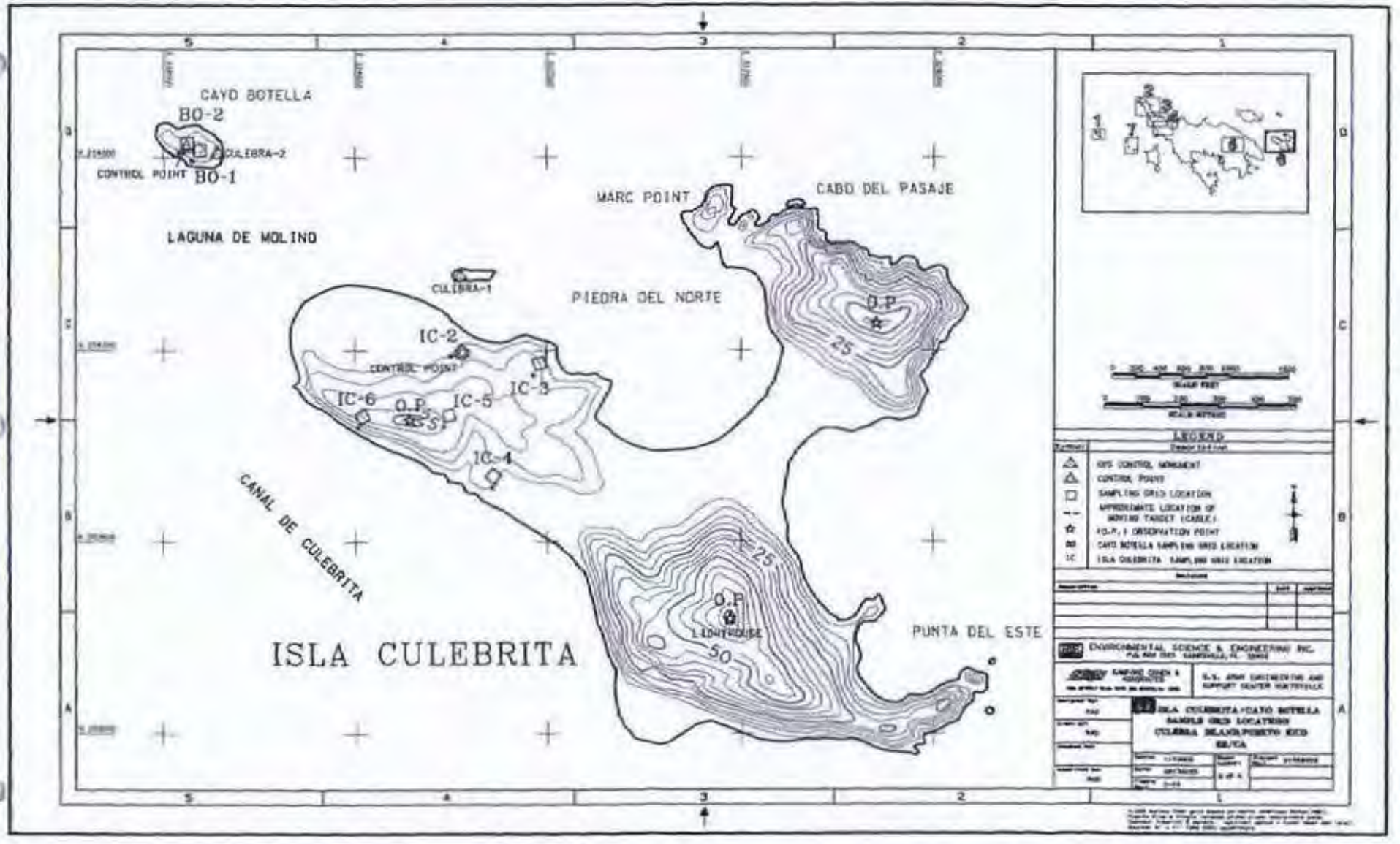
RE/CA


CERRO BALCON
CB-1
CB-2
CB-3
CB-4
CB-5
CB-6
FENCE
CULEBRA-5
Suspected Mortar Impact Area
TARGET RANGE FAN
Access denied by Landowner
LEGEND
ENVIRONMENTAL SCIENCE & ENGINEERING INC.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BO-2
BO-1
CULEBRA-2
CONTROL POINT
LAGUNA DE MOLINO
MARC POINT
CABO DEL PASAJE
CULEBRA-1
PIEDRA DEL NORTE
O.P
25
IC-2
CONTROL POINT
IC-6
O.P
IC-5
IC-3
IC-4
CANAL DE CULEBRITA
ISLA CULEBRITA
50
PUNTA DEL ESTE
LEGEND
GPS CONTROL MONUMENT
CONTROL POINT
SAMPLING GRID LOCATION
O.P.) OBSERVATION POINT
ENVIRONMENTAL SCIENCE & ENGINEERING INC.
ISLA CULEBRITA-CAYO BOTELLA
SAMPLE GRID LOCATIONS
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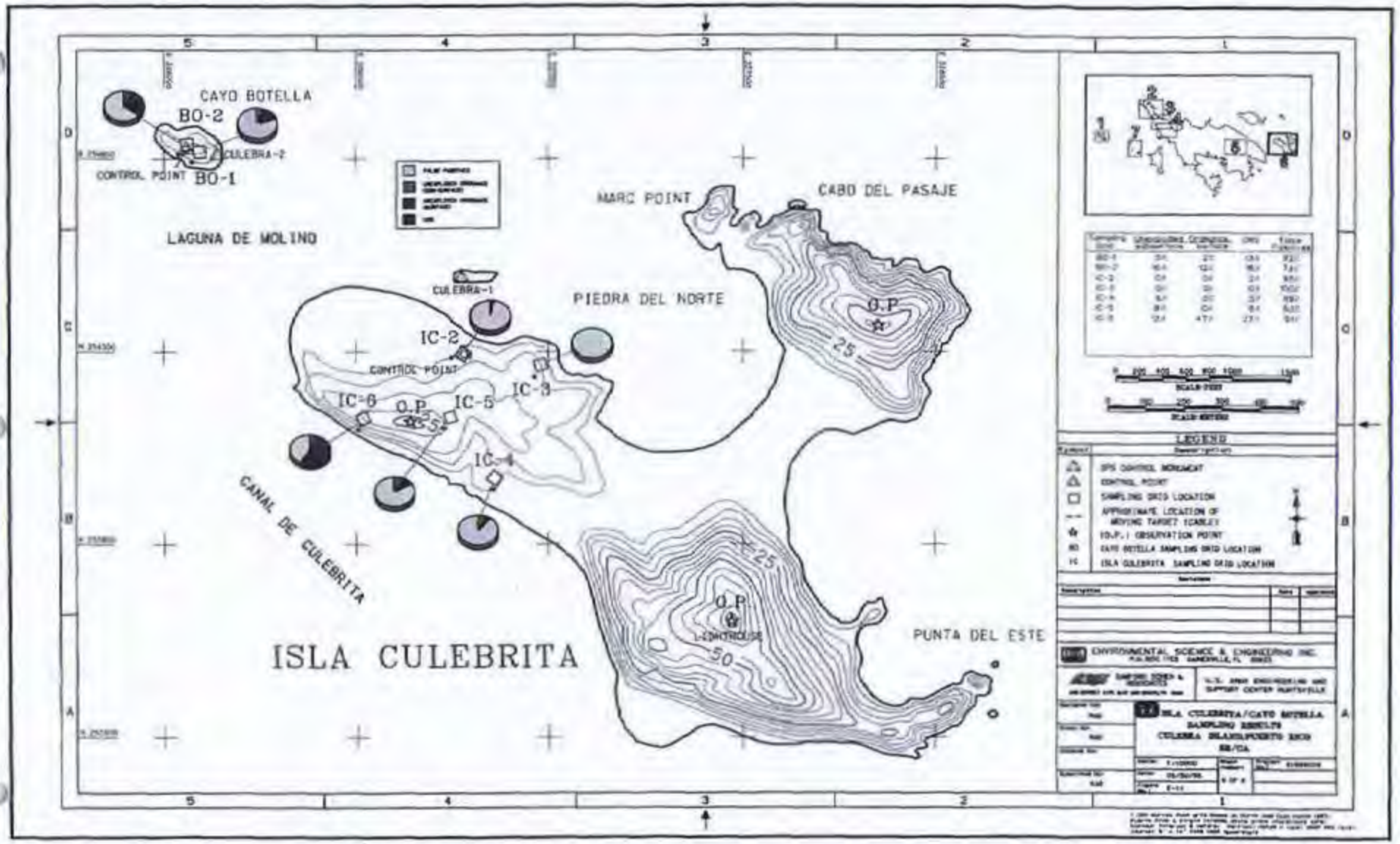
EE/CA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BO-2
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CULEBRA-1
IC-2
CONTROL POINT
IC-6
O.P
IC-5
IC-3
IC-4
CANAL DE CULEBRITA
ISLA CULEBRITA
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PUNTA DEL ESTE
25
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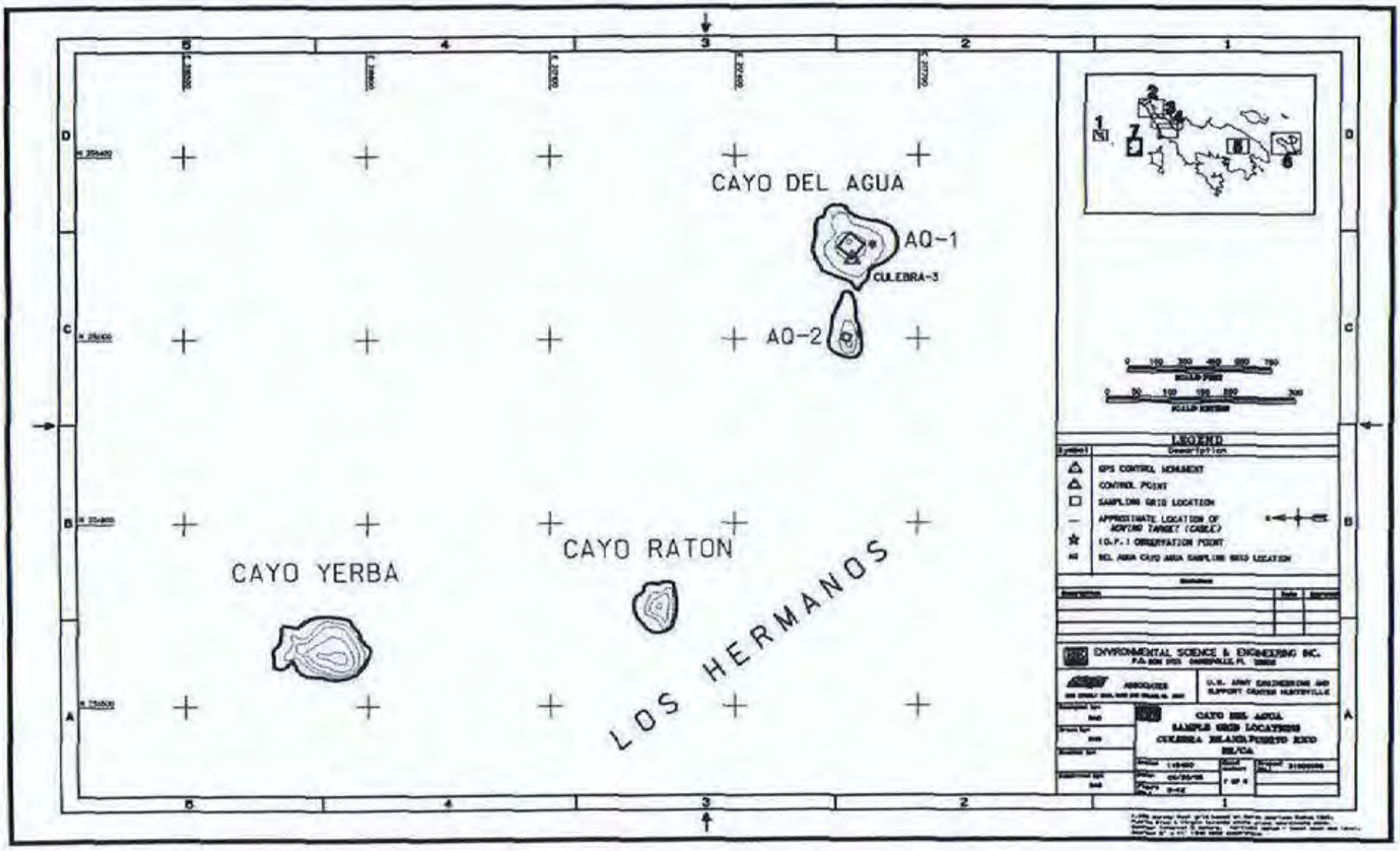
LEGEND
ISLA CULEBRITA SAMPLING GRID LOCATION
ENVIRONMENTAL SCIENCE & ENGINEERING INC.


CAYO DEL AGUA
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CULEBRA-3
AQ-2
CAYO YERBA
CAYO RATON
LOS HERMANOS
LEGEND
GPS CONTROL MONUMENT
CONTROL POINT
SAMPLING GRID LOCATION
OBSERVATION POINT
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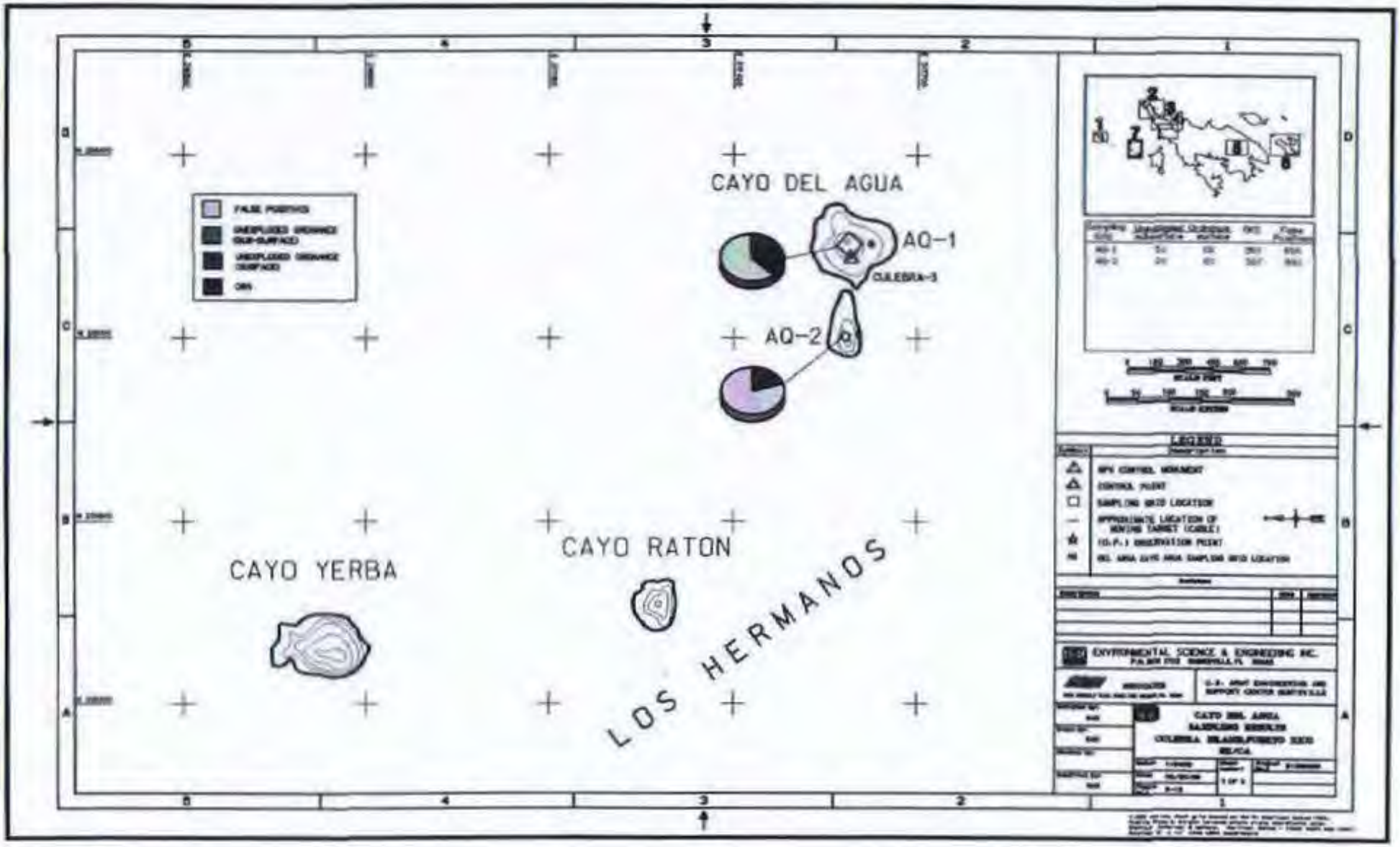
CAYO DEL AGUA
SAMPLE GRID LOCATIONS
CULEBRA ISLAND,PUERTO RICO


CAYO DEL AGUA
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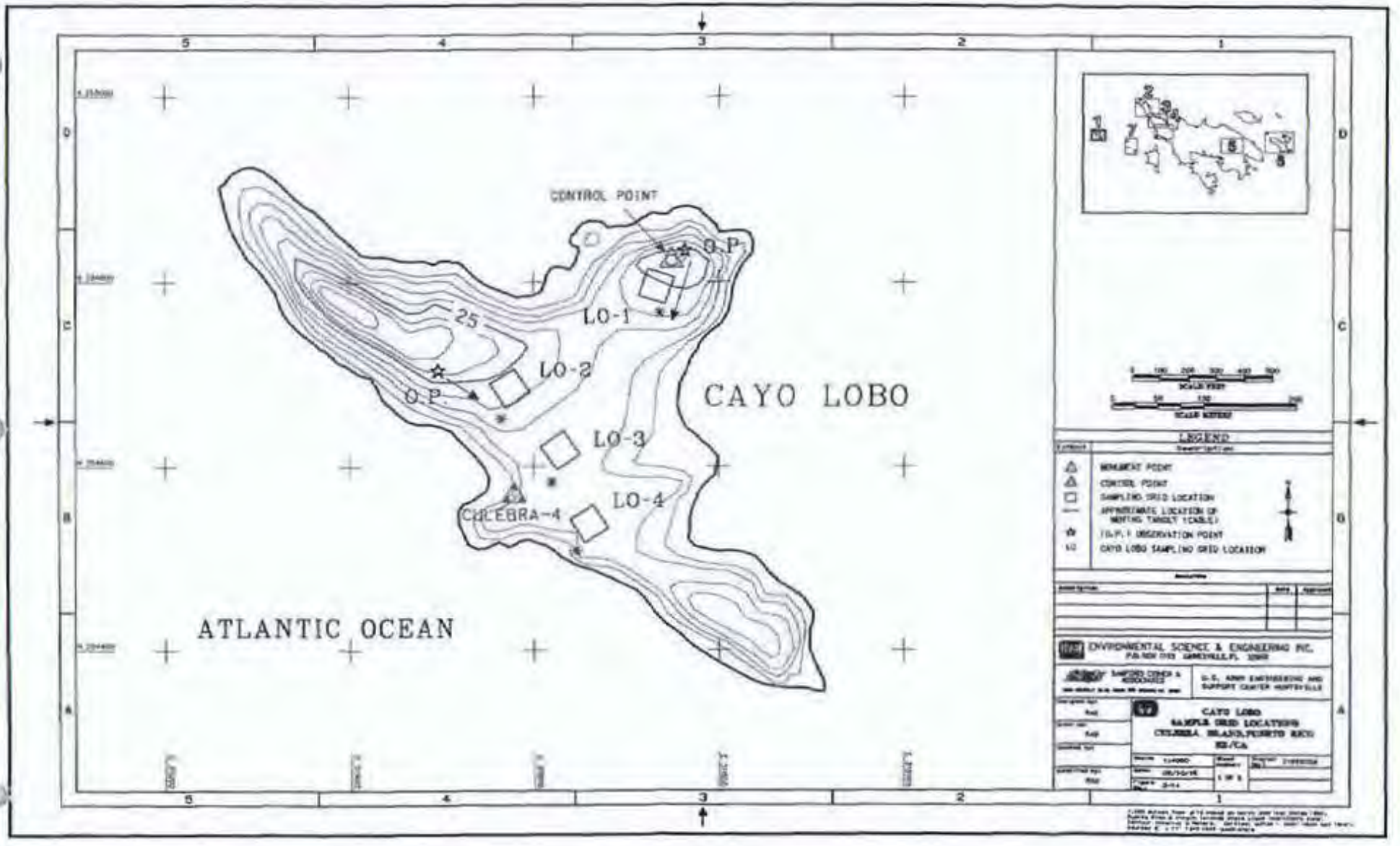
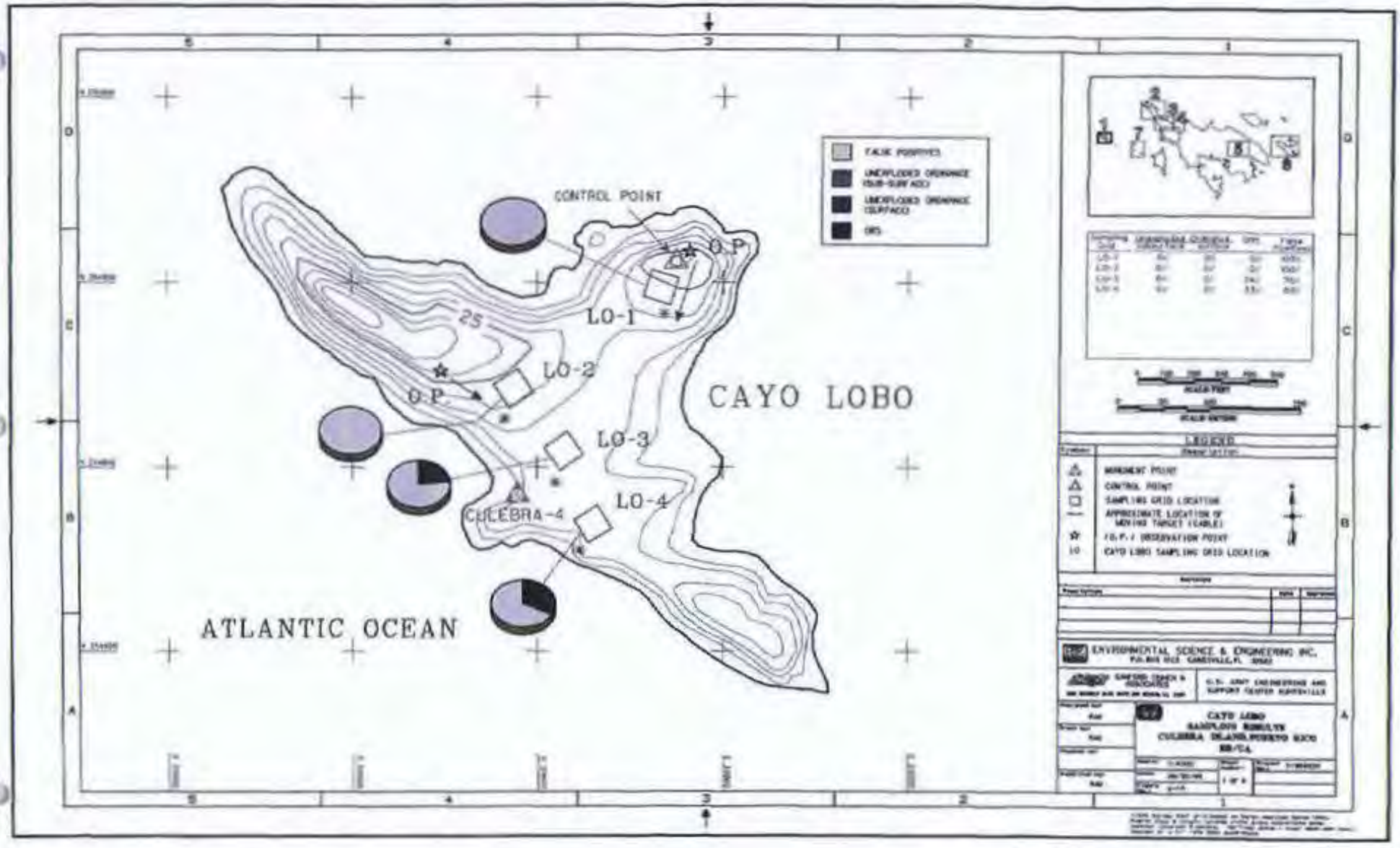
LOS HERMANOS
LEGEND
ENVIRONMENTAL SCIENCE & ENGINEERING INC.


CONTROL POINT
O.P.
O.P.
25
LO-1
LO-2
LO-3
LO-4
CAYO LOBO
CHLEBRA-4
ATLANTIC OCEAN
LEGEND
MONUMENT POINT
CONTROL POINT
SAMPLING GRID LOCATION
APPROXIMATE LOCATION OF MAPPING TRANSECT (CABLE)
O.P. OBSERVATION POINT
CAYO LOBO SAMPLING GRID LOCATION
ENVIRONMENTAL SCIENCE & ENGINEERING INC.
U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE
CAYO LOBO
SAMPLE GRID LOCATIONS
CULEBRA, ISLAND, PUERTO RICO
02-/CA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LO-1
25
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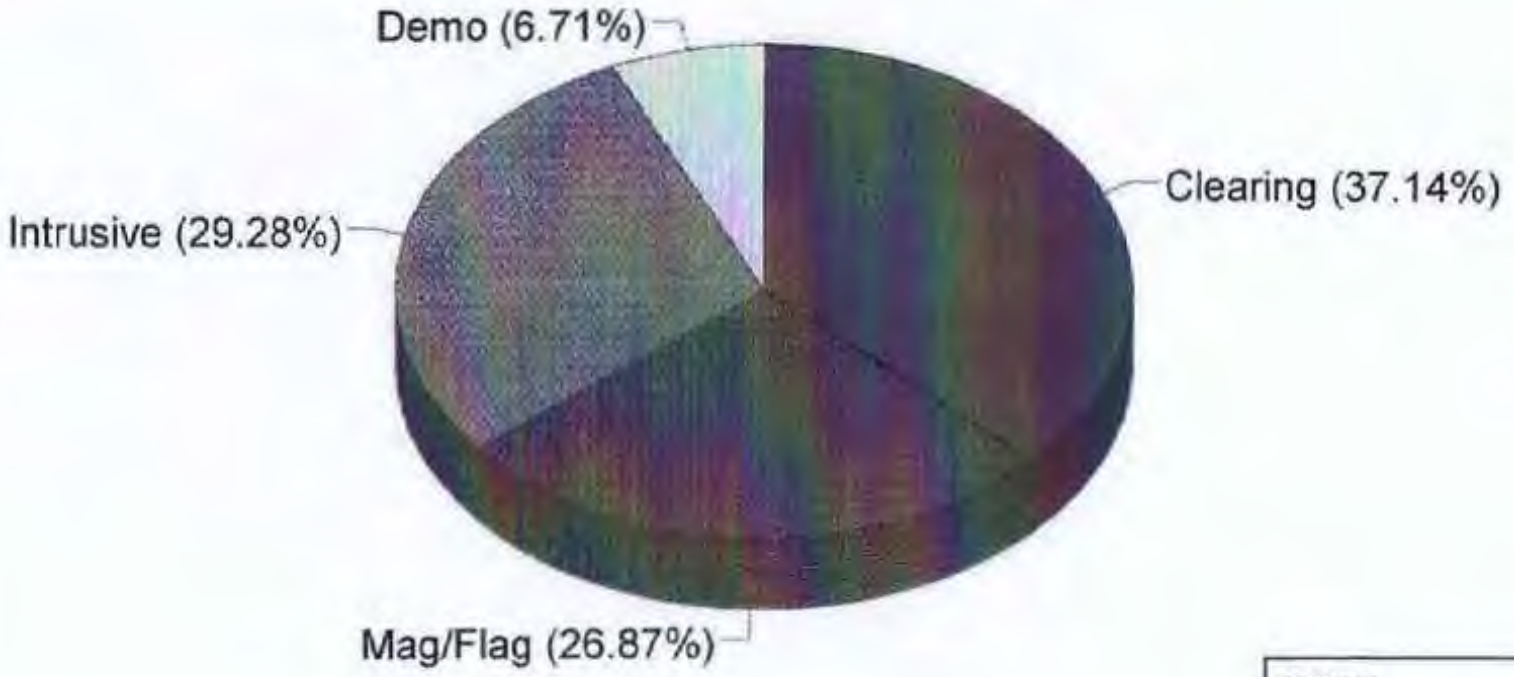
CAYO LOBO
LO-3
LO-4
CULEBRA-4
ATLANTIC OCEAN
ENVIRONMENTAL SCIENCE & ENGINEERING INC.
CAYO LOBO
SAMPLING RESULTS
CULEBRA ISLAND, PUERTO RICO
EE/CA



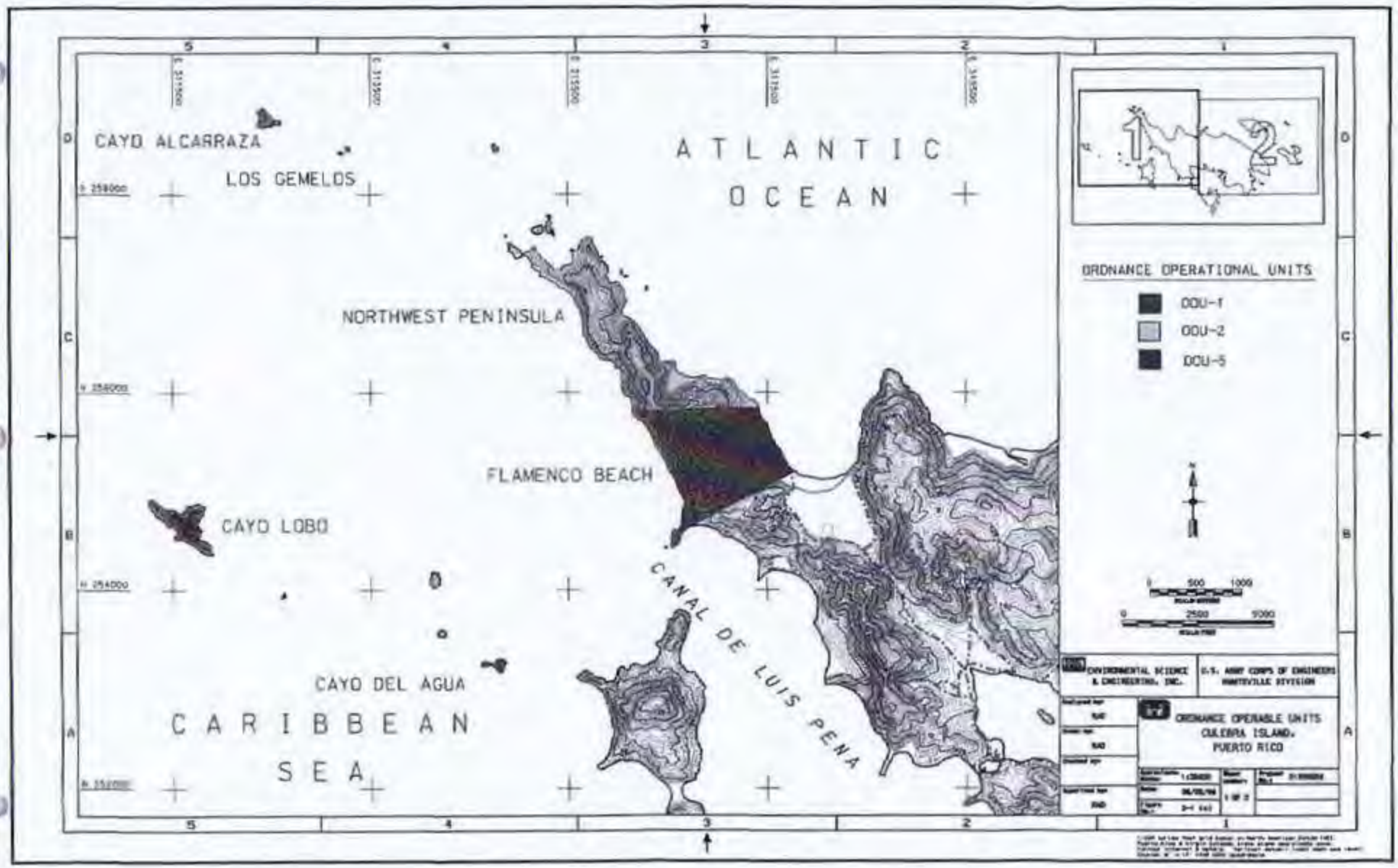
NOTE	
Clearing	908 hrs
Intrusive	716 hrs
Mag/Flag	657 hrs
Demo Ops	164 hrs

Figure 2-16
PRODUCTION RATES FOR CULEBRA EE/CA FIELD EFFORT

SOURCE: ESE.

CULEBRA ISLAND
CULEBRA ISLAND, PR

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE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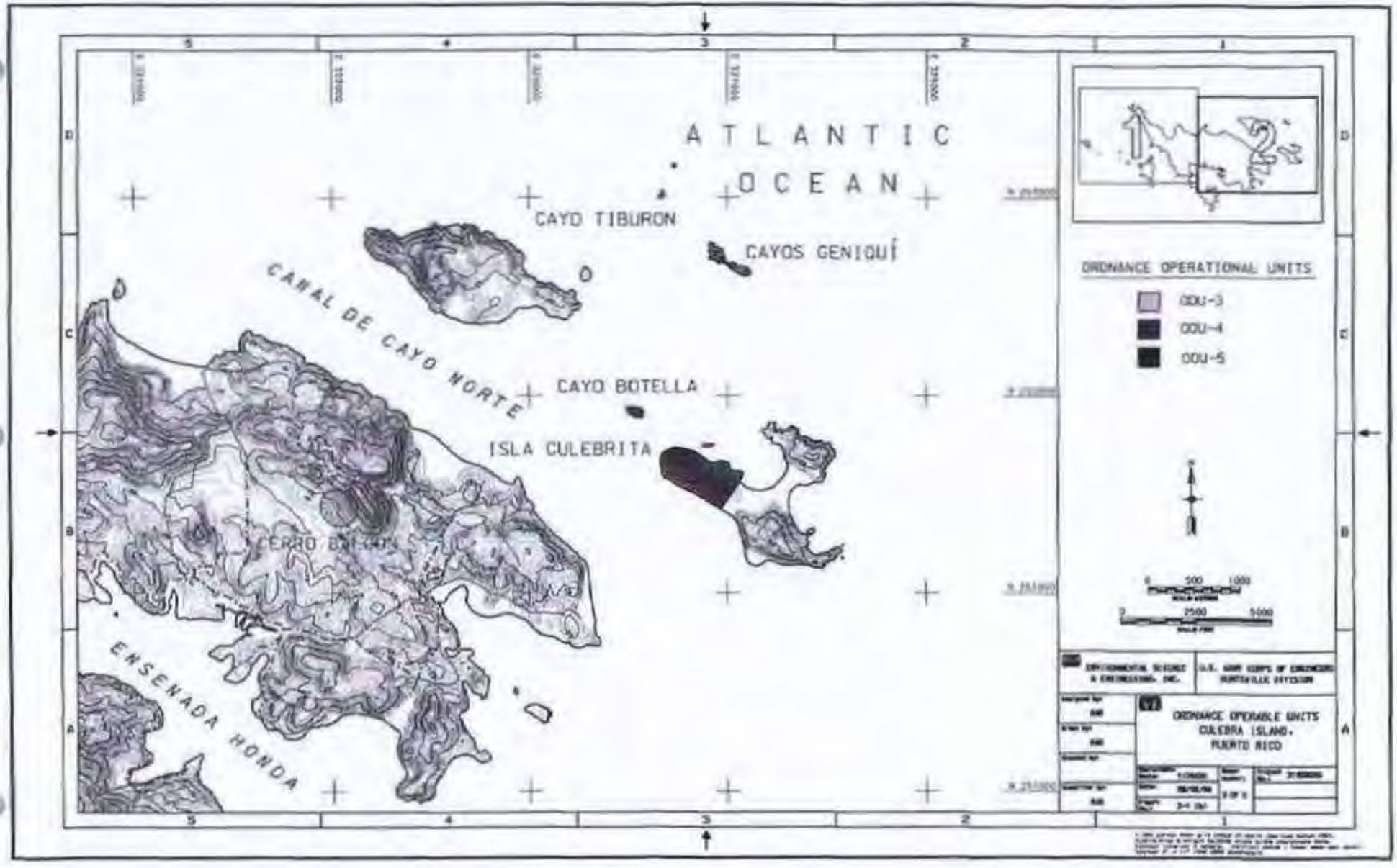
LOS GEMELOS
ATLANTIC OCEAN
NORTHWEST PENINSULA
FLAMENCO BEACH
CAYO LOBO
CANAL DE LUIS PENA
CAYO DEL AGUA
CARIBBEAN SEA
ORDNANCE OPERATIONAL UNITS
OOU-1
OOU-2
OOU-5
ENVIRONMENTAL SCIENCE & ENGINEERING, INC.
U.S. ARMY CORPS OF ENGINEERS HUNTSVILLE DIVISION
ORDNANCE OPERABLE UNITS
CULEBRA ISLAND,
PUERTO RICO


ATLANTIC
OCEAN
CAYO TIBURON
CAYOS GENIQUÍ
CANAL DE CAYO NORTE
CAYO BOTELLA
ISLA CULEBRITA
CERRO BALCONY
ENSENADA HONDA
ORDNANCE OPERATIONAL UNITS
OOU-3
OOU-4
OOU-5
ORDNANCE OPERABLE UNITS
CULEBRA ISLAND,
PUERTO RICO

APPENDIX A

SCOPE OF WORK

APPENDIX A
ANNEX AC
ENGINEERING EVALUATION/COST ANALYSIS
CULEBRA ISLAND NATIONAL WILDLIFE REFUGE
CULEBRA ISLAND, PR
18 March 1995

1.0 OBJECTIVE

The objective of this Delivery Order is to perform an Engineering Evaluation/Cost Analysis (EE/CA) at the former Navy gunnery training and bombing range, Culebra Island National Wildlife Refuge (NWR) and adjacent cayos, PR. The EE/CA will be used to support the Ordnance and Explosive Waste (OEW) restoration process. OEW contamination exists at the Culebra Island NWR and adjacent cayos. There are listed and/or proposed endangered/threatened species located within these sites. OEW sampling may be performed.

2.0 BACKGROUND

The work required under this Scope of Work (SOW) falls under the Defense Environmental Restoration Program (DERP), and Formerly Used Defense Sites (FUDS). Ordnance and Explosive Waste (OEW) contamination exists on property owned by the Department of the Defense.

2.1 OEW is a safety hazard and may constitute an imminent endangerment. During the field activities, the A-E and subcontractor must take precaution not to disturb any OEW. During this action, it may be necessary for the A-E to destroy on site any OEW encountered. This action will be performed in accordance with (IAW) the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)(Section 104), and the National Contingency Plan (NCP)(Sections 300.120(c) and 300.400(e)). No Federal, State, or Local permits are required for any remedial action taken on this site. The applicable provisions

of 29 CFR 1910.120 shall apply.

2.2 Due to the inherent risk in this type of operation, the A-E shall be limited to a 40-hour work week (either five 8-hour days or four 10-hour days) when performing OEW operation. Unexploded Ordnance (UXO) personnel shall not perform UXO-related tasks for more than 10 hours per day. Personnel performing UXO-unrelated tasks are not limited to a 40-hour work week.

2.3 This site is not a suspected Chemical Warfare Material (CWM) site. However, if the A-E encounters suspected CWM during work, The A-E shall immediately withdraw from the work area and notify the Huntsville Division Project Manager. The Huntsville Division Safety Office who will in turn notify the Technical Escort Unit (TEU).

2.4 The following areas and adjacent cayos are to be covered under this EE/CA:

2.4.1 Northwest Peninsula. The 600-acre Northwest Peninsula was used primarily for shore bombardment centered on white-washed rocks along the shoreline, simulated gun emplacement, White-washed Sherman Tanks, and white-painted fuel drums. Target was placed mid-peninsula for napalm and aircraft delivery of inert bombs and rockets. A wire "cyclone" fence and fire break delineated the southeast boundary of the bombardment area. There may be other areas of OEW contamination within the Northwest Peninsula.

2.4.2 Cayo de Agua or Agua Cay. Cayo de Agua was used for offshore and aerial bombardment extensively for night firing. This cayo had one of the greatest density of observable OEW and many are exposed.

2.4.3 Cayo Lobo or Cross Cay. Cayo Lobo has two bunker

observation posts and a series of fire targets presumably used for air to ground small arm fire or strafing. No large munitions are commonly found on the island.

2.4.4 Cayo Alcarraza or Fungy Bowl. Cayo Alcarraza also has high density of OEW. This island is very steep and difficult and dangerous to work on. High and low level radar bombing and searchlight target bombing were conducted.

2.4.5 Los Gemalos or Twin Rocks. This area was used for dive-bombing and air to ground missiles practices.

2.4.6 Culebrita Island. Culebrita Island provided strafing on and offshore on the western end of the island at Botella Beach. Live and dummy-warhead torpedo were fired at a sheer cliff face on the northwest side of the island (Marc Point).

2.4.7 Cayo Tiburon or Shark Key. This area was used as a target for live and inert conventional ordnance firing. This area is a small, unvegetated rock with little or no public use.

2.4.8 Cayos Ganiqui or Palada Cays. Two vegetated islands that were used as conventional ordnance targets.

2.4.9 Cayo Botella or Cayo Ladron. A flat, vegetated key near Culebrita Island that was used for Navy bombardment.

3.0 DETAILED DESCRIPTION OF SERVICES

3.1 (TASK 1) REVIEW DATA AND PERFORM SITE VISIT.

3.1.1 Review Existing Data. The A-E shall review existing data as related to OEW at the Culebra Island and adjacent cayos. In addition, both flora and fauna that are listed as

endangered/threatened species or being propose for listing under the Federal, State and local Agencies shall be reviewed.

3.1.2 Site Visit. The A-E shall coordinate with the Contracting Officer, Federal, State, and Local Agencies prior to the site visit. A site visit is authorized. The A-E shall coordinate the number of days and any site visit travel plans with the CEHND Project Manager (Mr. Roland Belew) at least 10 calendar days in advance of the site visit. The site visit team shall include a Senior UXO Supervisor.

3.2 (TASK 2) PREPARE SITE SPECIFIC WORK PLAN.

The A-E shall prepare a site specific Work Plan (WP) to conduct the OEW sampling. The sites to be covered are listed in Paragraph 2.4 above. The approximate size of each OEW sampling grid shall be proposed by the A-E. The A-E shall propose the locations of sampling grids. The WP shall outline the A-E's proposed methodology of accomplishing the objective. This shall include site-specific natural and cultural resources plan, UXO-related procedures and practices, equipment, administrative area and equipment, demolition materials and their security and accountability system, personal protective equipment, internal and external communications systems, responsibilities of project personnel, resumes of all UXO personnel and key non-UXO personnel, on-site and off-site medical facilities and emergency response actions, daily work schedule, project time line, UXO safety and site general safety to include snakes, ticks, and other flora and fauna. All UXO related procedures shall comply with *CEHND Safety Concepts and Basic Considerations for UXO, 16 Dec 1992*. The WP shall include, as a minimum, the following sub-plans:

3.2.1. Site-specific Safety and Health Plan (SSHP). IAW 29

CFR 1910.120 the A-E shall submit a SSHP that contains OEW safety standards and procedures.

3.2.2 Equipment Plan (EP). The A-E shall prepare and submit a detailed EP describing the equipment to be employed to perform all necessary operations.

3.2.3 Quality Control Plan. The A-E shall propose a system to manage, control, and document the performance of this task. The methodology to accomplish the quality control shall be proposed in the WP. The QC activities shall be documented and included in the final investigation report. The individual performing the UXO QC shall have at least the same training and experience as a UXO supervisor and shall not be involved in the performance of the OEW sampling. UXO QC shall be a separate function and is not envisioned as a full-time position.

3.2.4 Location Survey and Mapping Plan. See Paragraph 3.5 for details.

3.2.5 Environmental Protection Plan. A site specific Environmental Protection Plan shall include all coordination with Federal, State, and local environmental agencies. All known endangered/threatened species, archaeological sites, wetland, and other sensitive environmental resources must also be included in this plan.

3.2.6 Geophysical Investigation Plan. The A-E shall prepare the Geophysical Investigation Plan to perform the geophysical mapping and site investigation. The plan shall be sufficient to detect a 105 mm projectile at 3 feet of depth (from the ground surface).

3.2.7 Disposal Alternatives. Based on the site visit, the

A-E shall describe feasible alternatives for disposal, and shall recommend the safest and most cost effective method of treatment and disposal of any explosive ordnance, inert ordnance, explosives, and debris. The method of treatment will be selected and approved by the Contracting Officer.

3.2.8 Work, Data, and Cost Management Plan. In addition to the hard copy distribution as shown in paragraph 4.0 of this SOW, the A-E shall provide two copies of the WP (in WordPerfect) on 3.5" computer disks, to CEHND-PM-OT. The A-E shall submit a work schedule and manpower allocation (by task) with the WP. Any assumptions shall be stated and their basis shall be provided. The A-E shall notify the USAEDH Project Manager at least 10 calendar days in advance of mobilization for the field work after the WP is approved by the Contracting Officer.

3.3 (TASK 3) PERFORM OEW SAMPLING.

3.3.1 The A-E shall provide all necessary personnel and equipment to perform OEW sampling. The A-E shall dispose of all OEW located during this investigation. The A-E shall excavate to a depth of three feet to determine the identity of any magnetic anomaly. If deeper excavation is required, the on-site USAEDH Safety Specialist or CEHND-PM-OT will make the decision.

3.3.2 Magnetometers shall be field tested daily to ensure they are operating properly. This shall be accomplished by planting an inert 105 mm projectile or similar magnetic inert item at a depth of three feet and determining the standard indication. If a magnetometer does not meet the standard during the daily check, it shall be calibrated/repaired or replaced.

3.3.3 All access/excavation/detonation holes shall be

backfilled and returned to the natural state.

3.3.4 The A-E shall maintain a detailed accounting of all OEW items/components encountered. This accounting shall include the amounts of OEW, the identification and condition, depth located, disposition and the location/mapping. This accounting shall be a part of the EE/CA Report.

3.3.5 The A-E shall maintain a detailed accounting system for all demolition materials used to detonate OEW on-site.

3.3.6 If a scenario is encountered that an unidentifiable UXO is located or a suspected toxic chemical munitions is encountered, the on-site USAEDH Safety Specialist or USAEDH Project Manager shall be notified, who in turn will request EOD Support.

3.3.7 The Government will furnish explosive for any demolitions to be performed on site. However, the A-E shall have a contingency plan to provide demolition materials, in the event the Government supply is depleted and/or resupply is not timely. This shall be outlined in the WP.

3.4 <u>(TASK 4) TURN-IN OF RECOVERED INERT ORDNANCE AND OEW RELATED SCRAP.</u>

3.4.1 The A-E shall provide all necessary personnel and equipment to accomplish this task. The A-E shall coordinate with the local Defense Reutilization and Marketing Office (DRMO) for the turn-in procedures to be followed.

3.4.2 The A-E shall complete a DD Form 1348-1 as turn-in documentation. Instructions for completing this form are contained in the Defense Utilization and Disposal Manual, DoD

4160.21-M. The Senior UXO Supervisor shall sign the Certificate as follows:

"I certify that the property listed hereon has been inspected by me and, to the best of my knowledge and belief, contains no items of a dangerous nature."

3.4.3 DRMO turn-in documentation receipts shall be submitted as a component of the EE/CA Report.

3.4.4 Should the servicing DRMO refuse to accept the OEW related scrap, the A-E shall make arrangements with a local scrap contractor to pick up the inert material.

3.5 (TASK 5) PERFORM LOCATION SURVEY AND MAPPING.

3.5.1 UXO Safety. During all field and intrusive activities, the survey crew shall be accompanied by a UXO Specialist who shall clear each area prior to the surveyors starting work.

3.5.2 Control Points. Plastic or wooden hubs shall be used for all basic control points. A minimum of 14 concrete monuments with 3-1/4 to 3-1/2 inch domed brass, bronze or aluminum alloy survey markers (caps) with witness posts shall be established for this project. Five shall be set on the Northwest Peninsula and one each shall be set on each of the cays or islands identified in paragraph 2.4 of this SOW. As an alternative, a cap may be epoxied into a drilled hole in rock, or a five foot rebar may be driven into the ground and topped with a cap. The concrete monuments shall be located within the project limits, set 10 meters (m) from the edge of any existing road in the interior of the project limits, and be a minimum of 300 meters apart. The top shall be set flush with the ground and the bottom a minimum of 0.6 meters below frost depth. Horizontal and vertical control

of "Class I", Third Order or better shall be established for the network of monuments . Horizontal control shall be based on the metric system using the International Survey Foot (1 inch = 25.4 millimeters (mm) and 1 meter (m) = 3.2808399 feet) and referenced to the North American Datum of 1983 (NAD83). Vertical control obtained by GPS methods shall also be based on the metric system and referenced to the North American Datum of 1988 (NAVD88). The caps for the new monuments shall be stamped in a consecutively numbered sequence and the identification shall be provided with each delivery order as follows:

SWAMPY-1-1995	SWAMPY-2-1995	SWAMPY-3-1995
USAED, HSV	USAED, HSV	USAED, HSV

The dies for stamping the numbers and letters into these caps shall be 1/8-inch to 3/16-inch in size. All coordinates and elevations shall be shown to the closest one-thousandth of a meter (0.001 m) and one-hundredth of a foot (0.01 ft).

3.5.3 Corner Establishment. The AE shall install semi-permanent markers establishing the location of the four corners of each grid. This shall be done by first clearing the corner location of surface and subsurface ordnance and then driving a three-to-four foot long 3/4" galvanized steel pipe or 3/8" rebar into the ground with a six inch stick-up above ground surface. The stickup shall be painted orange. This requirement shall be waived in areas where such an installation is unfeasible or otherwise undesirable. In such cases, the A-E shall, if possible, tape-measure the four corners from established, nearby features and indicate the distance and grid azimuth direction of the referenced features on the individual grid map.

3.5.4 Grid Location Maps. The A-E shall provide a planimetric or topographic map(s) of the project site and all areas being investigated. The map(s) shall be at a scale no

smaller than 1:24,000 (7.5 minute topographic quadrangle sheet) and shall show the plotted location of each grid area that is to be investigated.

3.5.5 Individual Grid Maps. The AE shall prepare an individual map for each sampling grid at a scale no smaller than 1:400. The map shall indicate the location of each surface UXO, each verified subsurface UXO, and each subsurface geophysical anomaly within the grid. Each location shall be estimated or tape measured for an approximate accuracy of plus or minus one foot and shall be shown as an individual dot or "X" on the grid map. GPS, Total Station, or other precision location surveys of individual anomalies shall not be performed. Other notable features within the grid shall also be sketched in. Coordinates of the corners of each sampling grid area investigated shall be located to the closest 25 meters and shall be based on the North American Datum of 1983(NAD83) referenced to the State Plane Grid System, and a Grid North arrow shall also be shown.

3.5.6 Description Cards. A tabulated list and a "Description Card" of all control points established or used for this project shall be submitted. The Description Card shall show a Grid North arrow; a sketch of each monument and its location relative to reference marks, buildings, roads, railroads, towers, trees, etc.; a typed description telling how to locate the monument from a well known and identifiable point; the monument's name or number; and the final adjusted coordinates and elevations in meters and feet (to the closest 0.001m and 0.01 ft.) The Description Cards shall be 5 by 8 inches describing one monument per card, or an 8-1/2 by 11 inch sheet of bond paper may be used for describing two monuments.

3.5.7 Each ordnance item shall be located in the field to the closest 1.0 ft and plotted and identified on the map. A tabulation of each ordnance item encountered shall be provided

showing the identification number and a description (noun and nomenclature) of the item found above or below the ground surface within a sampling grid area.

3.5.8 Items and data to be submitted to USAEDH (ATTN: CEHND-PM-OT).

3.5.8.1 The original of all field books, layout sheets, computation sheets, abstracts, and computer printouts. All of these shall be suitably bound, and clearly marked and identified.

3.5.8.2 A tabulation of all control points showing the adjusted coordinates established and/or used for this survey.

3.5.8.3 A tabulated list of all hits located in the field showing the data identified in paragraph 3.5.3 above.

3.5.8.4 Drawings. One original, reproducible (mylar) map and five blueline copies of each map produced as a result of this SOW.

3.5.10 Schedule. All work and services under this task (Task 5) shall be completed and submitted to CEHND-PM-OT within 30 days after completing all field work.

3.6 <u>/TASK 6/ PREPARE EE/CA FOR THE ENTIRE SITE</u>.

The A-E shall prepare an EE/CA for all areas specified in Paragraphs 2.4 of this SOW. An EE/CA report which documents the investigation, evaluation and recommendations at all sites shall be prepared. The report shall be prepared in accordance with the EPA Guidance Document, EPA/540-R-93-057, "Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA", August 1993.

3.7 (TASK 7) EE/CA ACTION MEMORANDUM

After the EE/CA has been approved by the Contracting Officer, the A-E shall prepare an EE/CA Action Memorandum in accordance with the EPA Guidance Document, "Superfund Removal Procedures, Action Memorandum Guidance, EPA/540/P-90/004, December 1990."

3.8 (TASK 8) PROJECT MANAGEMENT AND MEETING.

3.8.1 Public Affairs. The A-E shall not make available or publicly disclose any data generated or reviewed under this contract or any subcontract unless specifically authorized by the Contracting Officer. When approached by any person or entity requesting information about the subject of this contract, the A-E shall defer to the Contracting Officer for a response. All reports and data generated under this contract shall become the property of the Government, and distribution to any other source by the A-E is prohibited unless authorized by the Contracting Officer.

3.8.2 The A-E shall, during the life of this Delivery Order, manage this Delivery Order in accordance with the SOW, Appendix A. All project management associated with this Delivery Order, with the exception of direct technical oversight of the work described in the preceding tasks, shall be accounted for in this task. The A-E shall attend meetings to be held at the site or at CESND to discuss the project status, the progress, and plans for future activities. The A-E shall provide a minimum of three professionals, thoroughly familiar with the project, at the minimum of three meetings.

3.8.3 The A-E shall provide all logistical support for 2 public meetings to be held at Culebra Island. This shall include mailing the notification to all persons and agencies on the

mailing list. All costs associated with this public meeting shall be paid by the A-E, which in-turn will be reimbursed by the Government. The A-E shall provide a senior UXO supervisor to assist in this public meeting. The Government will conduct the public meeting.

4. SCHEDULE OF MEETING AND DELIVERABLE

Task	Days after NTP
Site Visit	2 May 95
Draft Work Plan	2 Jun 95
Comment on Draft Work Plan	30 Jun 95
Final Work Plan	15 Aug 95
Mobilize to Field	21 Aug 95
Demobilize from Field	13 Oct 95
Draft EE/CA Report	13 Dec 95
Comment on Draft EE/CA Report	15 Jan 96
Draft Final EE/CA (for public)	15 Feb 96
Final EE/CA Report (plus computer file)	15 Mar 96
Draft Action Memo	15 Apr 96
Final Action Memo	15 May 96

All work and services on this Delivery Order shall be completed on or before 1 Jul 96.

4.1 Format and Content of Report. A Report shall be prepared in accordance with Paragraphs 3.6 AND 3.7 of this Delivery Order. All drawings shall be of engineering quality. The report shall consist of 8 1/2" X 11" sheets. The report covers shall consist of durable binders and shall hold all pages firmly while allowing easy removal, addition, or replacement of any page. A title shall identify the site, the A-E, the Huntsville Division, and date. The A-E identification shall not dominate the title page.

4.2 Review Comments. The A-E shall review all comments received through the CEMRD Project Manager and evaluate their appropriateness based upon their merit. The A-E shall incorporate all applicable comments and provide a written response to each comment as the attachment to the next submittal.

4.3 Identification of Responsible Personnel. Each submittal shall identify the specific members and title of the subcontractor and A-E's staff which had significant input into the report. All final submittal shall be sealed by the Professional-In-Charge.

4.4 Presentations. The A-E shall make presentations of work performed as directed by the Contracting Officer. The presentations shall consist of a summary of the work accomplished and anticipated followed by an open discussion.

4.5 Minutes of Meetings. Following the presentation and the public meeting (if required), the A-E shall prepare and submit minutes of the meeting within 10 calendar days to the Contracting Officer.

4.6 Correspondence. The A-E shall keep a record of all phone conversations and written correspondence affecting decisions relating to the performance of this Delivery Order. A summary of the phone conversations and a copy of all written correspondence shall be submitted to the Contracting Officer with the monthly progress report.

4.7 Monthly Progress Report. The A-E shall prepare and submit monthly progress report describing the work performed since the previous report, work currently underway and work anticipated. The report shall state whether current work is on schedule. If the work is not on schedule, the A-E shall state what actions shall be taken in order to get back on schedule. The

report shall be submitted to the Contracting Officer not later than the 10th day of each calendar month.

4.8 Computer Files. All final text files generated by the A-E under this Delivery Order shall be furnished to the Contracting Officer in WordPerfect, IBM PC compatible format. All drawings shall be on metric A-1 size reproducible (mylar). CEHND project manager will receive 20 copies of the final EE/CA report. All other distributions of final and draft are as shown below.

4.9 Addressee. Copies

US ARMY ENGINEER DIVISION, HUNTSVILLE 5
ATTN: CEHND-PM-OT (Mr. Roland Below)
P.O. BOX 1600
HUNTSVILLE, AL. 35807-4301

US ARMY ENGINEER DISTRICT, JACKSONVILLE 4
ATTN: CESAJ-DP-I (Mr. Bridgers)
400 West Bay Street
Jacksonville, FL 32232-0019

US ARMY ENGINEER DIVISION, SOUTH ATLANTIC 2
ATTN: CESAD -PM (Mr. S. Ernst)
77 Forsyth St., S.W.
Atlanta, GA 30335-6801

US ARMY CORPS OF ENGINEERS 2
ANTILLES AREA OFFICE
ATTN: CESAJ-DS (Mr. E. Colon)
400 Fernandee Juncos Avenue
San Juan, PR 00901-3299

US FISH AND WILDLIFE SERVICES 1

(Address to be provided)

PUERTO RICAN DEPARTMENT OF NATURAL RESOURCE 1
(Address to be provided)

COMMANDER 1
547 ORD DET-EODCC
Fort Gillem, GA 30050-5000

COMMANDER 1
EODGRU TWO DET ROOSEVELT ROADS
USNAVSTA Box 3635
FPO Maimi, FL 34051-8701

APPENDIX B
CURRENTLY PROPOSED LAND USE DOCUMENTS

ESTADO LIBRE ASOCIADO DE PUERTO RICO
GOBIERNO MUNICIPAL DE CULEBRA
OFICINA DE Eco-Turismo
APARTADO 189
CULEBRA, PUERTO RICO 00775
TEL. 742-3521

9 de febrero de 1996

Lcda. Elsa Jiménez
Cuerpo de Ingenieros
San Juan, Puerto Rico

Estimada Licenciada:

Hago referencia a nuestra conversación teléfonica del pasado miércoles 7 de febrero de 1996, en relación con la Propuesta que le hemos sometido al Departamento de Recursos Naturales, Pesca y Vida Silvestre, solicitando su apoyo para que se habran para el disfrute de todos los culebrenses todas aquellas veredas existentes antes de que ambos Departamentos toman jurisdicción sobre las áreas de veredas señaladas.

Hemos estimado que luego de terminar la labor de decontaminación por el Cuerpo de Ingenieros de los Estados Unidos, no habrá peligro ni el temor que vayan a explotar explosivos en el area de los molinos en la parte noreste de la península.

Adjunto les estoy sometiendo un mapa señalandole en rojo las areas para su recomendación, solo pedimos la apertura y el mantenimiento de las antiguas veredas o caminos peatonales que existian antiguamente.

Como solicitud número dos (2) estamos señalando que se autorize el uso de la comunidad, el área que fue cerrada por Recursos Naturles y Pesca y Vida Silvestre, como vía de vehículo desde donde existe la Cadena de Recursos hasta el lugar llamado la estación de Don Eladio Alvarez, ahí se estacionan los vehículos y luego seguir a pie tal como estamos indicando.

Loda. Elsa Jiménez
Ramón Feliciano

Las demas áreas solo serían veredas, a pie donde los usuarios estarían sujetos a los contrastes existentes por Recursos Naturales y Pesca y Vida Silvestre. Los pescadores tendrían que identificarse y señalar el área donde iran a pescar, dejando del público las áreas de los bubiés.

Esperando que la información adjunta sea de gran beneficio para el estudio y recomendación de ustedes, quedo.

Cordialmente,

Ramón Feliciano
Presidente Comité Eco-Turísmo
Municipio de Culebra

Associated Free State of Puerto Rico
Municipal Government of Culebra
Office of Eco-Tourism
Apartado 189
Culebra, Puerto Rico
Tel. 742-3521

February 9, 1996

Licenciada Elsa Jimenez (= Elsa Jimenez, B.S.)
Corps of Engineers
San Juan, Puerto Rico

Dear Ms. Jimenez

I make reference to our telephone conversation of last Wednesday, February 7, related to the proposal that we had submitted to the Puerto Rico Department of Natural Resources (DNER) and U.S. Fish and Wildlife (FWS), soliciting your assistance so that all of the existing trails/paths be made available for the benefit of all Culebra residents before both Departments take jurisdiction over the areas of the referenced trails/paths.

We have believed that after the decontamination effort by the U.S. Army Corps of Engineers, there will be no danger nor fear that arms would explode in the mill area of the northeast part of the peninsula.

Attached to this letter I am submitting a map, marking in red the areas for your recommendation. We only ask for the opening and maintenance of the historic trails/paths and pedestrian roads that have existed historically.

As solicitation number 2, we are suggesting that the community be authorized to use the area that was closed by the DNER and FEW, as a route for vehicles to travel from Cadena de Recursos to the place called the Station of Don Eladio Alvarez. Vehicles would then be parked and from there travel would continue by foot.

The rest of the areas will only be foot trails/paths where the users would be subject to the existing control of the DNER and FWS. The fishermen will have to identify themselves and indicate the area where they will fish, leaving the public with the indigenous negro (?) areas.

I hope that the information attached is of benefit for your study and recommendation.

Sincerely,

Ramon Feliciano
President of Eco-Tourism Committee
Municipality of Culebra

PROPUESTA:

AUTORIZACION PARA LA REHABILITACION, MANTENIMIENTO Y ACCESIBILIDAD DE VEREDAS Y SENDAS EN LUGARES DE INTERES TURISTICOS RICOS POR SU CONTENIDO DE FLORA Y FAUNA AUTOCTONA DEL MUNICIPIO DE CULEBRA

SOMETIDA POR:

POR LA COMISION PRO DESARROLLO DEL ECOTURISMO

MUNICIPIO DE CULEBRA

INTRODUCCION

CULEBRA HA SIDO BENDECIDA POR LA NATURALEZA. SU PATRIMONIO ECOLOGICO ES EXEPCIONALMENTE BELLO . MUY VARIADO TANTO A NIVEL TERRESTRE COMO EN EL MEDIO ACUATICO QUE RODEA EL TERRITORIO.

LA ISLA DE CULEBRA, NOS CONVIERTE EN UN VALUARTE UNICO EN PUERTO RICO PARA EL DESARROLLO DE ACTIVIDADES ACUATICAS MANIFESTADAS A TRAVES DE SUS PLAYAS, ENSENADAS E ISLOTES VIRGENES Y RICOS EN LA VIDA MARINA . UN MEDIO PARA FOMENTAR EL DESARROLLO DE UNA INDUSTRIA TURISTICA, DIRIGIDA HACIA UN TURISMO ESPECIALIZADO, ORIENTADO EN UNA CLIENTELA AMANTE DE LA CONSERVACION Y PROTECCION DE NUESTRO MEDIO AMBIENTE Y PATRIMONIO ECOLOGICO.

TIERRA ADENTRO SU FAUNA Y SU FLORA ES IGUALMENTE INTERESANTE, RICA EN YACIMIENTOS ARQUEOLOGICOS ABUNDANTES PAISAJES DE INTERES TURISTICOS, LO SUFICIENTEMENTE ATRACTIVOS PARA DESPERTAR Y SATISFACER LA CURISOSIDAD DE LOS CIENTOS DE VISITANTES QUE ACUDEN A CULEBRA EN BUSCA DE ALGO DIFERENTE QUE LES PERMITA UN CONTACTO DIRECTO CON LA NATURALEZA. EN SU ESTADO PRIMITIVO E IMPERTURBABLE.

MISION:

PROMOVER EL DESARROLLO DE UNA INFRAESTRUCTURA TURISTICA, VARIADA Y ESPECIALIZADA QUE SE AJUSTE A LOS GUSTO Y PREFERENCIAS DE NUESTRA CLIENTELA; PARTIENDO DE UNA BASE QUE IDENTIFIQUE NUESTROS RECURSOS ECOLOGICOS COMO LA RAZON BASICA PARA PROMOVER LA ISLA COMO DESTINO TURISTICO.

CREAR LOS MECANISMOS DE DESARROLLO MEDIANTE LA PARTICIPACION ACTIVA DEL MUNICIPIO Y OTRAS ORGANIZACIONES PUBLICAS Y PRIVADAS COMO LOS AGENTES,MOTIVADORES Y PROPULSORES DEL DESARROLLO Y ACTIVIDADES Y FACILIDADES QUE FORTALESCAN Y AUMENTEN LOS RECURSOS TURISTICOS DENTRO DEL TERRITORIO.

VISION:

PREPARAR LA ISLA COMO UN CENTRO TURISTICO IDENTIFICADO CON LA NATURALEZA DONDE EL CONTENIDO DE LA MISMA SE CONVIERTA EN EL PRINCIPAL PRODUCTO A MERCADEAR Y PROMOVER.

OBJETIVOS:

IDENTIFICAR Y FOMENTAR EL DESARROLLO DE ACTIVIDADES TURISTICAS DIRIGIDAS A CREAR NUEVAS OPORTUNIDADES DE EMPLEO QUE DEN SEGUIMIENTO A UNA CLASE EMPRESARIAL COMPURSTA EN SU MAYORIA POR RESIDENTES DEL TERRITORIO.

PROMOVER LA PARTICIPACION Y ENVOLVIMIENTO DEL SECTOR PUBLICO Y PRIVADO DIRIGIDO Y MOTIVADO POR UN FIN COMUN DONDE SE PUEDAN COMPARTIR RESPONSABILIDADES QUE NOS PERMITAN DIVERSIFICAR NUESTRA INDUSTRIA TURISTICA.

ACUERDOS Y COORDINACION INTERAGENCIAL

EL INTERES DE LA ADMINISTRACION MUNICIPAL DE CULEBRA Y DE LA COMISION PARA EL DESARROLLO DEL ECOTURISMO ES LA DE PODER ESTABLECER UN ACUERDO O RELACION DE COOPERACION CON DIFERENTES INSTRUMENTALIDADES PUBLICAS CON INHERENCIA EN NUESTROS PLANES DE DESARROLLO DE NUESTRA INFRAESTRUCTURA DE SERVICIOS TURISTICOS.

COMO PARTE DE LA PROGRAMACION ANTES MENCIONADA LA COMISION PARA EL DESARROLLO DEL ECOTURISMO DE CULEBRA SE HA TOMADO LA INICIATIVA DE IDENTIFICAR UNAS RUTAS O VEREDAS, DE INTERES TURISTICO CON MIRAS HA REHABILITAR LAS MISMAS PARA USO PUBLICO.

LAS VEREDAS O CAMINOS SERAN DESTINADAS PARA FINES PEATONALES Y POSIBLEMENTE PARA TRANSITO DE BICICLETAS Y CABALLOS.

LAS VEREDAS Y SENDAS DE INTERES TURISTICO ESTAN UBICADAS EN TERRENOS PRIVADOS, FEDERALES Y ESTATALES.

ES NUESTRO INTERES ESTABLECER UN ACUERDO COOPERATIVO ENTRE LOS ORGANISMOS PUBLICOS Y PRIVADOS. ACCION QUE PERMITA AL MUNICIPIO Y LAS AGENCIAS ANTES MENCIONADAS, AUTORIZAR EL USO PUBLICO DE LAS MISMAS MEDIANTE CONTROLES ADECUADOS. ESTABLECER AREAS DE RESPONSABILIDAD MEDIANTE ACUERDOS OFICIALES ENTE LAS AGENCIAS DONDE CADA CUAL APORTE Y SE RESPONSABILIZE POR LA PROTECCION, LIMPIEZA Y MANTENIMIENTO DE LAS VEREDAS.

ESTA ACCION CONLLEVA EN ADICION A LA REHABILITACION DE LOS ANTIGUOS CAMINOS, LA UBICACION ROTULACION ADECUADA, ADIESTRAR EL PERSONAL QUE SIRVA DE GUIA TURISTICO DONDE SE LE OFRESCA INFORMACION AL VISITANTE SOBRE LA FLORA Y LA FAUNA EXISTENTE EN DISTINTOS LUGARES.

PLAN DE TRABAJO

DE PRIMERA INTENCION EL MUNICIPIO INTERESA HACER CONTACTO OFICIAL CON LAS DIFERENTES AGENCIAS CUYA JURISDICCION AFECTAN LAS VEREDAS ANTES INDICADAS. ESTABLECER UNA SERIE DE ACUERDOS EN LO QUE RESPECTA A LA PROTECCION DEL MEDIO AMBIENTE, FAUNA, FLORA MANTENIMIENTO Y LIMPIEZA DE LOS CAMINOS, PROTECCION CONTRA POSIBLES HALLAZGOS ARQUEOLOGICOS, INCENDIOS, HORARIO DE OPERACION, ROTULACION ADECUADA, PLAN DE SEGURIDAD CONTRA LAS PERSONAS Y PROPIEDADES, PROGRAMA DE EMERGENCIAS MEDICAS Y LA AGENCIA RESPONSABLE POR ADMINISTRAR EL PROGRAMA.

EL MUNICIPIO ESTA EN LA MEJOR DISPOSICION DE OFRECER Y COORDINAR CIERTOS SERVICIOS BAJO NUESTRO CONTROL; SIEMPRE Y CUANDO SE LOGRE UNA COORDINACION INTERAGENCIAL DONDE CADA ORGANISMO APORTE EN LA MEDIDA Y CAPACIDAD DE SUS RECURSOS.

A CONTINUACION UNA SERIE DE SERVICIOS QUE EL MUNICIPIO PUDIERA OFRECER PARA LA ADMINISTRACION Y OPERACION DE LAS VEREDAS.

LIMPIEZA Y ACONDICIONAMIENTO DE VEREDAS

EL MUNICIPIO DISPONE DE UNA BRIGADA DE LIMPIEZA Y DESYERBO PARA DESPEJAR LAS VEREDAS. ESTA ACCION DE TRABAJO SE PUEDE COORDINAR CON OTRAS AGENCIAS Y UNIR ESFUERZOS PARA ACCIONES PERIODICAS DURANTE EL AÑO Y QUE TODO EL TRABAJO NO DESCANSE EN UN SOLO ORGANISMO.

SERVICIO DE GUIA

EL MUNICIPIO DISPONE DE UN PERSONAL CAPACITADO, BILINGUE EL CUAL SE PUEDE UTILIZAR COMO GUIA TURISTICO, PREVIA COORDINACION Y ARREGLO CON LA OFICINA. EL MISMO PUEDE SER ADIESTRADO POR LAS DIFERENTES AGENCIAS CON INHERENCIA EN EL ASUNTO.

RESCATE Y SEGURIDAD PUBLICA

LA DEFENSA CIVIL Y LA GUARDIA MUNICIPAL ESTAN DISPONIBLES PARA PARTICIPAR EN EL PROGRAMA DE SEGURIDAD. PODEMOS ESTABLECER UNAS RONDAS PERIODICAS EN CONJUNTO Y EN COMBINACION CON EL PERSONAL DE OTRAS AGENCIAS CON AUTORIDAD LOCAL PARA PROTEGER EL MEIO AMBIENTE DURANTE EL PERIODO DE OPERACION DEL PROGRAMA.

EMERGENCIAS MEDICAS

EL PROGRAMA DE SALUD DEL MUNICIPIO TIENE COMO FUNCION PRINCIPAL PRESTAR SERVICIOS A LOS RESIDENTES DEL TERRITORIO NO OBSTANTE PUDIERAN RESULTAR EN UN RECURSO ADICIONAL A PARTICIPAR EN CASOS DE ALGUNA EMERGENCIA QUE SURJA EN EL PROGRAMA DE EXCURSIONES ANTES INDICADAS.

SISTEMA DE RESERVACIONES

EL MUNICIPIO CUENTA CON UNA OFICINA DE INFORMACION TURISTICA. SU PERSONAL ESTA DISPONIBLE PARA COORDINAR Y ATENDER RESERVACIONES PARA GRUPOS HOMOGENEOS INTERESADOS EN VISITAR A CULEBRA Y PARTICIPAR DE ALGUNA DE ESTAS EXCURSIONES.

sE PUEDE ESTABLECER UN COSTO O TARIFA PARA EXCURSIONES ESPECIALES QUE REQUIERAN DE UN GUIA Y OTROS SERVICIOS ADICIONALES.

FINALIDADES Y PROPOSITOS EN PERMITIR EL USO DE ESTAS VEREDAS PARA USO PUBLICO

ES POLITICA PUBLICA DEL MUNICIPIO DE CULEBRA FOMENTAR EL DESARROLLO DE UNA INFRAESTRUCTURA TURISTICA QUE PROPENDA A CREAR UNA CLASE EMPRESARIAL ORIUNDA DEL TERRITORIO.

UN DESARROLLO TURISTICO BASADO EN LAS BONDADES DE NUESTROS RECURSOS NATURALES, LOS CUALES RESULTAN UNICOS POR SU VARIEDAD, COLORIDO Y ABUNDANCIA.

NUESTROS RECURSOS NATURALES RESULTAN LA MATERIA PRIMA PARA PERPETUAR NUESTRA INDUSTRIA TURISTICA. DEBEMOS POR TODOS LOS MEDIOS POSIBLES ENTRAR EN UNA ESTECHA RELACION Y COORDINACION CON TODOS LOS ORGANISMOS PUBLICOS Y PRIVADOS CON INHERENCIA Y JURISDICCION SOBRE LAS AREAS DE GRAN RIQUEZA ECOLOGICA DENTRO DEL TERRITORIO. DEBEMOS CONFORMAR UN PLAN DE MANEJO PARA QUE ESTE MEDIO AMBIENTE EXTRAORDINARIO SE PUEDA DISFRUTAR MEDIANTE CONTROLES ADECUADOS, ACCION QUE LOS PROTEJA Y CONSERVE PARA EL USO Y DELEITE DE FUTURAS GENERACIONES; MAS IMPORTANTE AUN, FACILITA QUE EL TERRITORIO DE CULEBRA SE CONVIERTA EN UN PARQUE NATURAL POR SUS ATRACTIVOS NATURALES, DONDE LA PROTECCION DE LOS RECURSOS RESULTE VITAL. UN LUGAR PRIVILEGIADO DONDE TODAVIA USTED PUEDA DISFRUTAR DE LA NATURALEZA EN SU ESTADO PRIMITIVO.

NECESITAMOS LA COOPERACION Y ASISTENCIA DE TODAS Y CADA UNA DE LAS AGENCIAS CON INHERENCIA EN ESTE ASUNTO PARA QUE CULEBRA SE CONVIERTA EN EL DESTINO MAS IMPORTANTE EN EL CARIBE PARA LOS AMANTES DE LA NATURALEZA. QUE NUESTRA IMAGEN TRASCIENDA A NIVELES INTERNACIONALES COMO UN EJEMPLO DONDE EL HOMBRE PUEDA VIVIR EN ARMONIA Y TOTAL SIMBIOSIS CON SU MEDIO AMBIENTE ECOLOGICO. ES BIEN CONOCIDO EN PUERTO RICO Y LOS ESTADOS UNIDOS QUE LUGARES DE VALOR ECOLOGICO BAJO LA JURISDICCION ESTATAL Y FEDERAL ESTAN A LA DISPOSICION DEL PUBLICO. SU FUNCION BASICA ES LA DE FOMENTAR Y

DISPOSICION DEL PUBLICO. SU FUNCION BASICA ES LA DE FOMENTAR Y DESARROLLAR Y CREAR SENTIDO Y CONSCIENCIA PARA CONSERVAR Y PROTEGER LOS RECURSOS ECOLOGICOS DE NUESTRO MUNDO.

ES UNA FORMA DE EDUCAR A LAS PERSONAS QUE NOS VISITAN PARA CREAR CONCIENCIA EN TERMINOS DE PROTEGER NUESTROS RECURSOS. NOS AYUDA A MEJORAR LA IMAGEN DE LAS AGENCIAS FEDERALES, ESTATALES Y MUNICIPALES EN CULEBRA EN SU EMPEÑO POR ESTABLECER UN PROGRAMA DE MANEJO QUE FACILITE, PROMUEVA Y ALIENTE AL PUBLICO EN VISITAR LOS LUGARES DE INTERES ECOLOGICO.

EN ADICION ESTA ACCION HABRA DE CAMBIAR LA IMAGEN NEGATIVA QUE PROYECTAN VARIAS AGENCIAS FEDERALES QUE OPERAN EN CULEBRA, DE SOBRE PROTEGER Y VEDAR EL USO PUBLICO DE TODOS LOS TERRENOS BAJO SU JURISDICCION EN EL TERRITORIO DE CULEBRA.

RECOMENDAMOS UNA REUNION INTERAGENCIAL PARA COORDINAR LA PARTICIPACION DE OTRA AGENCIA A NIVEL ESTATAL Y FEDERAL CON INHERENCIA EN EL ASUNTO, TALES COMO EL DEPARTAMENTO DE BOMBEROS, LA POLICIA ESTATAL, LA AUTORIDAD DE CONSERVACION Y DESARROLLO DE CULEBRA, EL DEPARTAMENTO DE RECURSOS NATURALES, Y LA OFICINA DE PESCA Y VIDA SILVESTRE PARA ESTABLESER LA LOGISTICA DEL PROGRAMA E IDENTIFICAR LA PARTICIPACION DE CADA ORGANISMO EN ESTA INICIATIVA.

SOMETEMOS LA PROPUESTA EN CUESTION, CON MIRAS A FOMENTAR UNA REUNION INTERAGENCIAL QUE PERMITA AÑADIR UNA ACTIVIDAD ADICIONAL DE INTERES ECOLOGICO EN NUESTRO MUNICIPIO.

ESPERAMOS QUE TODAS LAS AGENCIAS CONCERNIDAS NOS EXTIENDAN SU COOPERACION Y ASISTENCIA PARA QUE ESTA INICIATIVA SE DESARROLLE CON EXITO EN LA MEDIDA QUE CADA CUAL APORTE PARA LA CONSECUSION DE UN FIN COMUN, NECESARIO PARA LOS QUE RESIDIMOS EN EL TERRITORIO DE CULEBRA.

Proposal

Authorization for the Rehabilitation, Maintenance, and Accessibility of Trails/Paths and Roads in Areas of Rich Tourists' Interest for Their Contents of Flora and Fauna Autochthonous of the Municipality of Culebra.

Submitted by:

The Commission for Eco-Tourism Development
Municipality of Culebra

Introduction

Culebra has been blessed by nature. Its native ecology is exceptionally beautiful. It is as varied on land as in the waters that surround its territory.

The island of Culebra is uniquely valuable in Puerto Rico for the development of aquatic activities through its beaches, virgin coves and islets, and rich marine life. One way to promote the development of a tourist industry directed at specialized tourism, it to orient it to a nature loving clientele interested in the conservation and protection of our environment and native ecology.

The land, as a part of the flora and fauna, is equally interesting as it is rich in abundant archeological landscapes of tourist interest, sufficiently attractive to awaken and satisfy the curiosity of the hundreds of visitors that come to Culebra looking for something different that would permit them direct contact with nature in its primitive and undisturbed state.

Mission:

Promote the development of a tourist infrastructure, varied and specialized that meets the likes and preferences of our clientele, adding to a base that identifies our ecological resources as the basic reason to promote the island as a tourist destination.

Create the mechanisms of development through the active participation of the municipality and other public and private organizations like the agents, motivators, and proposers of development and activities and facilities that would strengthen and build the tourist resources in the territory.

Vision:

Prepare the island as a tourist center identified with nature where the same would convert into its principal product to market and promote.

Objectives:

Identify and foster the development of tourist activities directed at creating new employment opportunities that would lead to a business class primarily made up of residents of the territory.

Promote the participation and involvement of the public and private sector directed and motivated by a common end where responsibilities that permit us to diversify our tourist industry can be shared.

Interagency Understandings and Coordination

The interest of the Municipal Administration of Culebra and the Commission for Eco-Tourism Development is to be able to establish an understanding and relationship of cooperation with the different public agencies with inherent interest in our development plans for our tourist service infrastructure.

As a part of the program previously mentioned, the Commission of Eco-Tourism Development of Culebra has taken the initiative to identify the routes or trails/paths of tourist interest with intention to rehabilitate the same for public use.

The trails or paths will become pedestrian walkways and possibly be used for bicycle or horseback riding.

The trails or paths of tourist interest are located on private, federal, and state lands.

It is our interest to establish an cooperative understanding between the public and private organizations. Such an act would permit the municipality and the previously mentioned agencies authority for the public use of the same using adequate controls. To establish areas of responsibility using official agreements between the agencies where each would support and be responsible for the protection, cleaning, and maintenance of the trails/paths.

This act would bring with it in addition the rehabilitation of the historic trails/paths, the adequate location of direction signs, and training of the personnel that would serve as tourist guides where information would be offered to visitors about the flora and fauna which exists in the distinct areas.

Work Plan

The first intention of the municipality involves official contact with the different agencies whose jurisdiction affects the aforementioned trails/paths to establish a series of agreements with respect to the protection of the environment, fauna, flora maintenance and cleaning of the trails/paths, protection against possible archeological pillaging, fires, hours of operation, adequate direction signs, personal and property security plans, medical emergency program, and the agency responsible for administering the program.

The municipality is in the best position to offer and coordinate certain services under our control, when and after a interagency coordination is achieved where each organization supports the measurement and capacity of the resources.

What follows is a list of services for the administration and operation of the trails/paths that the municipality could offer.

Cleaning and Conditioning of the Trails/Paths

The municipality makes available a group of cleaning and cutting

workers to clear the trails/paths. This work effort can be coordinated with other agencies and forces can be united periodically for actions during the year so that all the work will not rest on only one organization.

Guide Service

The municipality makes available one capable, bilingual person, who can be used as a tourist guide with previous coordination and arrangement with the office. The same could be trained by the different agencies with a stake in the issue.

Public Recovery and Security

The civil defense and the municipal guard are available to participate in the security program. We can establish periodic turns combined with personnel of other agencies with local authority to protect the environment during the period of operation of the program.

Medical Emergencies

The Municipal Health Plan has as its principal function to offer its services to the residents of the territory. Nevertheless, they could serve as an additional resource to participate in cases where some emergency arises in the program of excursions previously mentioned.

Reservation System

The municipality has a tourist information office. Its personnel are available for to coordinate and help with reservations for homogenous groups interested in visiting Culebra and participating in one of these excursions.

A cost or tariff can be established for special excursions that require a personal guide and other additional services.

Objectives and Aims in Permitting Use of these Trails/Paths for Public Use

It is public policy of the Municipality of Culebra to promote the development of a tourist infrastructure that tends to build a local business class in the territory.

Tourist development based on the richness of our natural resources, which is a result of its unique variety, color, and abundance.

Our natural resources give us the prime material for perpetuating our tourist industry. We should by all possible means enter a close relationship and coordination with all the public and private organizations with interest and jurisdiction over the areas of rich ecology within the territory. We should come to agreement on a management plan so that this extraordinary environment can be

enjoyed using adequate controls, actions that protect and conserve for the use and pleasure of future generations. More important even, it would facilitate that the Culebra territory is converted in a natural park by its natural attractiveness, where protection of the resources is a vital result. A privileged place where you can enjoy nature in its primitive state.

We need the cooperation and assistance of all and each of the agencies with interest in this issue so that Culebra can become the most important destination in the Caribbean for nature lovers. If our image spreads internationally as an example where man can live in harmony and total symbiosis with this ecological environment. It is well known in Puerto Rico and the United States that places of ecological value under the control of the state or federal government are at the disposal of the public. Their basic function is the promotion, development and creation of a feeling and conscience to conserve and protect the ecological resources of our world.

It is a way of educating the people that visit us to grow conscious in terms of protecting our resources. It helps us better the image of the federal, state, and municipal agencies of Culebra in their effort to establish a management program that facilitates, promotes, and enthuses the public when visiting the areas of ecological interest.

In addition, this act will change the negative image that various federal agencies which operate in Culebra project, by protecting and prohibiting public use of all the properties under its jurisdiction in the Culebra territory.

We recommend a interagency meeting to coordinate the participation of another state and federal level agency with stake in the matter, much like the fire department, state police, the Authority for Conservation and Development of Culebra, the Department of Natural Resources, and the Office of Fish and Wildlife to establish the logistics of the program and identify the participation of each organization in this initiative.

We submit the proposal in question, looking to encourage an interagency meeting that would permit adding an additional activity of ecological interest in our municipality.

We hope that all the agencies concernad extend to us their cooperation and assistance so that this initiative develops successfully by the means of each supporting the realization of a common end necessary for those who reside in Culebra.

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RELACION DE VEREDAS DE INTERES TURISTICO A ESTABLECER EN CULEBRA PARA EL FORTALECIMIENTO DEL TURISMO INTERNO

VEREDAS	JURISDIC.	USO AUT.	HORARIO SERVICIO	DESTINO	ACTIVIDAD
1-CARLOS ROSARIO	D.R.N.	PEATONAL BICICLETA CABALLO VEHICULO	DIURNO	PLAYA DE CARLOS ROSARIO	BAÑO AREA RECREA-TIVA
2-PUNTA MOLINO	D.R.N. F.W.L.S.	PEATONAL	DIURNO	PLAYA BLANCA	PESCA
3-VEREDA DEL O.P.	PRIVADA F.W.L.S.	PEATONAL CABALLO	DIURNO	PLAYA RESACA	RECREAC. ESCENICA
4-VEREDA EL VIGIA	PRIVADO	PEATONAL	DIURNO	PLAYA BRAVA	VISTA ESCENICA
5-CULE-BRITA	F.W.L.S.	PEATONAL	DIURNO	FARO	RECREAC. ESCENICA
6-VEREDA PTA. SOLDADO	D.R.N.	PEATONAL BICICLETA VEHICULO	DIURNO NOCTURNO	FARO PTA. SOLDADO	PESCA CAMPING BAÑO
7-LUIS PEÑA	F.W.L.S.	PEATONAL	DIURNO	O.P.	RECREAC. ESCENIC
8-VEREDA TORTOLO	PRIVADA	BICICLETA PEATONAL VEHICULO	DIURNO NOCTURNO	ZONI	PLAYA ESCENICA

Relation of trails of tourist interest to establish in Culebra for the >>>>>>>>>> of internal tourism

Path/Trail	Jurisdiction	Authorized Use	Hours of Service	Destination	Activities
1-Carlos Rosario	D.R.N.	Pedestrian Bicycle Horse Vehicle	Daytime	Playa de Carlos Rosario	Swimming Recreation Area
2-Punta Molino	D.R.N. F.W.L.S.	Pedestrian	Daytime	Playa Blanca	Fishing
3-Vereda del O.P.	Private F.W.L.S.	Pedestrian Horse	Daytime	Playa Resaca	Recreation Area Scenic View
4-Vereda el Vigia	Private	Pedestrian	Daytime	Playa Brava	Scenic View
5-Culebrita	F.W.L.S.	Pedestrian	Daytime	Faro	Recreation Area Scenic View
6-Vereda Punta Soldado	D.R.N.	Pedestrian Bicycle Vehicle	Daytime Nighttime	Faro Punta Soldado	Fishing Camping Swimming
7-Luis Pena	F.W.L.S.	Pedestrian	Daytime	O.P.	Recreation Area Scenic View
8-Vereda Tortolo	Private	Bicycle Pedestrian Vehicle	Daytime Nighttime	Zoni	Scenic Beach


ISLA DE CULEBRA
CAYO NORTE
(see Caution)

1 de agosto de 1995

INFORME A LA AUTORIDAD PARA LA CONSERVACION Y EL DESARROLLO DE CULEBRA

ASUNTO : Desarrollo del Balneario de Playa Flamenco, Tercera etapa.

A : Sr. Secretario Pedro Gelabert, Presidente de la Junta, Distingidos Miembros de la Junta de Directores, Sr. Abraham Peña, Director Ejecutivo de la ACDEC.

1. Consulta de Ubicación (83-77-0220-JGU)

Cuando hicimos la consulta de ubicación para el desarrollo del Balneario de Playa Flamenco en el 1983, incluímos cinco (5) etapas para su desarrollo y la Junta de Planificación las aprobó todas.

La primera etapa se construyó con una asignación legislativa y la segunda dependía de otra asignación legislativa que estaba en proceso cuando se sometió la consulta. Ambas etapas fueron terminadas para el verano de 1984.

Las etapas subsiguientes podrían llevarse a cabo, de acuerdo a las condiciones establecidas por la Junta de Planificación, en su aprobación, cuando hubiese agua potable.disponible en cantidades adecuadas.

2. Estado Actual del Balneario

Una orden del Honorable Gobernador Dr. Pedro Rosselló, logró que la A.A.A. extendiera hasta Flamenco su sistema de agua potable, condición requerida para proceder con las etapas 3, 4 y 5.

Según aprobadas, dichas etapas consisten de las facilidades siguientes:

3 : 24 unidades vacacionales
4 : 24 unidades vacacionales adicionales
5 : Parador de Turismo de 32 habitaciones

La política establecida en la operación del Balneario, consistente en limitar el número de usarios nocturnos y de requerir que hagan reservaciones, ha tenido resultados muy favorables. El Balneario ha empezado a generar ingresos y con ellos se han hecho mejoras y las facilidades se mantienen en muy buen estado.

3. Tercera etapa

La tercera etapa consiste en 24 unidades vacacionales, y la infraestructura necesaria para servirlas: planta de tratamiento terciario, tiendita y cafetería. La tiendita debe vender artículos de primera necesidad y alquilar sábanas, almohadas, y utensilios de cocina. Habría que añadir algunas mejoras al Balneario y los accesos, estacionamiento y utilidades necesarias.

4. Estimado de costo probable

Basado en los costos de facilidades similares en construcción en Humacao y Boquerón, el costo de una unidad sería de 60 mil dólares en Puerto Rico y 1 1/3 veces más alto, o sea, 80 mil dólares en Culebra.

Estimado de Costos:

Facilidades		Costo probable
4.1	24 unidades x $80,000	$1,920,000.00
4.2	Planta terciaria	180,000.00
4.3	1 kilómetro de accesos y líneas sanitarias y de agua y electricidad	300,000.00
4.4	Tiendita, cafetería	160,000.00
4.5	Otras mejoras: tres sanitarios, torre salvavidas, facilidades recreativas	140,000.00
	Sub-Total	$2,700,000.00
4.6	Estudios del subsuelo, mensura y topografía, planos de construcción, supervisión de la construcción	240,000.00
	Costo probable total	$2,940.00.00

Notice to the Authority for Conservation and Development of Culebra

Issue: Develop the Seaside Resort of Flamenco Beach, Third Phase

To: Mr. Secretary Pedro Gelabert, President of the Board, Distinguished Members of the Board of Directors, Executive Director of ACDEC

1. Location Study (83-77-0220-JGU)

When we studied the location for the development of seaside resort of Flamenco Beach in 1983, we included 5 phases for its development and the Planning Board approved all phases.

The first phase was made up of a legislative allocation of funds and the second would depend on another legislative allocation of funds which was in progress when the study was submitted. Both phases were finished by summer of 1984.

The subsequent phases could be completed in agreement with the conditions established by the Planning Board, in their allocations when there is potable water available in adequate quantities.

2. Current Stage of the Resort

An order by the Honorable Governor Dr. Pedro Rossello was successful in causing the A.A.A., (Water Authority?) to extend its potable water system to Flamenco, a required condition for proceeding with Phases 3, 4, and 5.

According to that approved, those Phases consist of the following facilities:

3	:	24 Vacation Units
4	:	24 Additional Vacation Units
5	:	Tourist Inn of 32 Rooms

The established policy of the resort operation, which consists of limiting the number of night time guests and to require them to make reservations has had favorable results. The Resort has begun to generate income with which improvements have been made and the facilities are maintained in very good shape.

3. Third Phase

The third phase consists in 24 vacation units and the necessary infrastructure to serve them: a water treatment plant (?), a small shop, and a cafeteria. The small store

should sell primary need items and rent sheets, pillows, and kitchen utensils. Some improvements will have to be added to the Resort and the entrances, parking, and necessary utilities.

4. Probable Estimated Costs

Based on the costs of similar facilities being constructed in Humacao and Bosqueron, the cost of one unit will be 60 thousand dollars and 1 and 1/3 times more, being 80 thousand dollars, in Culebra.

Estimated Costs:

Facilities		Probable Cost
4.1	24 units X $80,000.00	$1,920,000.00
4.2	Water Treatment Plant	180,000.00
4.3	1 Kilometer of access and sanitary lines for water and electricity	300,000.00
4.4	Small Shop and Cafeteria	160,000.00
4.5	Other improvements: three bathrooms, Lifeguard tower, recreational facilities	140,000.00
	Subtotal	$2,700,000.00
4.6	Geographic and topographic studies, construction plans, construction supervision	240,000.00
	Probable Total Cost	$2,940,000.00

JP - Forma 31 A (Rev.)
2 feb. 83

ESTADO LIBRE ASOCIADO DE PUERTO RICO
OFICINA DEL GOBERNADOR
JUNTA DE PLANIFICACION
SANTURCE, PUERTO RICO

CONSULTAS DE UBICACION PARA PROYECTOS RESIDENCIALES, INDUSTRIALES, COMERCIALES, TURISTICOS, INSTITUCIONALES Y OTROS

I. INFORMACION GENERAL:

RADICACION (Para uso de JP)	
Número	Fecha
83-77-0221-5621	

NUMERO DE CATASTRO				
Municipio	Mapa		Manzana	Parcela
	1:10,000	1:1,000		
77	472	000	004	01

PROYECTO O FINCA		HISTORIAL EN JP O ARPE: INDICAR CASO ANTERIOR SOMETIDO A LA JP Y CON RESPECTO A SEGREGACIONES PROPUESTAS INDIQUE LOS SOLARES FORMADOS EN LA FINCA PRINCIPAL:		
Nombre	BALNEARIO DE PLAYA FLAMENCO			
Localización exacta. Pueblo (calle) municipio, barrio, carretera, km. y punto de referencia.	CULEBRA PR 999, FIN	Número de Radicación	Número	Fecha

	Nombre
DUEÑO DE LA FINCA	ACDEC - Autos Conservacion y Desarrollo de Culebra
PROPONENTE	HECTOR ACEVEDO

Not Translated / Changed

Basically an order cover sheet for the Culebra Project

II. INFORMACION SOBRE EL

Zonificación		
DISTRITO (S)	Hoja Número	Vigencia
RURAL		

USO PROPUESTO A DARSELE A LOS TERRENOS

- ☐ Residencial
- ☐ Comercial
- ☐ Industrial
- ☐ Institucional
- ☐ Turístico
- ☒ Otro RECREATIVO (PÚBLICO) (Indique)

DESDE	ACDEC	Finca Núm.	

PENDIENTE DE INSCRIPCIÓN

III. DATOS SOBRE LA PARTE PROPONENTE SI ES UNA CORPORACION (DETALLE AL DORSO)

IV. MEMORIAL EXPLICATIVO PARA LA CONSULTA:

NO SE RADICARA Y SERA DEVUELTA TODA SOLICITUD QUE NO INCLUYA LA INFORMACION INDICADA ASI COMO LA INFORMACION Y DOCUMENTOS INDICADOS EN EL LISTADO PREPARADO PARA ESOS FINES.

DECLARACION DEL SOLICITANTE

Declaro que esta solicitud ha sido examinada por mí y según mi mejor información y creencia, es cierta y correcta.

27 DE FEBRERO DE 1983
Fecha

Firma Propietario

HECTOR E. ACEVEDO C.O.P.
ARQUITECTO
2689
PUERTO RICO

ESTADO LIBRE ASOCIADO DE PUERTO RICO
Oficina del Gobernador
JUNTA DE PLANIFICACION
Santurce, Puerto Rico

Informe Número 83-77-JGU-034

23 de marzo de 1983

Consulta Número 83-77-0220-JGU

RESOLUCION

La Autoridad de Conservación y Desarrollo de Culebra, amparándose en la reglamentación vigente, sometió a la consideración de esta Junta de Planificación la Consulta Número 83-77-0220-JGU, para la ubicación de un balneario público y área vacacional, en una finca con cabida de 150 cuerdas, que radica al Suroeste de la Bahía Flamenco y al final de la Carretera Estatal Número 999, en el Barrio Flamenco de Culebra. Dichos terrenos radican fuera de los límites del área zonificada de dicho Municipio.

La parte proponente contempla la utilización de dichos terrenos para la ubicación de un balneario público y área vacacional a desarrollarse en cinco (5) etapas las cuales se describen a continuación:

1. Primera etapa a construirse con una asignación legislativa de $125,000.00 y consiste de servicios sanitarios, vestidores, lago con sistema de bombeo y tanque elevado de 3,000 galones, caseta de control, dos (2) barreras vehiculares y la preparación de áreas para acampar.

2. Segunda etapa a construirse con una asignación legislativa de $200,000.00 en proceso, consiste de un sanitario, vestidor adicional, iluminación general, oficina y sala de primera ayuda, facilidades recreativas, mesas techadas y sin techar, pavimentación de accesos vehiculares y mejoras al drenaje general del área.

3. Las etapas tercera y cuarta, consisten cada una de veinticuatro (24) cabañas de dos (2) dormitorios, con facilidades de cocina. Para dichas etapas será necesario esperar hasta que Culebra tenga agua potable disponible en cantidades suficientes. Conjuntamente se proveerá una planta de tratamiento de aguas servidas y se ampliará el lago y el sistema de manglar existente.

4. La quinta etapa consiste de un parador de turismo de treinta y dos (32) habitaciones en dos (2) plantas, con restaurant, cafetería, barra y salón de usos múltiples.

Mediante comunicación del 24 de febrero de 1983 a la Junta de Calidad Ambiental, la parte proponente certifica que de llevarse a cabo el proyecto el mismo no ocasionará un impacto ambiental adverso.

Esta consulta de ubicación ha sido examinada y analizada a la luz de la información suministrada por el proponente y de las disposiciones de Leyes, Reglamentos y Normas de Planificación vigentes. También se ha dado consideración a las proyecciones poblacionales y a la disponibilidad de terrenos apropiados para la construcción de viviendas y otros usos en la zona que comprende el propuesto proyecto.

Del examen y análisis hecho se desprende que es viable el desarrollo de los terrenos anteriormente descritos para el uso propuesto, condicionado a los siguientes señalamientos y recomendaciones, los cuales habrán de tomarse en consideración al prepararse y someterse el desarrollo preliminar correspondiente a la Administración de Reglamentos y Permisos:

1. Los planos de desarrollo preliminar cumplirán con todas las disposiciones de leyes, reglamentos y normas de planificación vigentes y aplicables, así como con las normas de la referida Administración.

DESPACHADO
ABR. 05 1983
JUNTA PLANIFICACION
SECCION CONSULTAS

Associated Free State of Puerto Rico
Office of the Governor
Planning Board
Santurce, Puerto Rico

March 23, 1983

Report Number 83-77-JGU-034 Study Number 83-77-0220-JGU

RESOLUTION

The Conservation and Development Authority of Culebra, under the regulations in force, submit for consideration by this Planning Board, the Study Number 83-77-0220-JGU for the location of a public seaside resort and vacation area on property with the approximate size of 150 acres that is situated to the southwest of the Bahia Flamenco and at the end of State Road 999 in the Barrio Flamenco of Culebra. These properties are situated outside of the limits of the zoned areas of the mentioned municipality.

The proposed part contemplates the utilization of said properties for the location of a public seaside resort and vacation area to be developed in five (5) phases which are described below:

1. First Phase to construct with a legislative allocation of funds of $ 125,000.00 and consisting of bath rooms, dressing rooms, lake with pumping system and elevated 3,000 gallon tank, control house, two (2) vehicle parking lots/garages, and the preparation of area for camping.

2. Second Phase to construct with a legislative allocation of funds of $ 200,000.00 (being considered) consisting of one bath room building, an additional dressing room, general lighting, office and waiting room of first aid, recreational facilities, covered and uncovered tables, paved vehicle access and improvements to the general drainage.

3. Third and Forth Phase each consist of twenty-four (24) cabins of two (2) bedrooms each, with kitchen facilities. For these phases, it will be necessary to wait until Culebra has potable water available in sufficient quantities. Combined with this, a wastewater treatment plant will be provided and the existing lake and mangrove swamp (eco)system will be expanded.

4. Fifth Phase consists in a tourist inn of thirty-two (32) rooms and two floors, with restaurant, cafeteria, bar, and multi-use room.

By means of the communication of February 24, 1983 to the Environmental Quality Board, the proposed part certifies that

to complete the project would not cause an adverse environmental effect.

This location study has been examined and analyzed in light of the information supplied by the proposer and by the provisions of the planning laws, regulations, and norms in force. Consideration has also been given to the population projections and to the availability of appropriate properties for the construction of habitats and other uses in the zone that encompass the proposed project.

By the examination and analysis completed, it is conveyed that the development of properties previously described is feasible for the proposed use, under the conditions of the following designations and recommendations, which should be taken into consideration for preparing and submitting the preliminary correspondence to the Administration for Regulations and Permits:

1. The preliminary development plans will be completed with all the provisions of the planning laws, regulations, and norms applicable, as well as the norms of the referenced administration.

>>>>>> It falls off here. I believe there may be a page or more missing

Debido a las limitaciones de agua, se han provisto solo cien (100) estaciones de acampar. Cuando llegue la tubería de agua potable desde Puerto Rico o Vieques, prometida por el Honorable Gobernador el 16 de junio de 1984, se podrá limpiar áreas adicionales para ampliar las zonas de acampar.

Hay planes para proveer plataformas de madera para las casas de campaña, barbacoas, cobertizos con mesas adicionales, veredas, todo esto con los fondos que generen las áreas de acampar y el estacionamiento. Con esos fondos hay que pagar salvavidas, personal para administración, vigilancia y mantenimiento.

Si, como esperamos, los usuarios de estas facilidades mínimas las tratan con respeto y cariño, podremos acudir a la asamblea legislativa para proseguir con otras fases importantes de este proyecto, ya aprobadas por la Junta de Planificación... cabañas vacacionales, planta de tratamiento de aguas servidas y un Parador de Turismo.

La ciudadanía de Culebra es acogedora y hospitalaria. A la vez es sumamente celosa de las maravillas naturales de su archipiélago de islas. Establecer y sostener un asentamiento humano en Culebra ha sido una tarea muy árdua, y ha contado históricamente con muy poca ayuda de la Isla Grande.

Los Culebrenses, a cambio del disfrute que ustedes tendrán al visitar y hacer uso de sus bellezas naturales, esperan que usted trate la isla con cariño y que contribuya en lo que le sea posible con su economía. La infraestructura turística de Culebra es sencilla pero ha hecho grandes avances. Hay varios hoteles pequeños, magníficos restaurantes que les ofrecen mariscos, toda clase de comidas criollas, arepas y las mejores habichuelas de Puerto Rico.

Si le es posible y para que viaje con mayor comodidad, compre en Culebra y pruebe su maravillosa cocina. El comercio de Culebra se lo agradecerá.

A pesar de lo celosos que con su tierra y sus aguas son los Culebrenses, han estado siempre prestos a conceder la ciudadanía honoraria de su isla a todo aquel que la quiera y la respete.

BALNEARIO DE PLAYA FLAMENCO

CULEBRA, PUERTO RICO

Disfrútelo, consérvelo y trátelo con amor. Mejoraremos estas facilidades con las entradas que serán generadas por el área de acampar y el estacionamiento. El agua no solo es limitada sino costosa. De los fondos que genere el propio balneario dependerá el mantenimiento, los servicios y las mejoras permanentes futuras.

BALNEARIO
PLAYA FLAMENCO

CULEBRA, PUERTO RICO

Bienvenidos a la isla municipio de Culebra y al Balneario y Área de Acampar de Playa Flamenco.

Esperamos que disfruten de la increíble belleza de Culebra. En reconocimiento de dicha belleza, fue creada la Autoridad de Conservación y Desarrollo de Culebra, entidad que con dos asignaciones legislativas ha empezado el desarrollo de unas facilidades mínimas en esta hermosa playa.

La limitación más grande al desarrollo de Culebra y de este Balneario ha sido la falta de agua potable. La ACDEC ha comenzado con unas facilidades mínimas que por lo pronto utilizan agua salobre para operar los servicios sanitarios y las duchas. La capacidad del acuífero es limitada por cuya razón pedimos que economicen el agua.

Al dorso un mapa del Balneario, identificando las estaciones en las áreas de acampar.

Due to the limitations of water, only 100 camping sites have been proposed. When the pipelines of potable water arrive from Puerto Rico or Vieques, as promised by the Honorable Governor on the 16 of June of 1984, additional areas for camping can be cleared.

There are plans to provide wooden platforms for camping, barbecues, shelters/pavilions with additional tables, walkways, all these with the funds that the camping and parking areas generate. With these funds, lifeguards, administrative personnel, security, and maintenance must also be paid.

If, as we hope, the users of these facilities treat them with respect and care, we will be able to convince the legislative assembly to proceed with other important phases of this project already approved by the Planning Board....vacation cabins, a wastewater treatment plant, and a tourist inn.

The residents of Culebra are friendly and hospitable. At this time they are summarily jealous of the natural wonders of their Archipelago islands. To establish and sustain a human settlement in Culebra has been a difficult effort and has historically received very little support from the Isla Grande.

The Culebra residents, as opposed to the enjoyment that (you) visitors will have to visit and make use of the natural beauty, hope that you will treat the island with care and contribute as possible to its economy. The tourist infrastructure of Culebra is basic, but has made many advances. There are various small hotels, magnificent seafood restaurant, all types of Creole foods, and the best beans of Puerto Rico.

If it is possible and to travel comfortably, purchase in Culebra and try its magnificent food. The Culebra businesses would thank you.

In spite of the Culebra inhabitants' jealous guarding of their land and water, they have always been quick to grant honorary citizenship of their island to all who love it and respect it.

SEASIDE RESORT OF PLAYA FLAMENCO

Culebra, Puerto Rico

Enjoy it, conserve it, and treat it with love. We have improved these facilities with the income from the camping and parking areas. The water is not only limited, but costly. The maintenance, the services, and the future permanent improvements are dependent on the generated income from the resort.

Welcome to the Municipal Island of Culebra and the Seaside Resort and Camping Area of Flamenco Beach.

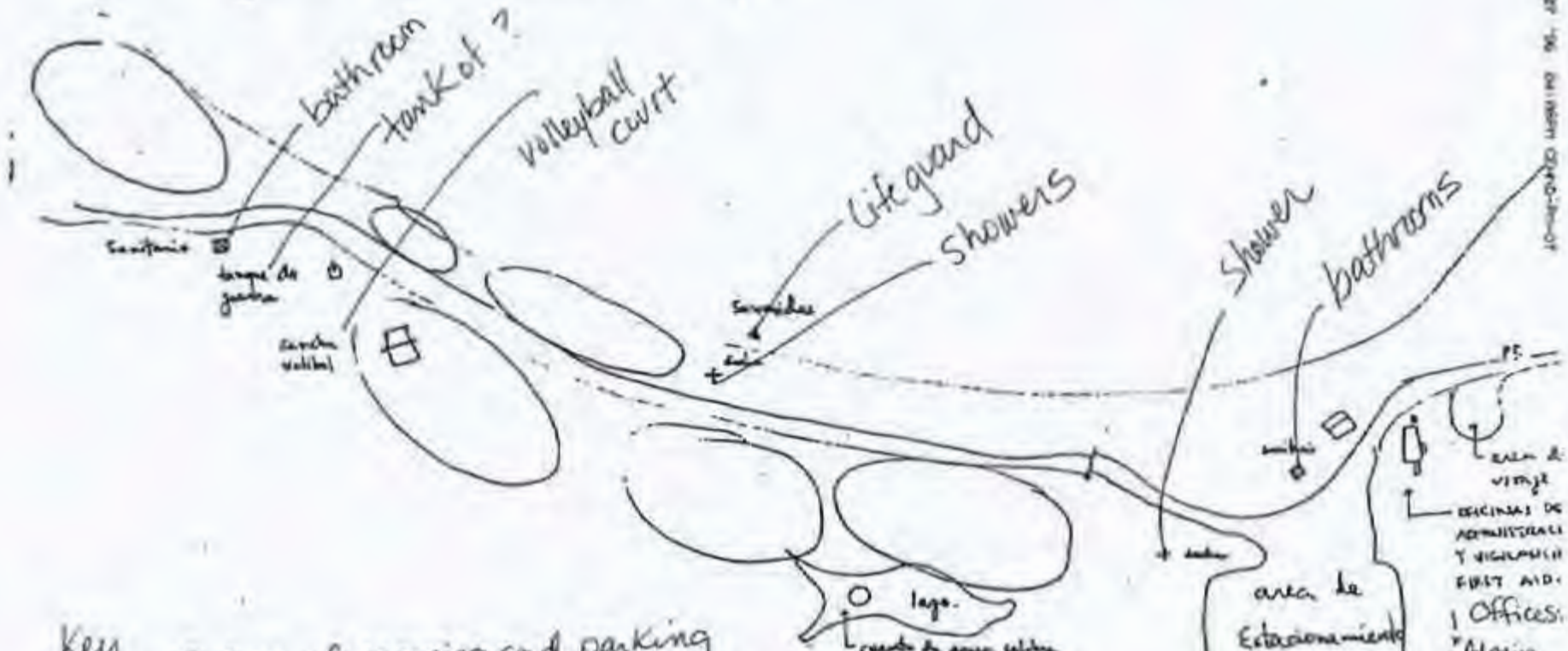
We hope you enjoy the incredible beauty of Culebra. Recognizing this beauty, the Authority of Conservation and Development of Culebra was created, understanding that the legislative allocations have initiated the development of basic facilities at this beautiful beach.

The greatest limitation to the development of Culebra and this resort has been the lack of potable water. The ACDEC has begun with basic facilities that for the time being utilize salt water for the bathrooms and showers. The capacity of water (tank?) is limited and the reason why we ask that you economize.

The back side of this page contains a map of the Resort, identifying the stations and the camping areas.

BALNEARIO DE PLAYA FLAMENCO CULEBRA, PUERTO RICO

Playa Flamenco Seaside Resort



Key identificar:
1. Area of camping and parking
2. oficinas Office
3. sanitarios bathrooms
4. duchas showers
5. salvavidas Life guards
6. lago lake
7. parking parking
8. canchas volibol y baloncesto. Volleyball and basket ball courts
9. water source (salt) for operation of toilets and showers

APPENDIX C

PHOTOGRAPHS

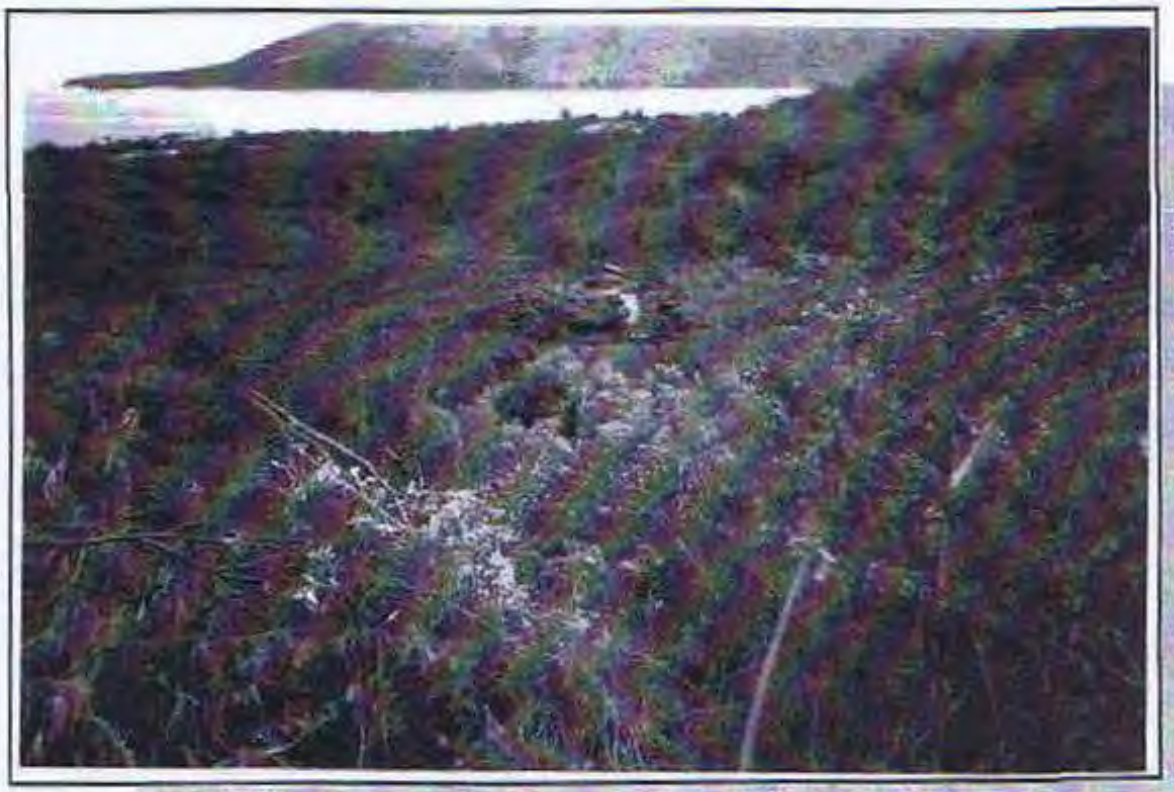
PHOTOGRAPH NO. 1
N.W. Peninsula.

PHOTOGRAPH NO. 2
N.W. Peninsula. Cable Tower Foundation Near NP-4&5, Next to Tank Target.

PHOTOGRAPH NO. 3
N.W. Peninsula. NP-18, Mapping and Flagging

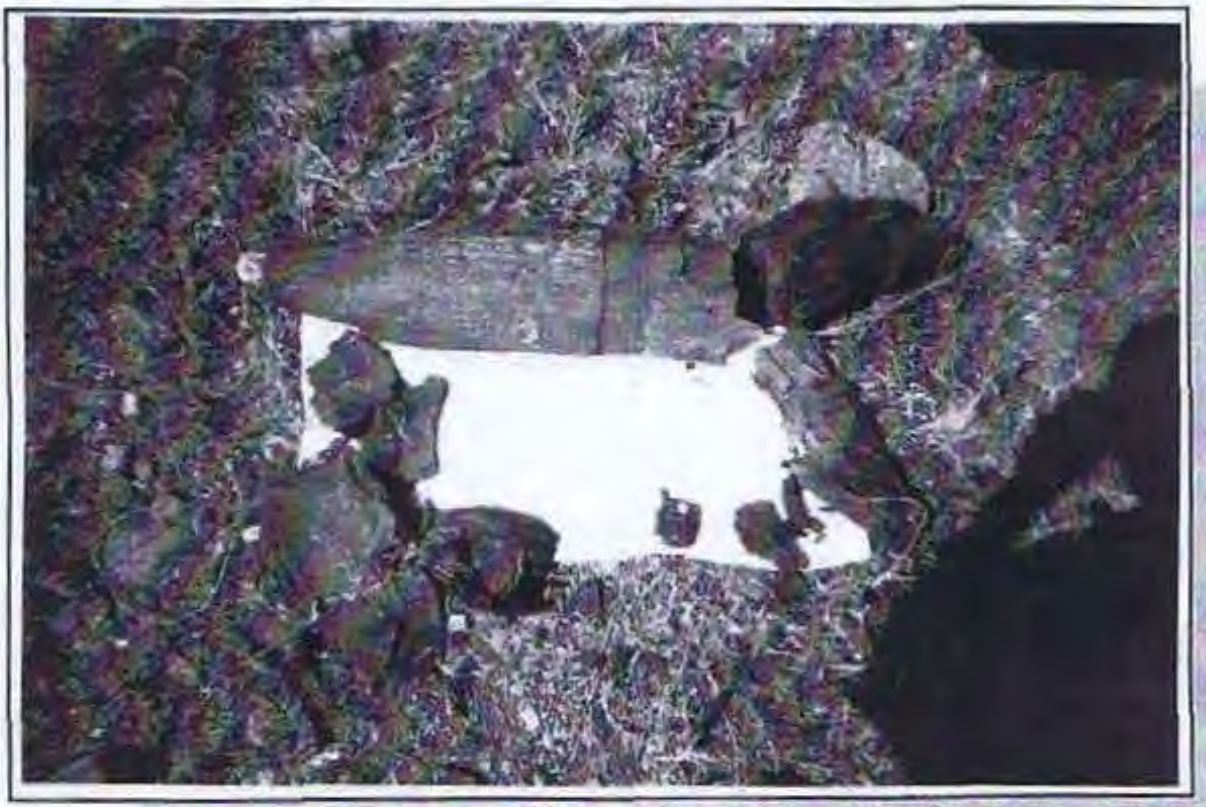
PHOTOGRAPH NO. 4
N.W. Peninsula. Tank Target Near NP-4 and NP-5.

PHOTOGRAPH NO. 5
N.W. Peninsula. NP-10, MK 77 Fire Bomb 750 lb Remnants.



PHOTOGRAPH NO. 6
N.W. Peninsula. NP-3, Tank East of Grid.

PHOTOGRAPH NO. 7
N.W. Peninsula. Tank Close to NP-4.



PHOTOGRAPH NO. 8
N.W. Peninsula. ORS Found on NP-22.

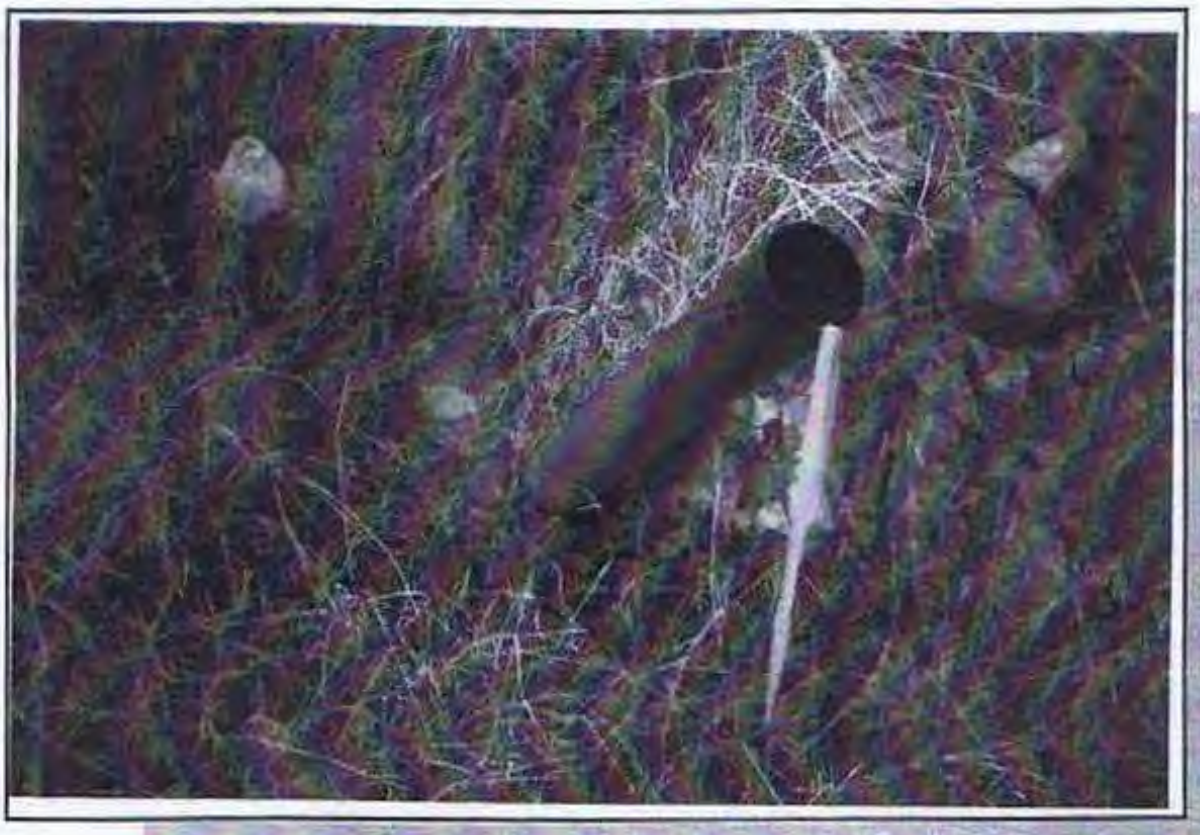
PHOTOGRAPH NO. 9
N.W. Peninsula. NP-25, Unknown Bomb Tail.

PHOTOGRAPH NO. 10
N.W. Peninsula. ORS Found on NP-17.

PHOTOGRAPH NO. 11
N.W. Peninsula. NP-6, View of Contact Flags.

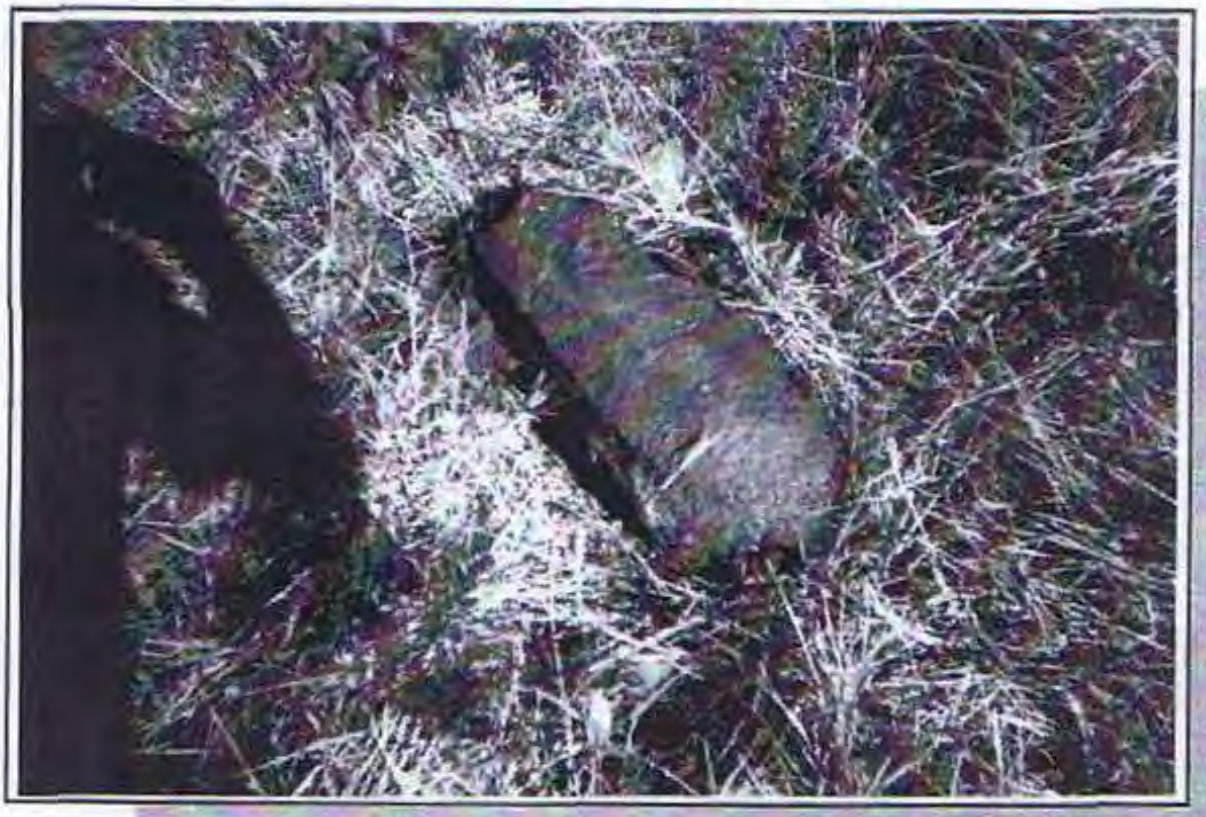
PHOTOGRAPH NO. 12
N.W. Peninsula. NP-10, Bomb, MK 77, Expended, Found on Surface.

PHOTOGRAPH NO. 13
N.W. Peninsula. NP-13, Crew Grubbing.



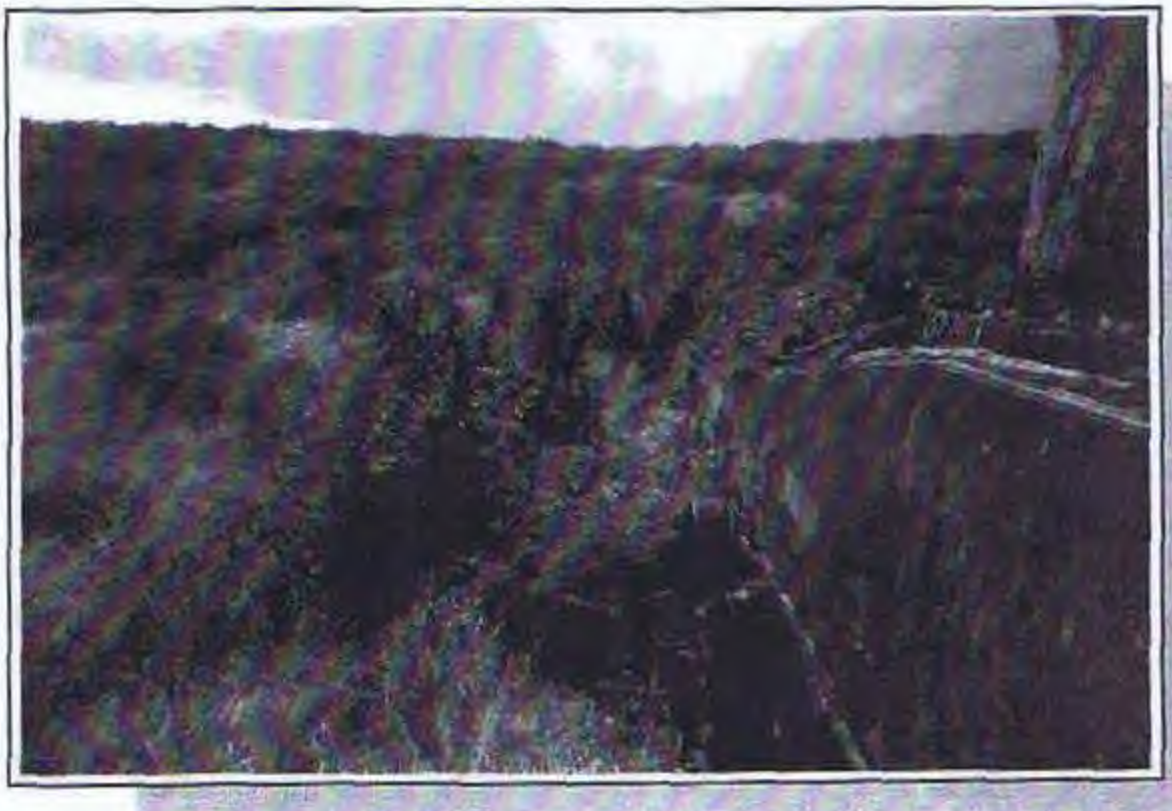
PHOTOGRAPH NO. 14
N.W. Peninsula. NP-11, Rocket, 5" HVAR, Inbedded in Ground.

PHOTOGRAPH NO. 15
N.W. Peninsula. NP-16, Tank.



PHOTOGRAPH NO. 16
N.W. Peninsula. NP-16, Cannister.

PHOTOGRAPH NO. 17
N.W. Peninsula. NP-16, MK 82, Expended.



PHOTOGRAPH NO. 18
N.W. Peninsula. NP-17, Tank.

PHOTOGRAPH NO. 19
N.W. Peninsula. NP-23, From East Side of Grid After Grubbing.

PHOTOGRAPH NO. 20
N.W. Peninsula. NP-25, From N.W. Corner Looking S.E., Before Grubbing.

PHOTOGRAPH NO. 21
N.W. Peninsula. NP-16, ORS.

PHOTOGRAPH NO. 22
N.W. Peninsula. 6" Round, Bulk HE on Top of 81 MM, 3" Round, Half of 6" Round.

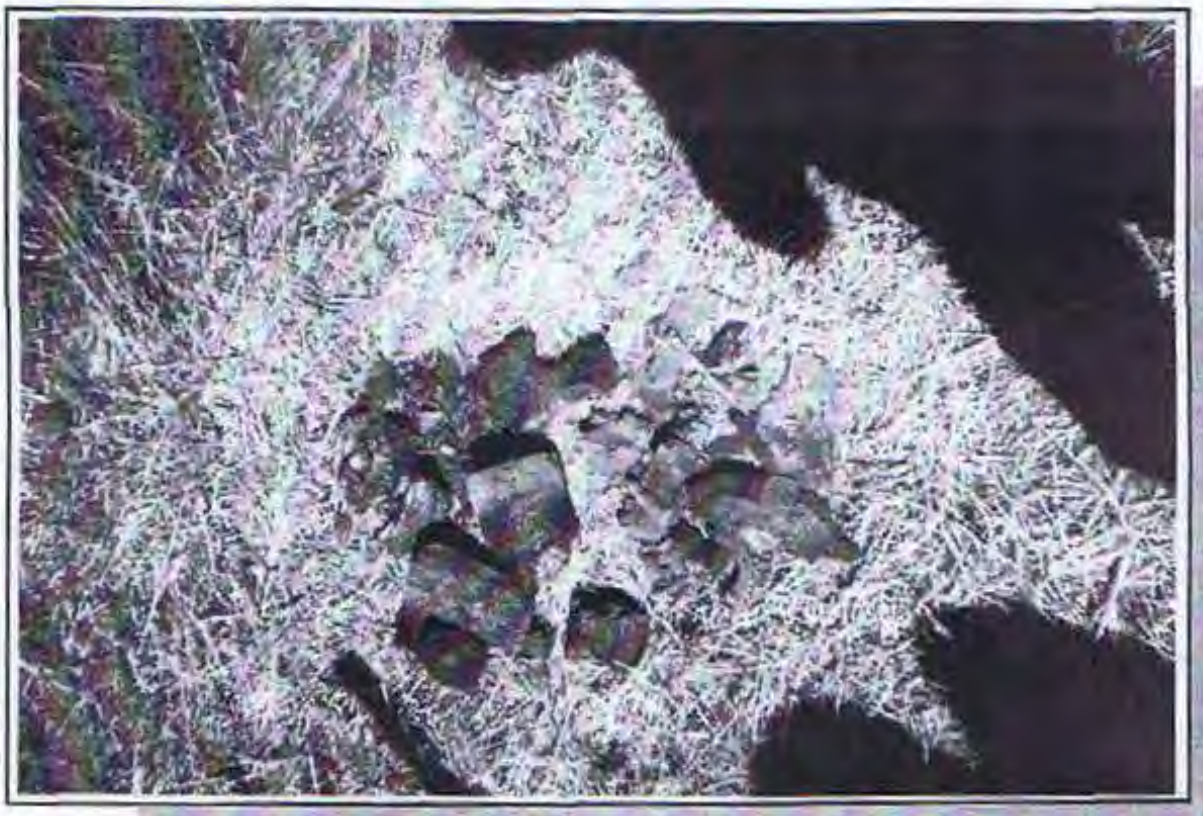
PHOTOGRAPH NO. 23
N.W. Peninsula. NP-17, 5" Round, Sheared Fuze.

PHOTOGRAPH NO. 24
N.W. Peninsula. NP-17, Round Found on Surface.

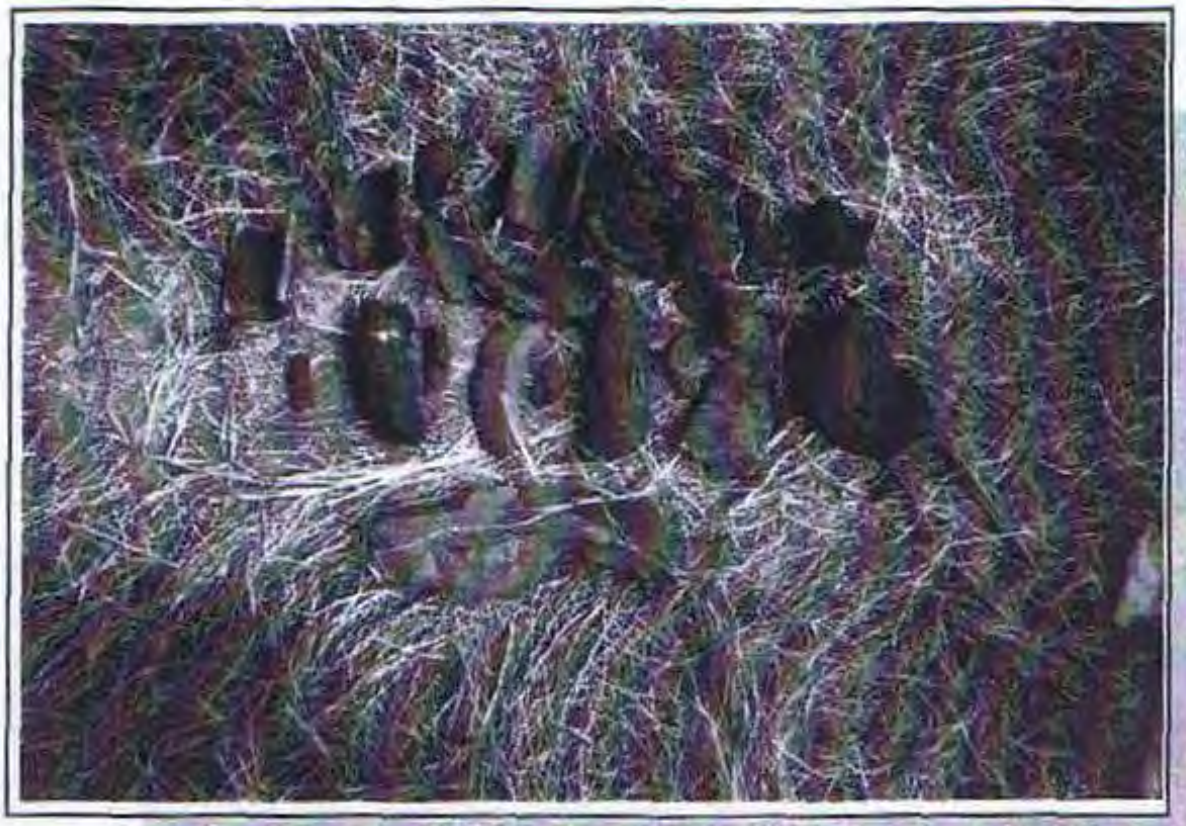
PHOTOGRAPH NO. 25
N.W. Peninsula. NP-5, ORS.

PHOTOGRAPH NO. 26
N.W. Peninsula. NP-17, Grenade, 6" with HE (Low Ordered), 2-5" Rounds Found on Surface

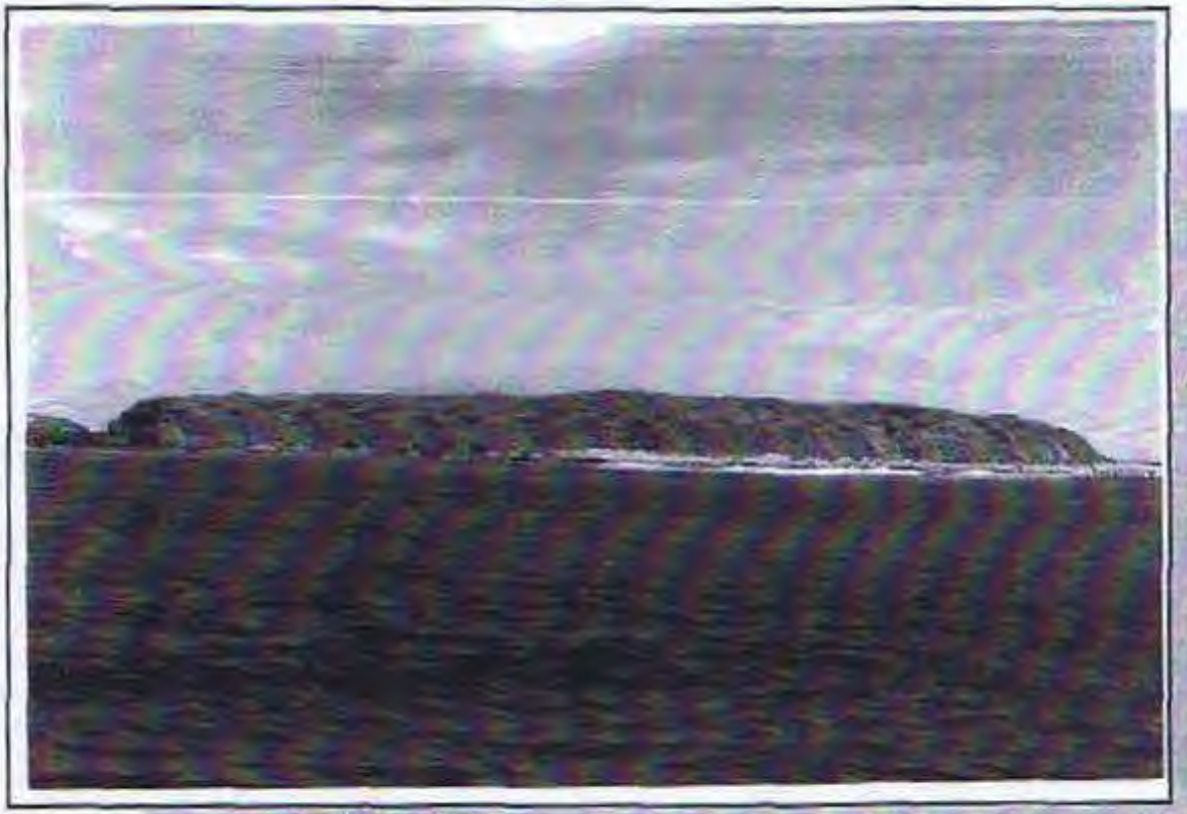
PHOTOGRAPH NO. 27
N.W. Peninsula. NP-3, 5" Rocket Mortor (Empty).



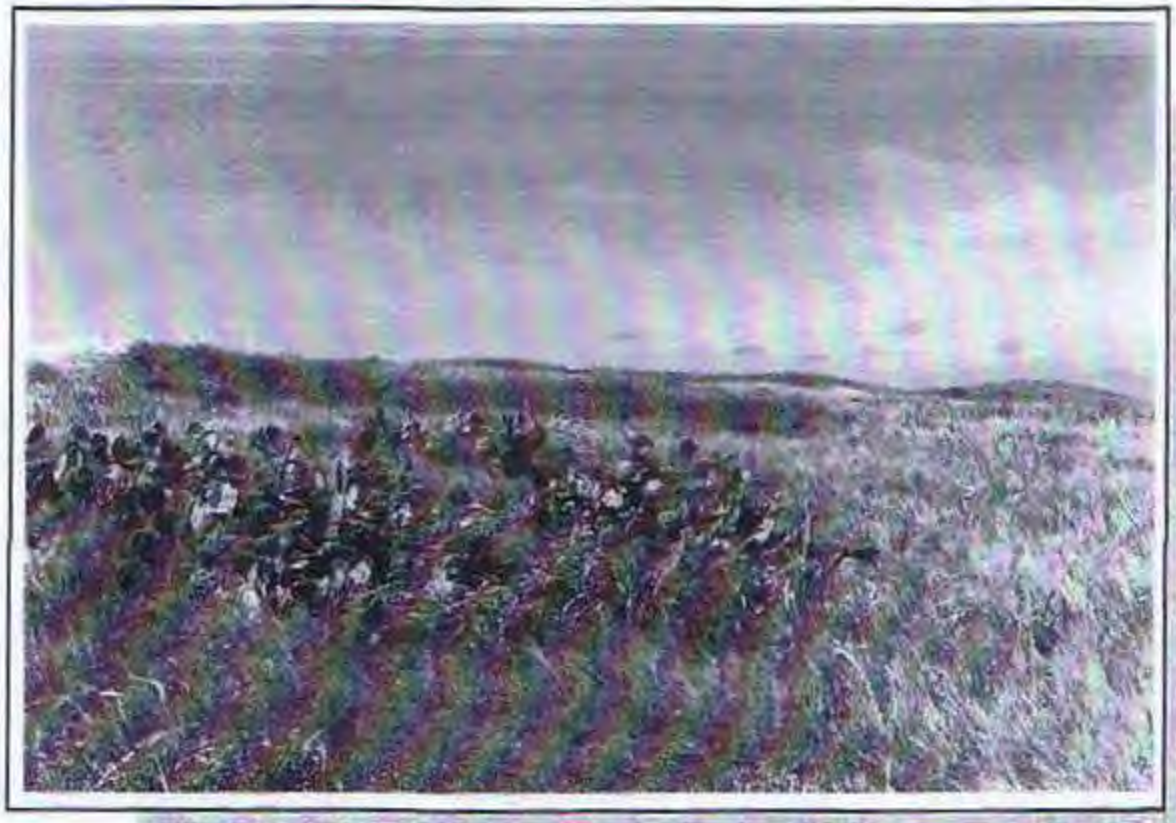
PHOTOGRAPH NO. 28
N.W. Peninsula. NP-9, ORS.



PHOTOGRAPH NO. 29
N.W. Peninsula. NP-5, ORS.



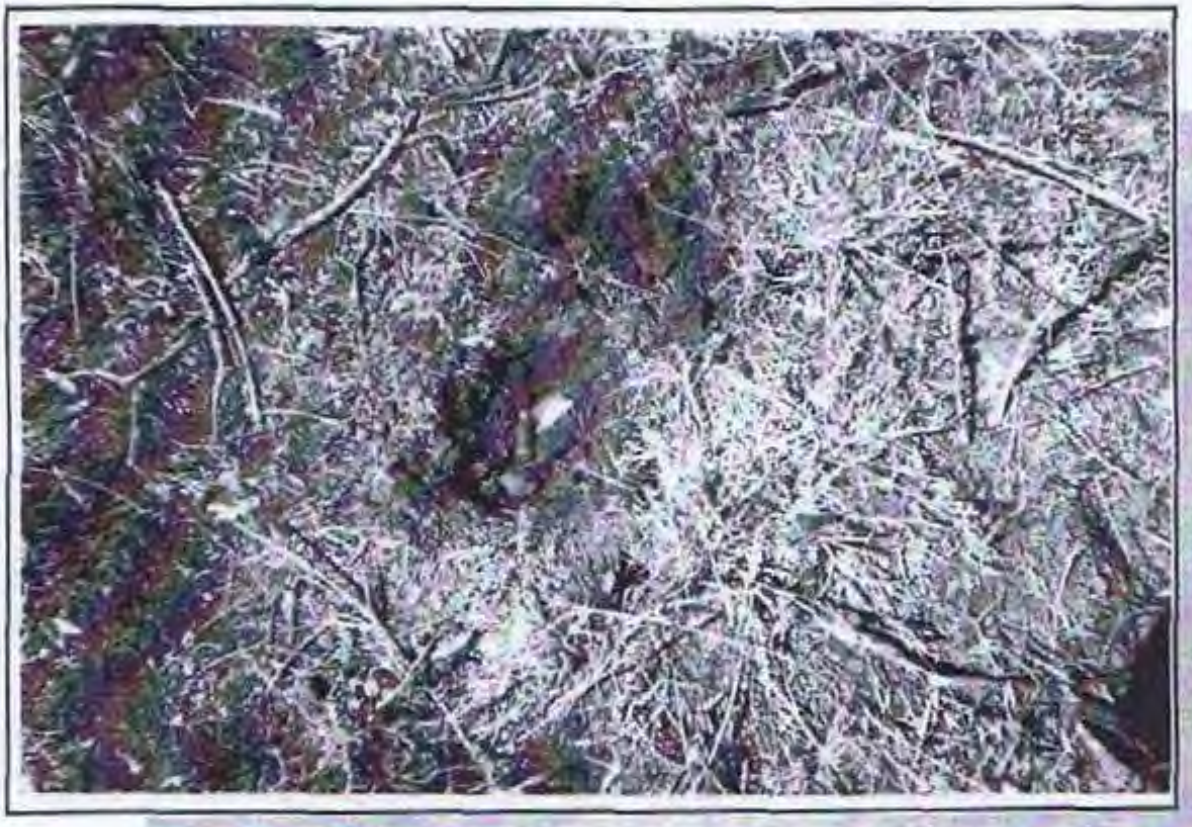
PHOTOGRAPH NO. 30
Cayo Botella.



PHOTOGRAPH NO. 31
Cayo Botella. Vegetation, Only Herbaceous Area Containing *Justicia*.

PHOTOGRAPH NO. 32
Cayo Botella. BO-1, S.W. Corner Looking N.E. at Los Gemelos.

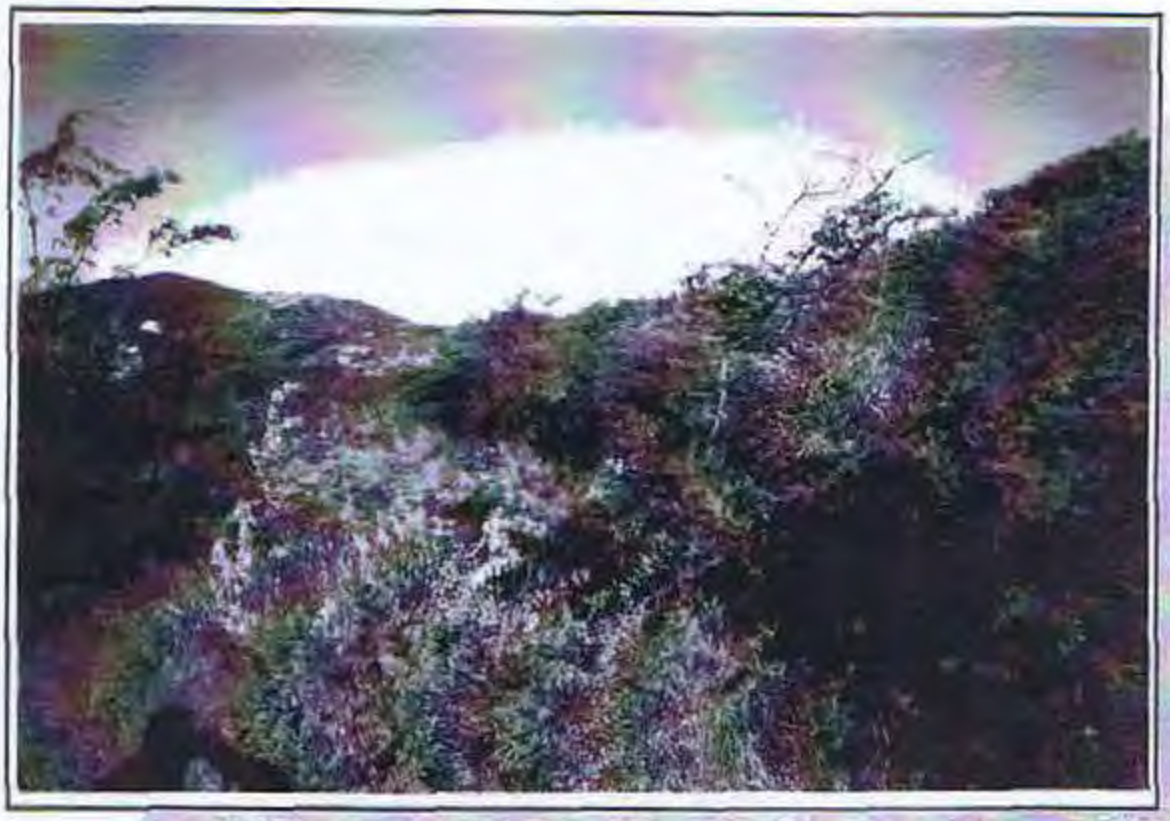
PHOTOGRAPH NO. 33
Culebrita. IC-6, View.



PHOTOGRAPH NO. 34
Culebrita. IC-4, 20 MM HEI.

PHOTOGRAPH NO. 35
Culebrita. Lighthouse/Observation Post.

PHOTOGRAPH NO. 36
Culebrita. Debris From Observation Post Near Marc Point.

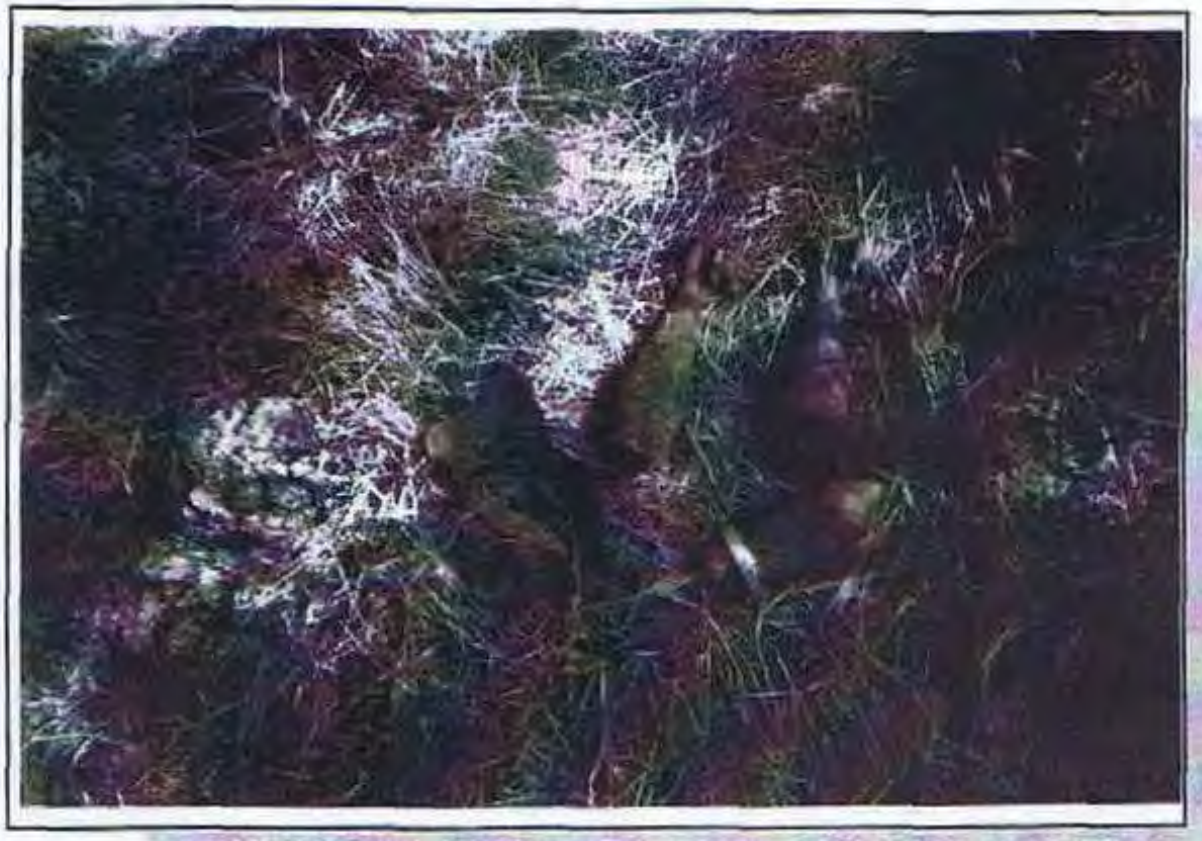


PHOTOGRAPH NO. 37
Cerro Balcon. CB-5, From S.E. Corner Looking N.W., Before Grubbing.

PHOTOGRAPH NO. 38
Cerro Balcon. CB-2, Flagged.

PHOTOGRAPH NO. 39
Flamenco Beach. Herbaceous Vegatation.

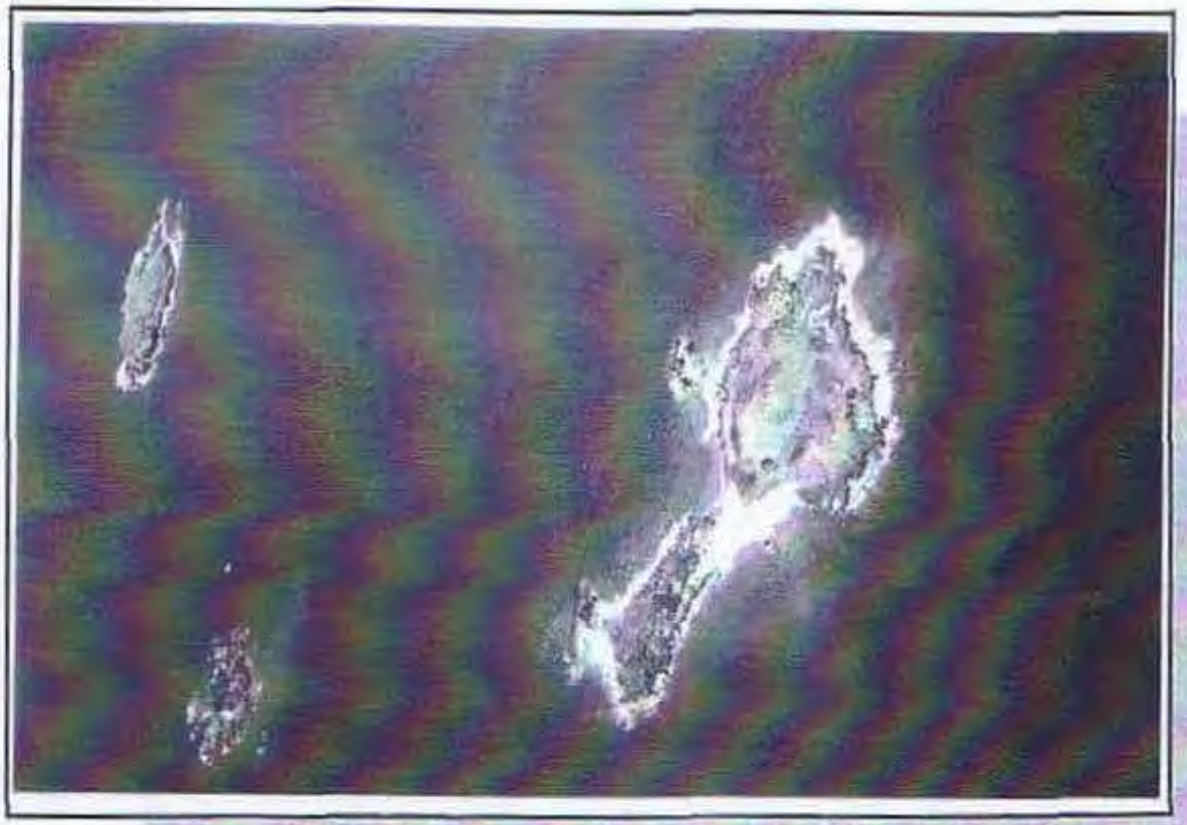
PHOTOGRAPH NO. 40
Flamenco Beach. FB-5, Impact Vehicle.



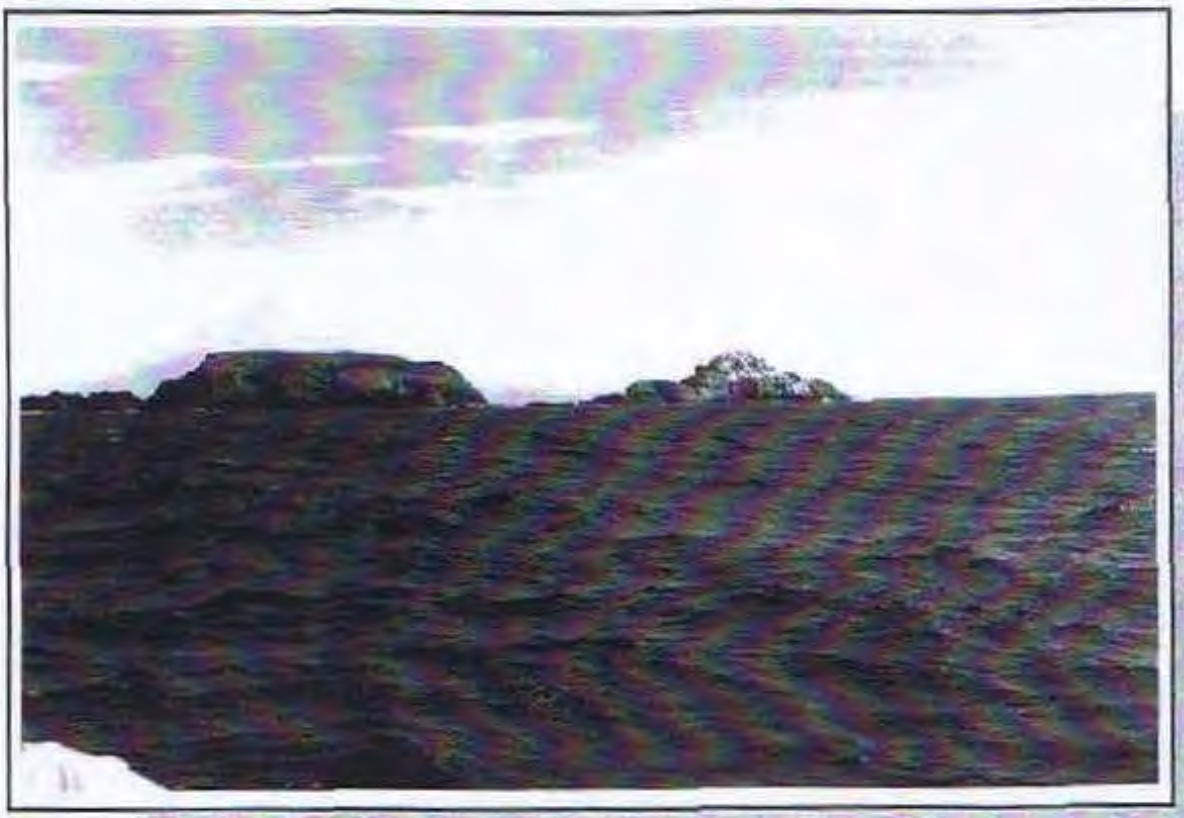
PHOTOGRAPH NO. 41
Flamenco Beach. FB-8, ORS.

PHOTOGRAPH NO. 42
Flamenco Beach. FB-5, Before Grubbing.

PHOTOGRAPH NO. 43
Flamenco Beach. FB-9, Tank Target.



PHOTOGRAPH NO. 44
Cayo Del Agua with Los Hermanos.



PHOTOGRAPH NO. 45
Cayo Geniqui.

PHOTOGRAPH NO. 46
Cayo Lobo. N.W. Observation Point

PHOTOGRAPH NO. 47
N.W. Peninsula. Looking North.

PHOTOGRAPH NO. 48
Los Hermanos from N.W. Peninsula.

APPENDIX D

REGULATORY PERMITS AND APPROVALS

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1875 Century Boulevard
Atlanta, Georgia 30345

IN REPLY REFER TO:

October 31, 1995

Mr. Mark Bagel
Environmental Science and
Engineering, Inc.
P.O. Box 1703
Gainesville, Florida 32602-1703

Dear Mr. Bagel:

We have reviewed the information you sent by facsimile to our office on October 27, 1995, regarding take of migratory birds at Culebra Island.

The Migratory Bird Treaty Act does not allow incidental take of migratory birds. We issue permits to take migratory birds that are causing damage to property or when birds are preventing a specific activity. Also, the applicant must be able to identify the particular species and the number of birds that need to be taken. According to our telephone conversation and your facsimile, you are not aware of any birds that will be causing damage or preventing the activity you described.

We suggest you continue to work closely with the Division of Ecological Services and the Puerto Rico Department of Natural Resources to minimize any accidental take of all wildlife. However, if at anytime during the activity you described in your facsimile involves species that can be identified and you know they are in the area and will be destroyed, you will need to notify this office as soon as possible. We also recommend that any activity which involves the potential take of migratory birds should be conducted outside the nesting season for any birds that are known to use this area for nesting habitat.

At this time we do not feel you need a permit in order to carry out the tasks you described. If you have any questions, please call me at (404) 679-7049.

Sincerely yours,

Carmen P. Simonton

Carmen P. Simonton
for Assistant Regional Director
Refuges and Wildlife

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Caribbean Field Office
P.O. Box 491
Boqueron, Puerto Rico 00622

November 9, 1995

Mr. Roland Belew
Department of the Army
Huntsville Division, Corps of Engineers
P.O. Box 1600
Huntsville, Alabama 35807-4301

Dear Mr. Belew:

We have reviewed the Work Plan for the Formerly Used Defense Site at Culebra, Puerto Rico and have received Mr. Douthat's letter dated November 7, 1995 regarding this issue. These two documents address the concerns we have expressed in the past. In addition, we have discussed the procedures to be followed when the grids are being laid out in the field with representatives of ESE. We understand that inaccessible or extremely sensitive areas may be encountered when the grids are established and that adjustments may be required in the field. Necessary adjustments will be discussed and agreed to by the field personnel from the Service and/or the Puerto Rico Department of Natural and Environmental Resources prior to being finalized.

We noted in the November 7th letter that sampling is not now scheduled for the Northwest Peninsula because it is currently inaccessible. Since the peninsula was a major impact area, we believe it is very important that it be surveyed and included in any plans for bomb removal. If it is not possible to include that area during the current field sampling, hopefully it can be sampled in the very near future.

At this time, we know of no reason why the field work associated with this project should not commence. Personnel from the Service and DNER will be coordinating with the field crews to ensure any potential problems are addressed in an expeditious manner.

Sincerely,

James P. Oland
Field Supervisor

cc:
CINWR, Boqueron PR
Culebra NWR, Culebra PR
DNER, San Juan, attn: José Chabert

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Caribbean Islands National Wildlife Refuge
P.O. Box 510, Carr. 301, Km. 5.1
Boqueron, Puerto Rico 00622

December 6, 1995

Mr. Roland G. Belew, Project Manager
U.S. Army Corps of Engineers
Explosive Ordnance Engineering
Huntsville Division
MCX and Design Center
P.O. Box 1600
Huntsville, AL 35807-4301

Dear Mr. Belew:

The U.S. Fish and Wildlife Service, Caribbean Islands National Wildlife Refuge (NWR) has issued Special Use Permits (Attachments 1 & 2) to Mark Bagel, Environmental Science and Engineering, Inc. (ESE), to access various islands within the Culebra NWR to establish monuments and plot corners for the unexploded ordnance survey and to perform the actual location and disposal of the materials.

Included in our list of authorized locations to perform the surveys was Cayo Luis Pena. I have since been informed that it was not on the original list and that we need to officially request from you that it be included.

I have enclosed copies of the permits to ESE for your records. If there is any problem including Cayo Luis Pena in the survey or if you have any questions, give me a call (809) 851-7258/74.

Sincerely,

W. Shaw Davis
Project Leader, CINWR

Attachments

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

Culebra National Wildlife Refuge

SPECIAL USE PERMIT

Station No. to be Credited	Permit Number
41522	36460

Date: December 1, 1995

Period of Use (Inclusive)
From December 4 19 95
To February 16 19 95

Permittee Name
Environmental Science and Engineering, Inc.
Attention: Mark Bagel

Permittee Address
P.O. Box 1703
Gainsville, FL 32605

c/o Harbor View Villas
Box 216, Culebra, PR 00775

Purpose (specify in detail privilege requested, or units of products involved)

Access Flamenco Peninsula, Culebrita, Luis Pena, and Cayos del Agua, Alcarraza, Gemelos, Tiburon, Geniqui, Noroest, Lobo, Yerba and Botella by boat to perform ordinance and explosive waste sampling.

Description (specify unit numbers; metes and bounds, or other recognizable designations)

Previously determined plot locations as indicated on provided maps or determined in the field on Flamenco Peninsula and off-shore cays within the Culebra National Wildlife Refuge, PR.

Amount of fee $ N/A If not a fixed payment, specify rate and unit of charge:

☒ Payment Exempt - Justification: Government sponsored survey
☐ Full Payment
☐ Partial Payment - Balance of payments to be made as follows:

Record of Payments

N/A

Special Conditions Hand clearing of vegetation and use of gas-powered trimmers is permitted within the previously determined plots. No trees will be cut down unless permission is given by a FWS employee. Excavation is permitted within the plot to expose any OEW. Detonation can be performed within the plot following safety measures as described within the final work plan for this project. If sand is needed for sand bags, sand sufficient for detonation may be removed from the water's edge. If sand bags are still intact, the sand should be taken back the site from where it was removed. If the sand bags can be

This permit is issued by the U.S. Fish and Wildlife Service and accepted by the undersigned, subjected to the terms, conditions, obligations and reservations expressed or implied herein and to the conditions and requirements appearing on the reverse side.

Permittee Signature	Issuing Officer Signature and Title

Form 3-1383 Rev. 9-91

SPECIAL CONDITIONS FOR SUP #36466

(Continuation Sheet)

used in more than one plot, this should be done to minimize the effects of sand removal. No more than 10 cubic yards of sand should be removed from any cay unless permission is received from FWS.

In order to minimize fire hazards, vegetation should be wetted around any detonation sites on flamenco Peninsula, Luis Peña, Culebrita and Cayo del Agua immediately prior to attempted detonation.

All work site debris and encountered OEW should be removed from the cays and Peninsula Flamenco.

FWS personnel at either the Culebra NWR or Caribbean Islands NWR should be notified weekly of the planned work sites surveys within the Culebra NWR.

A final report with map location of plots and encountered OEW should be provided to FWS by September 1, 1996. In addition, photos of any OEW should be included in this report.

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

Culebra National Wildlife Refuge

SPECIAL USE PERMIT

Station No. to be Credited	Permit Number
41522	36465

Date: November 27, 1995

Period of Use (Inclusive)
From November 28 1995
To December 15 1995

Permittee Name	Permittee Address
Environmental Science & Engineering	P.O. Box 1703 Gainsville, FL 32605

Purpose (specify in detail privilege requested, or units of products involved)

Access Flamenco Peninsula, Culebrita, Cayo del Agua, Alcarraza, Gemelos, Tiburon, Geniqui, Noroeste, Lobo, Luis Pena, Yerba and Botella by boat to establish monuments and plot corners for unexploded ordinance survey grid sites.

Description (specify unit numbers; metes and bounds, or other recognizable designations)

Previously determined grid locations as indicated on provided maps for Flamenco Peninsula and off-shore cays within the Culebra National Wildlife, PR

Amount of fee $ N/A if not a fixed payment, specify rate and unit of charge:

☒ Payment Exempt - Justification: Government Sponsored Survey

☐ Full Payment,

☐ Partial Payment - Balance of payments to be made as follows:

Record of Payments

N/A

Special Conditions: Workers will avoid sea turtle nesting areas and active Booby nesting sites. Wetlands will not be included without written permission from Fish & Wildlife Service. Hand clearing of vegetation by machete is permitted to access proposed grid sites. No trees will be cut down to establish plots. FWS personnel will accompany permittee to the following locations: Cayo Alcarraza, Geniqui, Culebrita, Agua, Yerba, Luis Pena, and Peninsula Flamenco. Final grid locations will be authorized upon review in the field by FWS personnel. No trash will be left on site. Culebra NWR will be notified daily of what areas will be surveyed.

This permit is issued by the U.S. Fish and Wildlife Service and accepted by the undersigned, subjected to the terms, covenants, obligations, and reservations expressed or implied herein and to the conditions and requirements appearing on the reverse side.

Permittee Signature	Issuing Officer Signature and Title

DEPARTMENT OF NATURAL AND ENVIRONMENTAL RESOURCES

November 30, 1995

Mr. Roland Belew
CEHND-PM-OT
P. O. Box 1600
Huntville, Alabama 35807-4301

Dear Mr. Belew:

This letter is in response to your phone call requesting our final concurrence of your contractor's work plan for the ordnance studies on Culebra.

We feel our comments have been addressed adequately and have no additional concerns on the work you will be doing on Culebra. You have our permission to proceed with mobilizing your workers.

Please keep us informed as the work progresses.

Cordially,

José A. González Liboy
Administrator
Natural Resources Administration

JGL/Hc

fc: Administrator, R.F., C.P.

Muñoz Rivera Ave., Stop 3 1/2, San Juan, P.R. / Box 5887, Puerta de Tierra Station, P.R. 00906 / Tel. (809) 724-8774

ESTADO LIBRE ASOCIADO DE PUERTO RICO
GOBIERNO MUNICIPAL DE CULEBRA
OFICINA DEL ALCALDE
CULEBRA, PUERTO RICO 00775

September 12, 1995

Mr. Roland G. Belew
Project Manager
U.S. Army Corps of Engineers
Att: Cehnd- P.M. ot (Belew)
P.O. Box 1600
Huntsville, Al 3580 7-4301

Dear Sir:

Thank you for the invitation directed to my office regarding the meeting concerning the presence of ordnance in the territory of Culebra.

The people of Culebra, including myself, are very much concerned about this situation. We look forward to the time when our territory becomes free of any explosive devices.

Any action taken by the Corp of Engineers to eliminate live ammo on our island is welcome. It is time to coordinate efforts between all Government agencies involved in this process to participate directly in developing the plans established by the Corps.

According to the information given during the meeting of august 18, 1995 the study will be limited only to identifing all ordnance located on land. It is very important for the well being and safety of our residents to include also in this stage of planing the ordnance located at the bottom of the sea.

Culebra is becoming one of the most important tourist destinations of Puerto Rico. Thousands of visitors come and visit the island mostly because Culebra offers plenty of opportunities for underwater activities all year around.

There is no way to avoid possible diver contact with ordnance located at the bottom of the sea. Any publicity will cause an adverse reaction affecting the Tourist Industry. For this and other reasons not stated in this letter the Corp of Engineer should make all possible effort to free Culebra of all ordnance located both on land and in the sea simultaneously.

We would very much appreciate your help and assistance with this.

Cordially yours,

Anastacio Soto Ayala
Mayor

Environmental Quality Board

November 28, 1995 DADA 95-2552

Mr. Chester D. Fowler
Lieutenant Colonel, U.S. Army
Deputy District Engineer
for the Antilles
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
Antilles Office
400 Fernandez Juncos Avenue
San Juan, P.R. 00901-3299

REF.: DN 95-1801 (CDE)
ENGINEERING EVALUATION/COST ANALYSIS
AT CULEBRA ISLAND
UNDER THE DEFENSE ENVIRONMENTAL
RESTORATION PROGRAM (DERP)
CULEBRA PUERTO RICO

Dear Mr. Fowler:

The Environmental Quality Board has reviewed the documents submitted for the reference project.

It is our understanding that the proposed projects will not have a significant environmental impact. However, we consider that, to lessen the environmental impact of this project, the following recommendations should be complied with:

1. The Land Pollution Control Area must be consulted, to determine if a permit for a waste generating activity (DS-3) is required for this project.

2. If any dangerous material or substance is found during the sampling or excavation activities; it should be stored, managed and disposed, in conformity with the applicable state and federal regulations.

3. The United States Army Corps of Engineers must make the corresponding consultation and obtain the pertinent endorsement from state and federal agencies such as: The Puerto Rico Department of Natural and Environmental Resources and the Fish and Wildlife Service.

We appreciate your cooperation in preserving and maintaining the quality of our environment.

Sincerely yours,

Héctor Rosse Martínez
Chairman

nn

APPENDIX E

GRIDSTAT DATA

GRID RESULTS

Site Name: Isle de Culibrita
Sector ID:
Grid Number: IC-2
Date: 20 Dec 95

Number of Anomalies: 512
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 170
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 166
Number of UXO Scrap Items Found: 4
Number of Surface UXO Items Found: 0
Sample Plan Number: 48

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 512

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Isle de Culibrita
Sector ID:
Grid Number: IC-2
Date: 20 Dec 95

Sample Number	Sub-Grid Location	Description of Item
1	17	False Positive
2	4	False Positive
3	20	False Positive
4	26	False Positive
5	19	False Positive
6	15	False Positive
7	9	False Positive
8	30	False Positive
9	1	False Positive
10	15	False Positive
11	31	False Positive
12	11	False Positive
13	20	False Positive
14	31	False Positive
15	12	False Positive
16	32	False Positive
17	12	False Positive
18	16	False Positive
19	7	False Positive
20	25	False Positive
21	26	False Positive
22	15	False Positive
23	17	False Positive
24	4	False Positive
25	13	False Positive
26	13	False Positive
27	9	False Positive
28	12	False Positive
29	24	False Positive
30	26	False Positive
31	13	False Positive
32	11	False Positive
33	7	False Positive
34	13	False Positive
35	15	False Positive
36	20	False Positive
37	8	False Positive
38	30	False Positive
39	14	False Positive
40	10	False Positive
41	15	False Positive
42	21	False Positive
43	16	False Positive
44	27	False Positive
45	5	False Positive
46	8	False Positive
47	12	False Positive
48	31	False Positive
49	2	False Positive
50	13	False Positive
51	1	False Positive

52	24	False Positive
53	29	False Positive
54	12	False Positive
55	25	False Positive
56	6	False Positive
57	15	False Positive
58	23	False Positive
59	16	False Positive
60	18	False Positive
61	1	False Positive
62	31	False Positive
63	23	False Positive
64	1	False Positive
65	26	False Positive
66	20	False Positive
67	1	False Positive
68	16	False Positive
69	19	False Positive
70	1	False Positive
71	20	False Positive
72	28	False Positive
73	28	False Positive
74	3	False Positive
75	13	False Positive
76	13	False Positive
77	19	False Positive
78	25	False Positive
79	19	False Positive
80	18	False Positive
81	20	False Positive
82	11	UXO Scrap
83	10	False Positive
84	18	False Positive
85	2	False Positive
86	14	False Positive
87	2	False Positive
88	7	False Positive
89	9	False Positive
90	13	False Positive
91	20	False Positive
92	18	False Positive
93	32	False Positive
94	21	False Positive
95	20	False Positive
96	7	False Positive
97	8	False Positive
98	19	UXO Scrap
99	27	False Positive
100	20	False Positive
101	25	False Positive
102	11	False Positive
103	22	False Positive
104	5	False Positive
105	5	False Positive
106	10	False Positive
107	20	False Positive
108	21	False Positive
109	15	False Positive
110	2	False Positive
111	15	False Positive
112	22	False Positive
113	8	False Positive
114	32	False Positive

115	27	False Positive
116	1	False Positive
117	10	False Positive
118	11	False Positive
119	7	False Positive
120	22	False Positive
121	24	False Positive
122	30	False Positive
123	4	False Positive
124	26	False Positive
125	14	UXO Scrap
126	26	False Positive
127	25	False Positive
128	23	False Positive
129	19	False Positive
130	26	False Positive
131	9	False Positive
132	25	False Positive
133	26	False Positive
134	7	False Positive
135	4	False Positive
136	15	False Positive
137	2	False Positive
138	4	False Positive
139	17	False Positive
140	5	False Positive
141	2	False Positive
142	12	False Positive
143	21	False Positive
144	11	False Positive
145	17	False Positive
146	17	False Positive
147	16	False Positive
148	17	False Positive
149	4	False Positive
150	9	False Positive
151	27	False Positive
152	3	False Positive
153	3	False Positive
154	13	False Positive
155	23	False Positive
156	32	False Positive
157	7	UXO Scrap
158	4	False Positive
159	10	False Positive
160	23	False Positive
161	12	False Positive
162	31	False Positive
163	31	False Positive
164	18	False Positive
165	27	False Positive
166	24	False Positive
167	14	False Positive
168	1	False Positive
169	15	False Positive
170	15	False Positive

GRID RESULTS

Site Name: Isle de Culibrita
Sector ID:
Grid Number: IC-3
Date: 20 Dec 95

Number of Anomalies: 368
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 120
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 120
Number of UXO Scrap Items Found: 0
Number of Surface UXO Items Found: 0
Sample Plan Number: 57

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 368

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Isle de Culibrita
Sector ID:
Grid Number: IC-3
Date: 20 Dec 95

Sample Number	Sub-Grid Location	Description of Item
1	25	False Positive
2	30	False Positive
3	20	False Positive
4	8	False Positive
5	7	False Positive
6	30	False Positive
7	22	False Positive
8	28	False Positive
9	17	False Positive
10	18	False Positive
11	29	False Positive
12	30	False Positive
13	12	False Positive
14	20	False Positive
15	21	False Positive
16	23	False Positive
17	29	False Positive
18	18	False Positive
19	27	False Positive
20	14	False Positive
21	25	False Positive
22	24	False Positive
23	14	False Positive
24	14	False Positive
25	10	False Positive
26	29	False Positive
27	23	False Positive
28	27	False Positive
29	6	False Positive
30	29	False Positive
31	3	False Positive
32	32	False Positive
33	21	False Positive
34	20	False Positive
35	2	False Positive
36	18	False Positive
37	27	False Positive
38	23	False Positive
39	11	False Positive
40	10	False Positive
41	30	False Positive
42	15	False Positive
43	21	False Positive
44	13	False Positive
45	8	False Positive
46	27	False Positive
47	4	False Positive
48	4	False Positive
49	6	False Positive
50	16	False Positive
51	15	False Positive

52	23	False Positive
53	18	False Positive
54	5	False Positive
55	27	False Positive
56	12	False Positive
57	7	False Positive
58	13	False Positive
59	12	False Positive
60	24	False Positive
61	3	False Positive
62	16	False Positive
63	12	False Positive
64	14	False Positive
65	9	False Positive
66	18	False Positive
67	4	False Positive
68	19	False Positive
69	32	False Positive
70	19	False Positive
71	2	False Positive
72	5	False Positive
73	29	False Positive
74	3	False Positive
75	24	False Positive
76	8	False Positive
77	12	False Positive
78	10	False Positive
79	25	False Positive
80	12	False Positive
81	14	False Positive
82	16	False Positive
83	22	False Positive
84	3	False Positive
85	13	False Positive
86	21	False Positive
87	5	False Positive
88	22	False Positive
89	32	False Positive
90	19	False Positive
91	8	False Positive
92	18	False Positive
93	2	False Positive
94	11	False Positive
95	18	False Positive
96	3	False Positive
97	8	False Positive
98	5	False Positive
99	19	False Positive
100	7	False Positive
101	16	False Positive
102	25	False Positive
103	3	False Positive
104	13	False Positive
105	12	False Positive
106	4	False Positive
107	11	False Positive
108	28	False Positive
109	2	False Positive
110	18	False Positive
111	4	False Positive
112	7	False Positive
113	9	False Positive
114	1	False Positive

115	28	False Positive
116	20	False Positive
117	26	False Positive
118	4	False Positive
119	22	False Positive
120	19	False Positive

GRID RESULTS

Site Name: Isle de Culibrita
Sector ID:
Grid Number: IC-4
Date: 20 Dec 95

Number of Anomalies: 460
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 85
Number of Sub-Surface UXO Items Found: 5
Number of False Positive Items Found: 76
Number of UXO Scrap Items Found: 4
Number of Surface UXO Items Found: 0
Sample Plan Number: 49

Expected Number of Sub-Surface UXO Items: 27
Expected Number of Non-UXO Items: 433

Cost Error: 0.1820
Risk Error: 1.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Isle de Culibrita
Sector ID:
Grid Number: IC-4
Date: 20 Dec 95

Sample Number	Sub-Grid Location	Description of Item
1	14	False Positive
2	32	False Positive
3	20	False Positive
4	4	False Positive
5	3	False Positive
6	6	False Positive
7	11	False Positive
8	26	False Positive
9	6	False Positive
10	20	False Positive
11	13	False Positive
12	16	False Positive
13	30	False Positive
14	12	UXO Scrap
15	12	False Positive
16	24	False Positive
17	3	False Positive
18	22	False Positive
19	28	False Positive
20	22	False Positive
21	28	False Positive
22	31	False Positive
23	1	False Positive
24	3	False Positive
25	4	False Positive
26	21	False Positive
27	32	False Positive
28	13	False Positive
29	10	UXO Scrap
30	28	False Positive
31	21	False Positive
32	8	False Positive
33	31	False Positive
34	24	False Positive
35	13	UXO
36	4	False Positive
37	9	False Positive
38	27	False Positive
39	25	False Positive
40	24	UXO
41	27	False Positive
42	4	False Positive
43	11	False Positive

44	31	False Positive
45	27	False Positive
46	16	False Positive
47	6	UXO
48	24	False Positive
49	9	False Positive
50	27	False Positive
51	15	False Positive
52	9	False Positive
53	4	False Positive
54	20	False Positive
55	31	False Positive
56	13	False Positive
57	3	UXO Scrap
58	16	False Positive
59	22	False Positive
60	18	False Positive
61	12	False Positive
62	26	False Positive
63	21	False Positive
64	11	False Positive
65	13	False Positive
66	4	False Positive
67	16	False Positive
68	18	False Positive
69	14	False Positive
70	4	UXO Scrap
71	19	False Positive
72	17	False Positive
73	16	False Positive
74	16	False Positive
75	6	False Positive
76	19	False Positive
77	11	False Positive
78	2	UXO
79	19	False Positive
80	14	False Positive
81	2	False Positive
82	22	False Positive
83	6	False Positive
84	14	False Positive
85	25	UXO

GRID RESULTS

Site Name: Isle de Culibreta
Sector ID:
Grid Number: IC-5
Date: 20 Dec 95

Number of Anomalies: 116
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 60
Number of Sub-Surface UXO Items Found: 5
Number of False Positive Items Found: 50
Number of UXO Scrap Items Found: 5
Number of Surface UXO Items Found: 0
Sample Plan Number: 75

Expected Number of Sub-Surface UXO Items: 10
Expected Number of Non-UXO Items: 106

Cost Error: 0.2973
Risk Error: 1.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRID RESULTS

Site Name: Isle de Culibreta
Sector ID:
Grid Number: IC-5
Date: 20 Dec 95

Number of Anomalies: 116
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 60
Number of Sub-Surface UXO Items Found: 5
Number of False Positive Items Found: 50
Number of UXO Scrap Items Found: 5
Number of Surface UXO Items Found: 0
Sample Plan Number: 75

Expected Number of Sub-Surface UXO Items: 10
Expected Number of Non-UXO Items: 106

Cost Error: 0.2973
Risk Error: 1.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Isle de Culibrets
Sector ID:
Grid Number: IC-5
Date: 20 Dec 95

Sample Number	Sub-Grid Location	Description of Item
1	22	False Positive
2	25	False Positive
3	29	False Positive
4	27	UXO Scrap
5	16	False Positive
6	30	False Positive
7	10	UXO
8	5	False Positive
9	5	False Positive
10	23	False Positive
11	32	False Positive
12	21	UXO Scrap
13	27	False Positive
14	10	False Positive
15	10	False Positive
16	16	False Positive
17	14	UXO
18	2	False Positive
19	18	False Positive
20	22	UXO Scrap
21	25	False Positive
22	29	False Positive
23	16	False Positive
24	5	False Positive
25	28	False Positive
26	22	False Positive
27	17	False Positive
28	24	False Positive
29	20	False Positive
30	27	False Positive
31	10	False Positive
32	28	UXO
33	25	False Positive
34	10	False Positive
35	4	False Positive
36	18	False Positive
37	3	False Positive
38	21	UXO Scrap
39	3	False Positive
40	25	False Positive
41	27	False Positive
42	29	False Positive
43	28	False Positive

44	10	UXO Scrap
45	2	False Positive
46	22	False Positive
47	7	UXO
48	10	False Positive
49	12	False Positive
50	19	False Positive
51	30	False Positive
52	5	False Positive
53	6	False Positive
54	3	False Positive
55	12	False Positive
56	16	False Positive
57	11	False Positive
58	21	UXO
59	4	False Positive
60	15	False Positive

GRID RESULTS

Site Name: Culebrita
Sector ID: 1
Grid Number: IC-6
Date: 13 Dec 95

Number of Anomalies: 545
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 49
Number of Sub-Surface UXO Items Found: 6
Number of False Positive Items Found: 30
Number of UXO Scrap Items Found: 13
Number of Surface UXO Items Found: 23
Sample Plan Number: 52

Expected Number of Sub-Surface UXO Items: 67
Expected Number of Non-UXO Items: 478

Cost Error: 0.0000
Risk Error: 1.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Culebrita
Sector ID: 1
Grid Number: IC-6
Date: 13 Dec 95

Sample Number	Sub-Grid Location	Description of Item
1	20	False Positive
2	25	False Positive
3	21	False Positive
4	30	UXO Scrap
5	28	False Positive
6	17	False Positive
7	23	UXO Scrap
8	16	False Positive
9	2	False Positive
10	27	UXO
11	1	False Positive
12	15	False Positive
13	28	False Positive
14	10	False Positive
15	28	UXO
16	22	False Positive
17	27	UXO Scrap
18	32	False Positive
19	16	UXO Scrap
20	8	UXO Scrap
21	27	False Positive
22	22	UXO
23	20	False Positive
24	5	UXO Scrap
25	20	UXO
26	15	False Positive
27	14	False Positive
28	6	UXO Scrap
29	14	False Positive
30	23	False Positive
31	11	UXO Scrap
32	12	False Positive
33	22	False Positive
34	29	False Positive
35	25	UXO Scrap
36	20	False Positive
37	16	UXO Scrap
38	31	False Positive
39	3	False Positive
40	7	UXO
41	20	False Positive
42	1	UXO Scrap
43	19	False Positive

44	25	UXO Scrap
45	31	False Positive
46	11	False Positive
47	1	UXO Scrap
48	25	False Positive
49	6	UXO

GRID RESULTS

Site Name: Flaminco Beach
Sector ID:
Grid Number: FB-1
Date: 20 Dec 95

Number of Anomalies: 116
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 40
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 12
Number of UXO Scrap Items Found: 28
Number of Surface UXO Items Found: 0
Sample Plan Number: 25

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 116

Cost Error: 1.0000
Risk Error: 0.0737

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

Sampling Notes

Program characterized grid after
37 samples
38-40 entered after

GRIDSTATS SAMPLING SEQUENCE

Site Name: Flaminco Beach
Sector ID:
Grid Number: FB-1
Date: 20 Dec 95

Sample Number	Sub-Grid Location	Description of Item
1	2	UXO Scrap
2	29	False Positive
3	32	False Positive
4	13	UXO Scrap
5	8	False Positive
6	31	False Positive
7	28	UXO Scrap
8	10	False Positive
9	26	False Positive
10	23	False Positive
11	32	UXO Scrap
12	27	False Positive
13	17	False Positive
14	18	UXO Scrap
15	19	UXO Scrap
16	25	UXO Scrap
17	12	UXO Scrap
18	19	UXO Scrap
19	25	False Positive
20	26	UXO Scrap
21	11	UXO Scrap
22	18	UXO Scrap
23	30	UXO Scrap
24	3	UXO Scrap
25	7	UXO Scrap
26	9	UXO Scrap
27	18	UXO Scrap
28	14	UXO Scrap
29	23	UXO Scrap
30	16	UXO Scrap
31	28	UXO Scrap
32	31	UXO Scrap
33	22	UXO Scrap
34	3	UXO Scrap
35	11	UXO Scrap
36	11	UXO Scrap
37	21	UXO Scrap
38	21	UXO Scrap
39	24	False Positive
40	20	False Positive

GRID RESULTS

Site Name: Flaminco Beach
Sector ID:
Grid Number: FB-2
Date: 20 Dec 95

Number of Anomalies: 64
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 22
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 4
Number of UXO Scrap Items Found: 18
Number of Surface UXO Items Found: 0
Sample Plan Number: 72

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 64

Cost Error: 1.0000
Risk Error: 0.0700

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Flaminco Beach
Sector ID:
Grid Number: FB-2
Date: 20 Dec 95

Sample Number	Sub-Grid Location	Description of Item
1	10	UXO Scrap
2	24	UXO Scrap
3	26	UXO Scrap
4	28	UXO Scrap
5	17	UXO Scrap
6	28	UXO Scrap
7	25	UXO Scrap
8	7	UXO Scrap
9	14	UXO Scrap
10	26	UXO Scrap
11	2	UXO Scrap
12	10	UXO Scrap
13	5	False Positive
14	17	UXO Scrap
15	13	UXO Scrap
16	12	False Positive
17	8	UXO Scrap
18	17	False Positive
19	5	False Positive
20	24	UXO Scrap
21	29	UXO Scrap
22	20	UXO Scrap

GRID RESULTS

Site Name: FLAMINCO BEACH
Sector ID:
Grid Number: FB-3
Date: 19 Dec 95

Number of Anomalies: 28
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 10
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 7
Number of UXO Scrap Items Found: 3
Number of Surface UXO Items Found: 0
Sample Plan Number: 53

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 28

Cost Error: 1.0000
Risk Error: 0.0493

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: FLAMINCO BEACH
Sector ID:
Grid Number: FB-3
Date: 19 Dec 95

Sample Number	Sub-Grid Location	Description of Item
1	15	UXO Scrap
2	30	UXO Scrap
3	26	False Positive
4	10	False Positive
5	26	False Positive
6	27	False Positive
7	27	False Positive
8	1	UXO Scrap
9	22	False Positive
10	4	False Positive

GRID RESULTS

Site Name: Flamenco Beach
[illegible]or ID: 1
[illegible]rid Number: FB-4
Date: 13 Dec 95

Number of Anomalies: 49
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 31
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 17
Number of UXO Scrap Items Found: 14
Number of Surface UXO Items Found: 0
Sample Plan Number: 3

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 49

Cost Error: 1.0000
Risk Error: 0.0000

[illegible]OTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Flamenco Beach
Sector ID: 1
Grid Number: FB-4
Date: 13 Dec 95

Sample Number	Sub-Grid Location	Description of Item
1	29	UXO Scrap
2	7	False Positive
3	11	UXO Scrap
4	23	False Positive
5	22	False Positive
6	3	False Positive
7	25	UXO Scrap
8	22	UXO Scrap
9	4	UXO Scrap
10	10	UXO Scrap
11	17	False Positive
12	28	False Positive
13	3	False Positive
14	25	False Positive
15	22	UXO Scrap
16	23	UXO Scrap
17	32	UXO Scrap
18	24	UXO Scrap
19	1	False Positive
20	15	False Positive
21	30	UXO Scrap
22	26	False Positive
23	6	False Positive
24	19	False Positive
25	19	False Positive
26	5	UXO Scrap
27	11	False Positive
28	29	False Positive
29	9	False Positive
30	14	UXO Scrap
31	1	UXO Scrap

GRID RESULTS

Site Name: Flamenco Beach
Sector ID: 1
Grid Number: FB-5
Date: 29 Dec 95

Number of Anomalies: 148
Length of Grid: 50 Feet
Width of Grid: 50 Feet
Grid Area: 2,500 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 50
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 47
Number of UXO Scrap Items Found: 3
Number of Surface UXO Items Found: 0
Sample Plan Number: 52

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 148

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Flamenco Beach
Sector ID: 1
Grid Number: FB-5
Date: 29 Dec 95

Sample Number	Sub-Grid Location	Description of Item
1	20	False Positive
2	25	False Positive
3	21	False Positive
4	30	False Positive
5	28	False Positive
6	17	False Positive
7	23	False Positive
8	16	False Positive
9	2	False Positive
10	27	False Positive
11	1	False Positive
12	15	False Positive
13	28	False Positive
14	10	False Positive
15	28	False Positive
16	22	False Positive
17	27	False Positive
18	32	False Positive
19	16	False Positive
20	8	False Positive
21	27	False Positive
22	22	False Positive
23	20	False Positive
24	5	False Positive
25	20	False Positive
26	15	False Positive
27	14	False Positive
28	6	False Positive
29	14	False Positive
30	23	False Positive
31	11	False Positive
32	12	False Positive
33	22	False Positive
34	29	False Positive
35	25	False Positive
36	20	False Positive
37	16	False Positive
38	31	False Positive
39	3	False Positive
40	7	False Positive
41	20	UXO Scrap
42	1	UXO Scrap
43	19	UXO Scrap

44	25	False Positive
45	31	False Positive
46	11	False Positive
47	1	False Positive
48	25	False Positive
49	6	False Positive
50	8	False Positive

GRID RESULTS

Site Name: Flamenco Beach
Sector ID: 1
Grid Number: FB-6
Date: 27 Dec 95

Number of Anomalies: 117
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 40
Number of Sub-Surface UXO Items Found: 5
Number of False Positive Items Found: 32
Number of UXO Scrap Items Found: 3
Number of Surface UXO Items Found: 0
Sample Plan Number: 37

Expected Number of Sub-Surface UXO Items: 18
Expected Number of Non-UXO Items: 99

Cost Error: 0.2182
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Flamenco Beach
Sector ID: 1
Grid Number: FB-6
Date: 27 Dec 95

Sample Number	Sub-Grid Location	Description of Item
1	5	False Positive
2	24	False Positive
3	21	False Positive
4	13	False Positive
5	23	False Positive
6	30	False Positive
7	28	False Positive
8	22	False Positive
9	24	False Positive
10	7	False Positive
11	25	False Positive
12	23	UXO Scrap
13	10	False Positive
14	7	UXO Scrap
15	17	False Positive
16	31	False Positive
17	24	False Positive
18	15	False Positive
19	19	UXO
20	28	False Positive
21	31	UXO
22	30	False Positive
23	14	False Positive
24	27	False Positive
25	1	UXO
26	12	False Positive
27	12	False Positive
28	20	False Positive
29	8	False Positive
30	23	UXO
31	5	False Positive
32	8	UXO
33	19	False Positive
34	9	False Positive
35	10	UXO Scrap
36	7	False Positive
37	18	False Positive
38	3	False Positive
39	27	False Positive
40	6	False Positive

GRID RESULTS

Site Name: Flamenco Beach
Sector ID: 1
Grid Number: FB-7
Date: 27 Dec 95

Number of Anomalies: 126
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 45
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 37
Number of UXO Scrap Items Found: 8
Number of Surface UXO Items Found: 0
Sample Plan Number: 28

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 126

Cost Error: 1.0000
Risk Error: 0.0000

TE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Flamenco Beach
Sector ID: 1
Grid Number: FB-7
Date: 27 Dec 95

Sample Number	Sub-Grid Location	Description of Item
1	12	False Positive
2	12	False Positive
3	17	False Positive
4	30	False Positive
5	26	False Positive
6	18	False Positive
7	7	UXO Scrap
8	25	False Positive
9	29	False Positive
10	6	False Positive
11	12	False Positive
12	13	False Positive
13	21	UXO Scrap
14	18	False Positive
15	17	False Positive
16	17	False Positive
17	8	UXO Scrap
18	2	False Positive
19	17	False Positive
20	17	False Positive
21	10	False Positive
22	23	False Positive
23	29	False Positive
24	20	UXO Scrap
25	5	False Positive
26	18	False Positive
27	15	False Positive
28	14	False Positive
29	17	UXO Scrap
30	8	False Positive
31	5	False Positive
32	15	False Positive
33	23	False Positive
34	32	UXO Scrap
35	21	False Positive
36	8	False Positive
37	26	UXO Scrap
38	15	False Positive
39	21	False Positive
40	2	False Positive
41	24	False Positive
42	15	False Positive
43	13	UXO Scrap

44	3	False Positive
45	19	False Positive

GRID RESULTS

Site Name: Flamenco Beach
Sector ID: 1
Grid Number: FB-8
Date: 29 Dec 95

Number of Anomalies: 411
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 140
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 136
Number of UXO Scrap Items Found: 4
Number of Surface UXO Items Found: 0
Sample Plan Number: 20

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 411

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Flamenco Beach
Sector ID: 1
Grid Number: FB-8
Date: 29 Dec 95

Sample Number	Sub-Grid Location	Description of Item
1	32	False Positive
2	4	False Positive
3	11	False Positive
4	27	False Positive
5	32	False Positive
6	3	False Positive
7	18	False Positive
8	22	False Positive
9	4	False Positive
10	26	False Positive
11	31	False Positive
12	7	False Positive
13	28	False Positive
14	21	False Positive
15	13	False Positive
16	19	False Positive
17	32	False Positive
18	9	False Positive
19	4	False Positive
20	18	False Positive
21	31	False Positive
22	24	False Positive
23	19	False Positive
24	3	False Positive
25	32	False Positive
26	27	False Positive
27	32	False Positive
28	10	False Positive
29	10	False Positive
30	24	False Positive
31	9	False Positive
32	2	False Positive
33	28	False Positive
34	6	False Positive
35	28	False Positive
36	1	False Positive
37	28	False Positive
38	7	False Positive
39	4	False Positive
40	31	False Positive
41	28	False Positive
42	7	False Positive
43	5	False Positive

44	32	False Positive
45	23	False Positive
46	30	False Positive
47	7	False Positive
48	32	False Positive
49	21	False Positive
50	13	False Positive
51	25	False Positive
52	14	False Positive
53	3	False Positive
54	11	False Positive
55	15	False Positive
56	27	False Positive
57	24	False Positive
58	2	False Positive
59	26	False Positive
60	30	False Positive
61	26	False Positive
62	31	False Positive
63	7	False Positive
64	28	False Positive
65	3	False Positive
66	31	False Positive
67	25	False Positive
68	8	False Positive
69	10	False Positive
70	1	False Positive
71	12	False Positive
72	13	False Positive
73	8	False Positive
74	15	False Positive
75	30	False Positive
76	21	False Positive
77	31	False Positive
78	28	False Positive
79	19	False Positive
80	20	False Positive
81	7	False Positive
82	25	False Positive
83	19	False Positive
84	15	False Positive
85	11	False Positive
86	30	False Positive
87	31	False Positive
88	12	False Positive
89	12	False Positive
90	4	False Positive
91	19	False Positive
92	9	False Positive
93	24	False Positive
94	25	False Positive
95	18	False Positive
96	15	False Positive
97	11	False Positive
98	20	False Positive

99	20	False Positive
100	2	False Positive
101	9	False Positive
102	2	False Positive
103	16	False Positive
104	30	False Positive
105	27	False Positive
106	12	False Positive
107	25	False Positive
108	25	False Positive
109	4	False Positive
110	2	False Positive
111	18	False Positive
112	4	False Positive
113	13	False Positive
114	18	False Positive
115	15	False Positive
116	1	False Positive
117	19	False Positive
118	3	False Positive
119	22	False Positive
120	15	UXO Scrap
121	1	False Positive
122	26	False Positive
123	13	False Positive
124	24	False Positive
125	13	False Positive
126	15	False Positive
127	22	False Positive
128	7	False Positive
129	20	False Positive
130	19	UXO Scrap
131	2	False Positive
132	32	False Positive
133	13	UXO Scrap
134	23	UXO Scrap
135	25	False Positive
136	4	False Positive
137	28	False Positive
138	9	False Positive
139	14	False Positive
140	10	False Positive

GRID RESULTS

Site Name: Flamenco Beach
Sector ID: I
Grid Number: FB-9
Date: 04 Jan 96

Number of Anomalies: 288
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 95
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 28
Number of UXO Scrap Items Found: 67
Number of Surface UXO Items Found: 0
Sample Plan Number: 8

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 288

Cost Error: 1.0000
Risk Error: 0.1391

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Flamenco Beach
Sector ID: 1
Grid Number: FB-9
Date: 04 Jan 96

Sample Number	Sub-Grid Location	Description of Item
1	7	False Positive
2	32	UXO Scrap
3	28	UXO Scrap
4	24	UXO Scrap
5	4	UXO Scrap
6	21	UXO Scrap
7	8	UXO Scrap
8	26	UXO Scrap
9	32	UXO Scrap
10	13	UXO Scrap
11	4	False Positive
12	13	UXO Scrap
13	12	UXO Scrap
14	23	UXO Scrap
15	27	UXO Scrap
16	20	UXO Scrap
17	31	UXO Scrap
18	1	UXO Scrap
19	10	UXO Scrap
20	18	UXO Scrap
21	5	False Positive
22	32	UXO Scrap
23	27	UXO Scrap
24	21	UXO Scrap
25	22	False Positive
26	23	False Positive
27	3	False Positive
28	13	False Positive
29	25	False Positive
30	16	False Positive
31	30	UXO Scrap
32	5	UXO Scrap
33	28	False Positive
34	8	False Positive
35	1	False Positive
36	23	UXO Scrap
37	13	UXO Scrap
38	19	UXO Scrap
39	9	UXO Scrap
40	26	UXO Scrap
41	28	False Positive
42	7	UXO Scrap
43	9	UXO Scrap

44	29	UXO Scrap
45	8	UXO Scrap
46	1	UXO Scrap
47	30	UXO Scrap
48	29	UXO Scrap
49	3	UXO Scrap
50	7	UXO Scrap
51	28	UXO Scrap
52	3	UXO Scrap
53	13	UXO Scrap
54	1	False Positive
55	3	UXO Scrap
56	24	UXO Scrap
57	29	UXO Scrap
58	25	UXO Scrap
59	29	UXO Scrap
60	18	UXO Scrap
61	19	UXO Scrap
62	20	UXO Scrap
63	8	UXO Scrap
64	8	UXO Scrap
65	9	UXO Scrap
66	28	UXO Scrap
67	24	False Positive
68	28	False Positive
69	31	False Positive
70	13	False Positive
71	19	False Positive
72	9	False Positive
73	2	False Positive
74	29	False Positive
75	5	False Positive
76	8	UXO Scrap
77	15	False Positive
78	14	False Positive
79	6	False Positive
80	11	False Positive
81	32	UXO Scrap
82	1	UXO Scrap
83	10	UXO Scrap
84	4	UXO Scrap
85	29	UXO Scrap
86	29	UXO Scrap
87	16	UXO Scrap
88	29	UXO Scrap
89	25	UXO Scrap
90	30	UXO Scrap
91	31	UXO Scrap
92	2	UXO Scrap
93	27	UXO Scrap
94	6	UXO Scrap
95	18	False Positive

GRID RESULTS

Site Name: Flamenco Beach
Sector ID: 1
Grid Number: FB-10
Date: 20 Feb 96

Number of Anomalies: 34
Length of Grid: 50 Feet
Width of Grid: 50 Feet
Grid Area: 2,500 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 15
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 12
Number of UXO Scrap Items Found: 3
Number of Surface UXO Items Found: 0
Sample Plan Number: 88

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 34

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Flamenco Beach
Sector ID: 1
Grid Number: FB-10
Date: 20 Feb 96

Sample Number	Sub-Grid Location	Description of Item
1	4	False Positive
2	2	False Positive
3	17	False Positive
4	8	False Positive
5	9	False Positive
6	29	False Positive
7	13	False Positive
8	10	False Positive
9	27	False Positive
10	25	False Positive
11	19	False Positive
12	9	False Positive
13	10	UXO Scrap
14	27	UXO Scrap
15	6	UXO Scrap

GRID RESULTS

Site Name: Cayo Botella
Sector ID: 1
Grid Number: BO-1
Date: 26 Dec 95

Number of Anomalies: 532
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 93
Number of Sub-Surface UXO Items Found: 5
Number of False Positive Items Found: 76
Number of UXO Scrap Items Found: 12
Number of Surface UXO Items Found: 2
Sample Plan Number: 79

Expected Number of Sub-Surface UXO Items: 29
Expected Number of Non-UXO Items: 503

Cost Error: 0.1801
Risk Error: 1.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Cayo Botella
Sector ID: 1
Grid Number: BO-1
Date: 26 Dec 95

Sample Number	Sub-Grid Location	Description of Item
1	22	False Positive
2	28	False Positive
3	30	False Positive
4	2	False Positive
5	6	False Positive
6	23	UXO Scrap
7	21	False Positive
8	15	False Positive
9	3	UXO Scrap
10	5	False Positive
11	15	False Positive
12	13	False Positive
13	14	False Positive
14	22	False Positive
15	8	False Positive
16	13	UXO Scrap
17	9	False Positive
18	20	False Positive
19	27	UXO
20	1	False Positive
21	29	False Positive
22	3	False Positive
23	8	False Positive
24	29	UXO Scrap
25	19	False Positive
26	22	False Positive
27	25	False Positive
28	4	UXO
29	9	False Positive
30	31	False Positive
31	28	False Positive
32	4	False Positive
33	6	UXO Scrap
34	23	False Positive
35	1	False Positive
36	4	False Positive
37	18	False Positive
38	15	False Positive
39	32	UXO
40	32	False Positive
41	28	False Positive
42	19	False Positive
43	5	False Positive

44	2	False Positive
45	20	False Positive
46	25	UXO Scrap
47	21	False Positive
48	21	False Positive
49	27	UXO Scrap
50	5	False Positive
51	18	False Positive
52	2	False Positive
53	10	False Positive
54	23	UXO
55	16	False Positive
56	24	False Positive
57	1	False Positive
58	11	False Positive
59	1	False Positive
60	9	UXO Scrap
61	23	False Positive
62	6	False Positive
63	31	False Positive
64	2	False Positive
65	30	False Positive
66	29	False Positive
67	4	UXO Scrap
68	1	False Positive
69	4	False Positive
70	4	False Positive
71	29	False Positive
72	14	False Positive
73	10	False Positive
74	24	UXO Scrap
75	18	False Positive
76	32	False Positive
77	27	False Positive
78	19	False Positive
79	15	False Positive
80	9	False Positive
81	15	False Positive
82	1	False Positive
83	8	False Positive
84	23	False Positive
85	4	False Positive
86	2	False Positive
87	1	UXO Scrap
88	26	False Positive
89	24	False Positive
90	25	UXO Scrap
91	6	False Positive
92	6	False Positive
93	2	UXO

GRID RESULTS

Site Name: Cayo Botella
Sector ID: 1
Grid Number: BO-2
Date: 26 Dec 95

Number of Anomalies: 788
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 60
Number of Sub-Surface UXO Items Found: 6
Number of False Positive Items Found: 43
Number of UXO Scrap Items Found: 11
Number of Surface UXO Items Found: 7
Sample Plan Number: 27

Expected Number of Sub-Surface UXO Items: 79
Expected Number of Non-UXO Items: 709

Cost Error: 0.0000
Risk Error: 1.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Cayo Botella
Sector ID: 1
Grid Number: BO-2
Date: 26 Dec 95

Sample Number	Sub-Grid Location	Description of Item
1	1	False Positive
2	9	UXO Scrap
3	16	False Positive
4	13	UXO
5	7	False Positive
6	19	False Positive
7	8	UXO
8	2	False Positive
9	28	False Positive
10	17	UXO Scrap
11	8	False Positive
12	5	UXO Scrap
13	16	False Positive
14	22	False Positive
15	2	UXO
16	22	False Positive
17	23	False Positive
18	3	False Positive
19	5	UXO Scrap
20	14	False Positive
21	7	False Positive
22	3	UXO Scrap
23	3	False Positive
24	8	False Positive
25	4	UXO
26	6	False Positive
27	8	UXO Scrap
28	14	False Positive
29	24	UXO
30	19	False Positive
31	23	False Positive
32	8	False Positive
33	5	False Positive
34	29	False Positive
35	2	UXO Scrap
36	31	False Positive
37	20	False Positive
38	4	False Positive
39	18	False Positive
40	12	UXO Scrap
41	8	False Positive
42	26	False Positive
43	20	False Positive

44	9	UXO
45	26	False Positive
46	30	False Positive
47	4	False Positive
48	18	False Positive
49	4	False Positive
50	26	False Positive
51	10	UXO Scrap
52	26	False Positive
53	12	False Positive
54	14	False Positive
55	12	False Positive
56	28	UXO Scrap
57	2	False Positive
58	28	False Positive
59	11	False Positive
60	3	UXO Scrap

GRID RESULTS

Site Name: Cayo Lobo
Sector ID: 1
Grid Number: LO-1
Date: 03 Jan 96

Number of Anomalies: 25
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 12
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 12
Number of UXO Scrap Items Found: 0
Number of Surface UXO Items Found: 0
Sample Plan Number: 89

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 25

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Cayo Lobo
Sector ID: 1
Grid Number: LO-1
Date: 03 Jan 96

Sample Number	Sub-Grid Location	Description of Item
1	9	False Positive
2	15	False Positive
3	29	False Positive
4	16	False Positive
5	7	False Positive
6	17	False Positive
7	11	False Positive
8	30	False Positive
9	4	False Positive
10	15	False Positive
11	25	False Positive
12	14	False Positive

GRID RESULTS

Site Name: Cayo Lobo
Sector ID: 1
Grid Number: LO-2
Date: 02 Jan 96

Number of Anomalies: 45
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 15
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 15
Number of UXO Scrap Items Found: 0
Number of Surface UXO Items Found: 0
Sample Plan Number: 76

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 45

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Cayo Lobo
Sector ID: 1
Grid Number: LO-2
Date: 02 Jan 96

Sample Number	Sub-Grid Location	Description of Item
1	32	False Positive
2	15	False Positive
3	14	False Positive
4	28	False Positive
5	12	False Positive
6	11	False Positive
7	20	False Positive
8	23	False Positive
9	14	False Positive
10	1	False Positive
11	21	False Positive
12	12	False Positive
13	12	False Positive
14	9	False Positive
15	27	False Positive

GRID RESULTS

Site Name: Cayo Lobo
Sector ID: 1
Grid Number: LO-3
Date: 03 Jan 96

Number of Anomalies: 51
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 17
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 13
Number of UXO Scrap Items Found: 4
Number of Surface UXO Items Found: 0
Sample Plan Number: 11

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 51

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Cayo Lobo
Sector ID: 1
Grid Number: LO-3
Date: 03 Jan 96

Sample Number	Sub-Grid Location	Description of Item
1	30	False Positive
2	26	UXO Scrap
3	18	False Positive
4	17	False Positive
5	8	UXO Scrap
6	6	False Positive
7	11	False Positive
8	15	False Positive
9	17	False Positive
10	10	False Positive
11	22	UXO Scrap
12	2	False Positive
13	26	False Positive
14	24	UXO Scrap
15	22	False Positive
16	29	False Positive
17	17	False Positive

GRID RESULTS

Site Name: Cayo Lobo
Sector ID: 1
Grid Number: LO-4
Date: 02 Jan 96

Number of Anomalies: 120
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 40
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 27
Number of UXO Scrap Items Found: 13
Number of Surface UXO Items Found: 0
Sample Plan Number: 19

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 120

Cost Error: 1.0000
Risk Error: 0.0000

OTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

5 skipped Subgrids (No Anomalies).

GRIDSTATS SAMPLING SEQUENCE

Site Name: Cayo Lobo
Sector ID: 1
Grid Number: LO-4
Date: 02 Jan 96

Sample Number	Sub-Grid Location	Description of Item
1	17	False Positive
2	3	False Positive
3	19	UXO Scrap
4	13	False Positive
5	18	False Positive
6	25	False Positive
7	22	UXO Scrap
8	21	UXO Scrap
9	11	False Positive
10	26	False Positive
11	18	False Positive
12	14	UXO Scrap
13	20	False Positive
14	2	False Positive
15	3	False Positive
16	29	UXO Scrap
17	16	False Positive
18	2	False Positive
19	32	UXO Scrap
20	11	UXO Scrap
21	21	False Positive
22	2	False Positive
23	8	False Positive
24	12	False Positive
25	29	UXO Scrap
26	10	False Positive
27	12	False Positive
28	9	False Positive
29	19	UXO Scrap
30	1	False Positive
31	8	UXO Scrap
32	18	False Positive
33	10	UXO Scrap
34	23	UXO Scrap
35	5	False Positive
36	1	False Positive
37	6	False Positive
38	23	False Positive
39	18	UXO Scrap
40	25	False Positive

GRID RESULTS

Site Name: Cerro Balcon
Sector ID: 1
Grid Number: CB-1
Date: 04 Jan 96

Number of Anomalies: 45
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 15
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 15
Number of UXO Scrap Items Found: 0
Number of Surface UXO Items Found: 0
Sample Plan Number: 49

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 45

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Cerro Balcon
Sector ID: 1
Grid Number: CB-1
Date: 04 Jan 96

Sample Number	Sub-Grid Location	Description of Item
1	32	False Positive
2	20	False Positive
3	4	False Positive
4	3	False Positive
5	6	False Positive
6	11	False Positive
7	26	False Positive
8	6	False Positive
9	13	False Positive
10	16	False Positive
11	30	False Positive
12	12	False Positive
13	24	False Positive
14	3	False Positive
15	22	False Positive

GRID RESULTS

Site Name: Cerro Balcon
Sector ID: 1
Grid Number: CB-2
Date: 04 Jan 96

Number of Anomalies: 32
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 13
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 13
Number of UXO Scrap Items Found: 0
Number of Surface UXO Items Found: 0
Sample Plan Number: 50

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 32

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Cerro Balcon
Sector ID: 1
Grid Number: CB-2
Date: 04 Jan 96

Sample Number	Sub-Grid Location	Description of Item
1	28	False Positive
2	27	False Positive
3	23	False Positive
4	10	False Positive
5	28	False Positive
6	9	False Positive
7	3	False Positive
8	21	False Positive
9	31	False Positive
10	18	False Positive
11	29	False Positive
12	30	False Positive
13	12	False Positive

GRID RESULTS

Site Name: Cerro Balcon
Sector ID: 1
Grid Number: CB-3
Date: 04 Jan 96

Number of Anomalies: 36
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 13
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 10
Number of UXO Scrap Items Found: 3
Number of Surface UXO Items Found: 0
Sample Plan Number: 17

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 36

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Cerro Balcon
Sector ID: 1
Grid Number: CB-3
Date: 04 Jan 96

Sample Number	Sub-Grid Location	Description of Item
1	18	False Positive
2	2	False Positive
3	2	False Positive
4	2	UXO Scrap
5	10	UXO Scrap
6	7	False Positive
7	6	False Positive
8	20	False Positive
9	26	UXO Scrap
10	19	False Positive
11	22	False Positive
12	32	False Positive
13	14	False Positive

GRID RESULTS

Site Name: Cerro Balcon
Sector ID: 1
Grid Number: CB-4
Date: 04 Jan 96

Number of Anomalies: 17
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 17
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 8
Number of UXO Scrap Items Found: 9
Number of Surface UXO Items Found: 0
Sample Plan Number: 49

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 17

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Cerro Balcon
Sector ID: 1
Grid Number: CB-4
Date: 04 Jan 96

Sample Number	Sub-Grid Location	Description of Item
1	14	UXO Scrap
2	32	False Positive
3	20	UXO Scrap
4	4	UXO Scrap
5	3	UXO Scrap
6	6	UXO Scrap
7	11	UXO Scrap
8	26	False Positive
9	6	False Positive
10	20	UXO Scrap
11	13	UXO Scrap
12	16	False Positive
13	30	False Positive
14	12	UXO Scrap
15	12	False Positive
16	24	False Positive
17	3	False Positive

GRID RESULTS

Site Name: Cerro Balcon
Sector ID: 1
Grid Number: CB-5
Date: 19 Feb 96

Number of Anomalies: 7
Length of Grid: 50 Feet
Width of Grid: 50 Feet
Grid Area: 2,500 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 7
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 5
Number of UXO Scrap Items Found: 2
Number of Surface UXO Items Found: 0
Sample Plan Number: 34

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 7

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Cerro Balcon
Sector ID: 1
Grid Number: CB-5
Date: 19 Feb 96

Sample Number	Sub-Grid Location	Description of Item
1	14	UXO Scrap
2	31	False Positive
3	16	False Positive
4	3	False Positive
5	28	False Positive
6	19	UXO Scrap
7	26	False Positive

GRID RESULTS

Site Name: Cerro Balcon
Sector ID: 1
Grid Number: CB-6
Date: 19 Feb 96

Number of Anomalies: 12
Length of Grid: 50 Feet
Width of Grid: 50 Feet
Grid Area: 2,500 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 12
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 7
Number of UXO Scrap Items Found: 5
Number of Surface UXO Items Found: 0
Sample Plan Number: 80

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 12

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Cerro Balcon
Sector ID: 1
Grid Number: CB-6
Date: 19 Feb 96

Sample Number	Sub-Grid Location	Description of Item
1	6	UXO Scrap
2	18	False Positive
3	13	False Positive
4	3	UXO Scrap
5	20	UXO Scrap
6	6	False Positive
7	23	UXO Scrap
8	28	False Positive
9	5	False Positive
10	32	UXO Scrap
11	2	False Positive
12	15	False Positive

GRID RESULTS

Site Name: Cayo Del Agua
Sector ID: 1
Grid Number: AQ-1
Date: 04 Jan 96

Number of Anomalies: 570
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 100
Number of Sub-Surface UXO Items Found: 5
Number of False Positive Items Found: 69
Number of UXO Scrap Items Found: 26
Number of Surface UXO Items Found: 11
Sample Plan Number: 2

Expected Number of Sub-Surface UXO Items: 29
Expected Number of Non-UXO Items: 541

Cost Error: 0.1803
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Cayo Del Agua
Sector ID: 1
Grid Number: AQ-1
Date: 04 Jan 96

Sample Number	Sub-Grid Location	Description of Item
1	10	False Positive
2	17	False Positive
3	25	UXO Scrap
4	22	False Positive
5	24	UXO
6	2	False Positive
7	11	UXO Scrap
8	9	False Positive
9	25	False Positive
10	23	False Positive
11	5	UXO Scrap
12	6	False Positive
13	27	UXO Scrap
14	25	False Positive
15	18	False Positive
16	19	UXO Scrap
17	22	False Positive
18	15	False Positive
19	12	UXO Scrap
20	16	UXO Scrap
21	10	False Positive
22	19	False Positive
23	31	UXO Scrap
24	12	False Positive
25	15	False Positive
26	1	False Positive
27	16	UXO Scrap
28	18	False Positive
29	16	False Positive
30	26	UXO Scrap
31	32	UXO Scrap
32	22	False Positive
33	7	False Positive
34	10	UXO
35	15	False Positive
36	27	False Positive
37	20	False Positive
38	4	UXO Scrap
39	22	UXO Scrap
40	21	False Positive
41	2	False Positive
42	15	False Positive
43	26	UXO

44	30	False Positive
45	8	UXO Scrap
46	31	False Positive
47	25	UXO
48	22	False Positive
49	21	UXO Scrap
50	6	False Positive
51	15	False Positive
52	24	UXO Scrap
53	24	False Positive
54	3	False Positive
55	1	False Positive
56	8	UXO Scrap
57	12	False Positive
58	26	False Positive
59	12	UXO Scrap
60	32	False Positive
61	31	False Positive
62	31	UXO Scrap
63	14	False Positive
64	18	False Positive
65	29	False Positive
66	13	UXO Scrap
67	17	False Positive
68	12	False Positive
69	6	UXO Scrap
70	5	False Positive
71	15	False Positive
72	32	False Positive
73	11	False Positive
74	14	False Positive
75	11	UXO Scrap
76	28	False Positive
77	10	UXO Scrap
78	21	UXO Scrap
79	27	False Positive
80	5	False Positive
81	17	False Positive
82	12	False Positive
83	8	False Positive
84	10	False Positive
85	22	UXO Scrap
86	1	False Positive
87	22	False Positive
88	19	False Positive
89	32	False Positive
90	18	False Positive
91	12	UXO Scrap
92	10	False Positive
93	7	False Positive
94	30	False Positive
95	17	False Positive
96	31	False Positive
97	25	UXO
98	5	False Positive

99	18	False Positive
100	11	False Positive

GRID RESULTS

Site Name: Cayo Del Agua
Sector ID: 1
Grid Number: AQ-2
Date: 04 Jan 96

Number of Anomalies: 23
Length of Grid: 40 Feet
Width of Grid: 40 Feet
Grid Area: 1,600 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 10
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 8
Number of UXO Scrap Items Found: 2
Number of Surface UXO Items Found: 0
Sample Plan Number: 76

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 23

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Cayo Del Agua
Sector ID: 1
Grid Number: AQ-2
Date: 04 Jan 96

Sample Number	Sub-Grid Location	Description of Item
1	32	False Positive
2	15	False Positive
3	14	False Positive
4	2	False Positive
5	28	False Positive
6	12	UXO Scrap
7	19	False Positive
8	11	False Positive
9	20	UXO Scrap
10	23	False Positive

GRID RESULTS

Site Name: Northwest Peninsula
Sector ID: 1
Grid Number: NP-1
Date: 15 Jan 96

Number of Anomalies: 307
Length of Grid: 50 Feet
Width of Grid: 50 Feet
Grid Area: 2,500 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 100
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 77
Number of UXO Scrap Items Found: 23
Number of Surface UXO Items Found: 1
Sample Plan Number: 42

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 307

Cost Error: 1.0000
Risk Error: 0.0917

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 1
Grid Number: NP-1
Date: 15 Jan 96

Sample Number	Sub-Grid Location	Description of Item
1	3	UXO Scrap
2	13	UXO Scrap
3	8	UXO Scrap
4	22	UXO Scrap
5	29	UXO Scrap
6	27	UXO Scrap
7	5	UXO Scrap
8	20	UXO Scrap
9	7	UXO Scrap
10	22	UXO Scrap
11	23	UXO Scrap
12	25	UXO Scrap
13	21	UXO Scrap
14	14	UXO Scrap
15	9	UXO Scrap
16	24	UXO Scrap
17	5	UXO Scrap
18	9	UXO Scrap
19	24	UXO Scrap
20	15	UXO Scrap
21	22	False Positive
22	8	False Positive
23	28	False Positive
24	32	False Positive
25	25	False Positive
26	8	False Positive
27	12	False Positive
28	11	False Positive
29	3	False Positive
30	23	False Positive
31	28	False Positive
32	27	False Positive
33	20	False Positive
34	10	False Positive
35	29	False Positive
36	11	False Positive
37	30	False Positive
38	10	False Positive
39	22	False Positive
40	23	False Positive
41	4	UXO Scrap
42	29	UXO Scrap
43	18	UXO Scrap

44	13	False Positive
45	30	False Positive
46	20	False Positive
47	3	False Positive
48	3	False Positive
49	24	False Positive
50	17	False Positive
51	17	False Positive
52	13	False Positive
53	11	False Positive
54	24	False Positive
55	8	False Positive
56	6	False Positive
57	21	False Positive
58	3	False Positive
59	25	False Positive
60	4	False Positive
61	4	False Positive
62	23	False Positive
63	5	False Positive
64	10	False Positive
65	27	False Positive
66	3	False Positive
67	15	False Positive
68	19	False Positive
69	31	False Positive
70	22	False Positive
71	23	False Positive
72	30	False Positive
73	10	False Positive
74	15	False Positive
75	26	False Positive
76	1	False Positive
77	7	False Positive
78	25	False Positive
79	12	False Positive
80	9	False Positive
81	27	False Positive
82	21	False Positive
83	14	False Positive
84	9	False Positive
85	31	False Positive
86	6	False Positive
87	26	False Positive
88	28	False Positive
89	28	False Positive
90	26	False Positive
91	1	False Positive
92	29	False Positive
93	2	False Positive
94	12	False Positive
95	32	False Positive
96	30	False Positive
97	18	False Positive
98	6	False Positive

	99	19	False Positive
	100	28	False Positive

Site Name: Northwest Peninsula
Sector ID: 1
Grid Number: NP-2
Date: 15 Jan 96

Number of Anomalies: 605
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 200
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 175
Number of UXO Scrap Items Found: 25
Number of Surface UXO Items Found: 0
Sample Plan Number: 34

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 605

Cost Error: 1.0000
Risk Error: 0.5329

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 1
Grid Number: NP-2
Date: 15 Jan 96

Sample Number	Sub-Grid Location	Description of Item
1	6	False Positive
2	11	False Positive
3	12	False Positive
4	25	False Positive
5	14	UXO Scrap
6	18	False Positive
7	32	False Positive
8	25	False Positive
9	20	False Positive
10	31	False Positive
11	23	UXO Scrap
12	18	False Positive
13	29	False Positive
14	5	False Positive
15	30	False Positive
16	1	UXO Scrap
17	12	False Positive
18	7	False Positive
19	8	UXO Scrap
20	10	False Positive
21	16	False Positive
22	21	False Positive
23	3	False Positive
24	6	False Positive
25	8	UXO Scrap
26	28	False Positive
27	6	False Positive
28	10	False Positive
29	25	False Positive
30	20	UXO Scrap
31	10	False Positive
32	28	False Positive
33	18	False Positive
34	10	False Positive
35	25	False Positive
36	13	UXO Scrap
37	29	False Positive
38	20	False Positive
39	7	False Positive
40	4	False Positive
41	1	False Positive
42	3	UXO Scrap
43	31	False Positive

44	12	False Positive
45	5	False Positive
46	32	False Positive
47	20	UXO Scrap
48	6	False Positive
49	8	False Positive
50	32	False Positive
51	4	False Positive
52	14	False Positive
53	19	UXO Scrap
54	9	False Positive
55	25	False Positive
56	21	False Positive
57	14	False Positive
58	32	UXO Scrap
59	9	False Positive
60	25	False Positive
61	8	False Positive
62	1	False Positive
63	14	False Positive
64	8	False Positive
65	25	False Positive
66	11	False Positive
67	18	False Positive
68	25	UXO Scrap
69	15	False Positive
70	29	False Positive
71	6	False Positive
72	21	False Positive
73	24	False Positive
74	15	UXO Scrap
75	21	False Positive
76	26	False Positive
77	20	False Positive
78	26	False Positive
79	2	False Positive
80	29	False Positive
81	20	False Positive
82	24	False Positive
83	23	False Positive
84	7	False Positive
85	12	False Positive
86	27	UXO Scrap
87	4	False Positive
88	8	False Positive
89	4	False Positive
90	10	False Positive
91	14	False Positive
92	31	UXO Scrap
93	7	False Positive
94	10	False Positive
95	5	False Positive
96	12	False Positive
97	24	False Positive
98	29	False Positive

99	20	UXO Scrap
100	6	False Positive
101	12	False Positive
102	27	UXO Scrap
103	32	False Positive
104	1	False Positive
105	7	False Positive
106	23	False Positive
107	18	UXO Scrap
108	12	False Positive
109	9	False Positive
110	11	False Positive
111	9	False Positive
112	23	False Positive
113	4	False Positive
114	3	False Positive
115	32	False Positive
116	10	False Positive
117	29	UXO Scrap
118	4	False Positive
119	17	False Positive
120	10	False Positive
121	19	False Positive
122	17	False Positive
123	16	False Positive
124	30	False Positive
125	17	False Positive
126	4	False Positive
127	6	False Positive
128	4	False Positive
129	30	False Positive
130	3	False Positive
131	28	False Positive
132	26	False Positive
133	19	False Positive
134	6	False Positive
135	27	False Positive
136	4	False Positive
137	16	UXO Scrap
138	24	False Positive
139	4	False Positive
140	21	False Positive
141	1	False Positive
142	3	False Positive
143	4	False Positive
144	3	False Positive
145	13	False Positive
146	22	False Positive
147	22	False Positive
148	29	False Positive
149	8	False Positive
150	21	False Positive
151	9	UXO Scrap
152	9	False Positive
153	7	False Positive

154	31	False Positive
155	28	False Positive
156	2	False Positive
157	23	False Positive
158	6	False Positive
159	20	UXO Scrap
160	20	False Positive
161	20	False Positive
162	17	False Positive
163	5	False Positive
164	5	False Positive
165	22	False Positive
166	7	False Positive
167	10	UXO Scrap
168	10	False Positive
169	2	False Positive
170	14	False Positive
171	24	False Positive
172	22	False Positive
173	26	False Positive
174	11	False Positive
175	21	False Positive
176	16	UXO Scrap
177	17	False Positive
178	31	False Positive
179	15	False Positive
180	24	False Positive
181	22	UXO Scrap
182	26	False Positive
183	17	False Positive
184	28	False Positive
185	10	False Positive
186	8	False Positive
187	26	False Positive
188	13	False Positive
189	4	False Positive
190	4	False Positive
191	30	False Positive
192	15	False Positive
193	12	False Positive
194	21	False Positive
195	5	False Positive
196	32	False Positive
197	14	False Positive
198	16	False Positive
199	23	False Positive
200	7	False Positive

GRID RESULTS

Site Name: Northwest Peninsula
Sector ID: 1
Grid Number: NP-3
Date: 16 Jan 96

Number of Anomalies: 143
Length of Grid: 50 Feet
Width of Grid: 50 Feet
Grid Area: 2,500 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 62
Number of Sub-Surface UXO Items Found: 2
Number of False Positive Items Found: 33
Number of UXO Scrap Items Found: 27
Number of Surface UXO Items Found: 0
Sample Plan Number: 22

Expected Number of Sub-Surface UXO Items: 5
Expected Number of Non-UXO Items: 138

Cost Error: 1.0000
Risk Error: 0.6783

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 1
Grid Number: NP-3
Date: 16 Jan 96

Sample Number	Sub-Grid Location	Description of Item
1	29	UXO Scrap
2	3	UXO Scrap
3	3	UXO Scrap
4	24	False Positive
5	4	False Positive
6	4	UXO Scrap
7	27	UXO Scrap
8	16	UXO Scrap
9	27	False Positive
10	27	UXO Scrap
11	31	False Positive
12	19	False Positive
13	30	UXO Scrap
14	20	UXO Scrap
15	32	UXO Scrap
16	32	False Positive
17	24	False Positive
18	15	UXO Scrap
19	28	False Positive
20	13	False Positive
21	18	UXO Scrap
22	25	False Positive
23	17	False Positive
24	10	False Positive
25	15	UXO
26	21	False Positive
27	18	False Positive
28	24	UXO Scrap
29	1	False Positive
30	12	False Positive
31	5	UXO Scrap
32	13	UXO Scrap
33	13	UXO Scrap
34	11	UXO Scrap
35	17	False Positive
36	5	UXO Scrap
37	5	False Positive
38	27	False Positive
39	26	False Positive
40	27	False Positive
41	21	UXO Scrap
42	17	UXO Scrap
43	14	False Positive

44	6	UXO
45	15	UXO Scrap
46	24	False Positive
47	24	UXO Scrap
48	4	UXO Scrap
49	29	False Positive
50	22	False Positive
51	8	False Positive
52	23	UXO Scrap
53	9	UXO Scrap
54	3	False Positive
55	4	UXO Scrap
56	1	False Positive
57	21	False Positive
58	6	UXO Scrap
59	1	False Positive
60	16	False Positive
61	30	False Positive
62	4	False Positive

GRID RESULTS

Site Name: Northwest Peninsula
Sector ID: A
Grid Number: NP-4
Date: 16Jan 96

Number of Anomalies: 109
Length of Grid: 50 Feet
Width of Grid: 50 Feet
Grid Area: 2,500 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 47
Number of Sub-Surface UXO Items Found: 1
Number of False Positive Items Found: 36
Number of UXO Scrap Items Found: 10
Number of Surface UXO Items Found: 2
Sample Plan Number: 86

Expected Number of Sub-Surface UXO Items: 2
Expected Number of Non-UXO Items: 107

Cost Error: 1.0000
Risk Error: 0.5354

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: A
Grid Number: NP-4
Date: 16Jan 96

Sample Number	Sub-Grid Location	Description of Item
1	11	False Positive
2	32	False Positive
3	20	False Positive
4	27	UXO Scrap
5	23	False Positive
6	20	False Positive
7	23	UXO Scrap
8	16	False Positive
9	3	False Positive
10	18	False Positive
11	10	UXO Scrap
12	26	False Positive
13	32	False Positive
14	25	False Positive
15	16	False Positive
16	19	False Positive
17	6	False Positive
18	17	False Positive
19	24	UXO Scrap
20	14	False Positive
21	30	False Positive
22	14	False Positive
23	28	False Positive
24	6	UXO Scrap
25	12	False Positive
26	17	False Positive
27	23	False Positive
28	8	UXO Scrap
29	25	False Positive
30	21	False Positive
31	5	UXO
32	12	False Positive
33	11	False Positive
34	7	False Positive
35	20	UXO Scrap
36	19	False Positive
37	3	UXO Scrap
38	9	UXO Scrap
39	3	False Positive
40	32	False Positive
41	8	UXO Scrap
42	27	False Positive
43	13	False Positive
44	31	False Positive
45	5	False Positive
46	1	False Positive
47	21	False Positive

GRID RESULTS

Site Name: Northwest Peninsula
Sector ID: 1
Grid Number: NP-5
Date: 17 Jan 96

Number of Anomalies: 209
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 80
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 36
Number of UXO Scrap Items Found: 44
Number of Surface UXO Items Found: 0
Sample Plan Number: 38

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 209

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 1
Grid Number: NP-5
Date: 17 Jan 96

Sample Number	Sub-Grid Location	Description of Item
1	19	UXO Scrap
2	30	UXO Scrap
3	13	UXO Scrap
4	11	False Positive
5	14	UXO Scrap
6	30	False Positive
7	22	False Positive
8	30	False Positive
9	4	UXO Scrap
10	21	False Positive
11	28	UXO Scrap
12	6	False Positive
13	18	UXO Scrap
14	28	UXO Scrap
15	29	False Positive
16	11	False Positive
17	11	UXO Scrap
18	27	UXO Scrap
19	27	False Positive
20	7	UXO Scrap
21	26	UXO Scrap
22	12	UXO Scrap
23	17	False Positive
24	32	UXO Scrap
25	23	UXO Scrap
26	25	UXO Scrap
27	23	False Positive
28	28	False Positive
29	6	UXO Scrap
30	10	False Positive
31	3	UXO Scrap
32	18	UXO Scrap
33	24	UXO Scrap
34	14	False Positive
35	15	UXO Scrap
36	13	False Positive
37	15	False Positive
38	3	False Positive
39	4	UXO Scrap
40	26	UXO Scrap
41	23	UXO Scrap
42	7	UXO Scrap
43	15	UXO Scrap

44	28	UXO Scrap
45	26	UXO Scrap
46	29	False Positive
47	1	False Positive
48	23	UXO Scrap
49	2	UXO Scrap
50	13	UXO Scrap
51	20	False Positive
52	26	False Positive
53	8	False Positive
54	22	UXO Scrap
55	20	False Positive
56	18	UXO Scrap
57	19	False Positive
58	25	UXO Scrap
59	7	False Positive
60	5	False Positive
61	16	False Positive
62	5	False Positive
63	17	False Positive
64	18	UXO Scrap
65	31	UXO Scrap
66	3	False Positive
67	15	UXO Scrap
68	20	UXO Scrap
69	26	UXO Scrap
70	10	UXO Scrap
71	27	False Positive
72	1	UXO Scrap
73	6	False Positive
74	21	UXO Scrap
75	11	UXO Scrap
76	29	False Positive
77	27	UXO Scrap
78	7	False Positive
79	22	False Positive
80	1	False Positive

GRID RESULTS

Site Name: Northwest Peninsula
Sector ID: 1
Grid Number: NP-6
Date: 17 Jan 96 - 18 JAN 96

Number of Anomalies: 265
Length of Grid: 50 Feet
Width of Grid: 50 Feet
Grid Area: 2,500 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 90
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 58
Number of UXO Scrap Items Found: 32
Number of Surface UXO Items Found: 0
Sample Plan Number: 57

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 265

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 1
Grid Number: NP-6
Date: 17 Jan 96

Sample Number	Sub-Grid Location	Description of Item
1	25	UXO Scrap
2	30	UXO Scrap
3	20	UXO Scrap
4	8	UXO Scrap
5	7	UXO Scrap
6	30	False Positive
7	22	UXO Scrap
8	28	UXO Scrap
9	17	False Positive
10	18	False Positive
11	29	UXO Scrap
12	30	UXO Scrap
13	12	UXO Scrap
14	20	False Positive
15	21	False Positive
16	23	False Positive
17	29	False Positive
18	18	UXO Scrap
19	27	False Positive
20	14	UXO Scrap
21	25	False Positive
22	24	False Positive
23	14	UXO Scrap
24	14	False Positive
25	10	UXO Scrap
26	29	UXO Scrap
27	23	False Positive
28	27	False Positive
29	6	False Positive
30	29	UXO Scrap
31	3	False Positive
32	32	False Positive
33	21	False Positive
34	20	False Positive
35	2	UXO Scrap
36	18	False Positive
37	27	UXO Scrap
38	23	UXO Scrap
39	11	False Positive
40	10	False Positive
41	30	False Positive
42	15	False Positive
43	21	UXO Scrap

44	13	False Positive
45	8	False Positive
46	27	False Positive
47	4	False Positive
48	4	UXO Scrap
49	6	False Positive
50	16	False Positive
51	15	False Positive
52	23	False Positive
53	18	False Positive
54	5	UXO Scrap
55	27	UXO Scrap
56	12	False Positive
57	7	False Positive
58	13	UXO Scrap
59	12	False Positive
60	24	False Positive
61	3	False Positive
62	16	False Positive
63	12	False Positive
64	14	UXO Scrap
65	9	False Positive
66	18	False Positive
67	4	UXO Scrap
68	19	False Positive
69	32	UXO Scrap
70	19	False Positive
71	2	False Positive
72	5	False Positive
73	29	False Positive
74	3	UXO Scrap
75	24	False Positive
76	8	UXO Scrap
77	12	False Positive
78	10	False Positive
79	25	False Positive
80	12	False Positive
81	14	False Positive
82	16	False Positive
83	22	False Positive
84	3	UXO Scrap
85	13	False Positive
86	21	False Positive
87	5	UXO Scrap
88	22	UXO Scrap
89	32	False Positive
90	19	False Positive

GRID RESULTS

Site Name: Northwest Pennsula
Sector ID: NP-1
Grid Number: NP-7
Date: 06 Feb 96

Number of Anomalies: 92
Length of Grid: 50 Feet
Width of Grid: 50 Feet
Grid Area: 2,500 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 30
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 14
Number of UXO Scrap Items Found: 16
Number of Surface UXO Items Found: 0
Sample Plan Number: 21

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 92

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Pennsula
Sector ID: NP-1
Grid Number: NP-7
Date: 06 Feb 96

Sample Number	Sub-Grid Location	Description of Item
1	11	UXO Scrap
2	17	False Positive
3	12	UXO Scrap
4	30	UXO Scrap
5	28	UXO Scrap
6	25	UXO Scrap
7	10	UXO Scrap
8	29	UXO Scrap
9	4	False Positive
10	5	False Positive
11	2	False Positive
12	21	UXO Scrap
13	12	False Positive
14	9	UXO Scrap
15	19	UXO Scrap
16	14	UXO Scrap
17	17	UXO Scrap
18	7	False Positive
19	8	UXO Scrap
20	16	False Positive
21	7	False Positive
22	10	UXO Scrap
23	26	False Positive
24	25	False Positive
25	21	False Positive
26	6	False Positive
27	30	False Positive
28	26	False Positive
29	31	UXO Scrap
30	12	UXO Scrap

GRID RESULTS

Site Name: Northwest Peninsula
Sector ID: 1
Grid Number: NP-8
Date: 06 Feb 96

Number of Anomalies: 74
Length of Grid: 50 Feet
Width of Grid: 50 Feet
Grid Area: 2,500 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 25
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 12
Number of UXO Scrap Items Found: 13
Number of Surface UXO Items Found: 0
Sample Plan Number: 57

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 74

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 1
Grid Number: NP-8
Date: 06 Feb 96

Sample Number	Sub-Grid Location	Description of Item
1	25	UXO Scrap
2	30	False Positive
3	20	False Positive
4	8	False Positive
5	7	False Positive
6	30	UXO Scrap
7	22	UXO Scrap
8	28	UXO Scrap
9	17	False Positive
10	18	UXO Scrap
11	29	False Positive
12	30	UXO Scrap
13	12	UXO Scrap
14	20	False Positive
15	21	UXO Scrap
16	23	UXO Scrap
17	29	False Positive
18	18	False Positive
19	27	False Positive
20	14	UXO Scrap
21	25	UXO Scrap
22	24	False Positive
23	14	UXO Scrap
24	14	UXO Scrap
25	10	False Positive

GRID RESULTS

Site Name: Northwest Peninsula
Sector ID: 1
Grid Number: NP-9
Date: 17 Jan 96

Number of Anomalies: 202
Length of Grid: 100 Feet
Width of Grid: 50 Feet
Grid Area: 5,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 65
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 21
Number of UXO Scrap Items Found: 44
Number of Surface UXO Items Found: 0
Sample Plan Number: 88

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 202

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 1
Grid Number: NP-9
Date: 17 Jan 96

Sample Number	Sub-Grid Location	Description of Item
1	4	UXO Scrap
2	2	False Positive
3	17	UXO Scrap
4	8	UXO Scrap
5	9	UXO Scrap
6	29	UXO Scrap
7	13	UXO Scrap
8	10	UXO Scrap
9	27	UXO Scrap
10	25	UXO Scrap
11	19	UXO Scrap
12	9	UXO Scrap
13	10	False Positive
14	27	UXO Scrap
15	6	UXO Scrap
16	19	False Positive
17	14	UXO Scrap
18	30	False Positive
19	21	UXO Scrap
20	27	UXO Scrap
21	17	UXO Scrap
22	21	UXO Scrap
23	30	UXO Scrap
24	2	UXO Scrap
25	17	UXO Scrap
26	4	UXO Scrap
27	12	UXO Scrap
28	23	False Positive
29	26	UXO Scrap
30	16	UXO Scrap
31	25	UXO Scrap
32	26	UXO Scrap
33	12	UXO Scrap
34	20	UXO Scrap
35	28	False Positive
36	2	UXO Scrap
37	18	UXO Scrap
38	31	False Positive
39	28	UXO Scrap
40	30	UXO Scrap
41	14	UXO Scrap
42	17	UXO Scrap
43	8	False Positive

44	21	False Positive
45	6	False Positive
46	30	UXO Scrap
47	17	UXO Scrap
48	2	UXO Scrap
49	10	False Positive
50	14	UXO Scrap
51	26	False Positive
52	7	False Positive
53	26	False Positive
54	6	False Positive
55	23	False Positive
56	13	False Positive
57	10	False Positive
58	7	UXO Scrap
59	8	UXO Scrap
60	27	False Positive
61	18	False Positive
62	7	False Positive
63	13	UXO Scrap
64	28	UXO Scrap
65	3	UXO Scrap

GRID RESULTS

Site Name: Northwest Peninsula
ector ID: 2
Grid Number: NP-10
Date: 06 Feb 96

Number of Anomalies: 165
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 54 + 6 SKIPS
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 17
Number of UXO Scrap Items Found: 37
Number of Surface UXO Items Found: 0
Sample Plan Number: 17

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 165

Cost Error: 1.0000
Risk Error: 0.0886

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-10
Date: 06 Feb 96

Sample Number	Sub-Grid Location	Description of Item
1	2	UXO Scrap
2	2	UXO Scrap
3	2	UXO Scrap
4	10	UXO Scrap
5	7	False Positive
6	6	False Positive
7	20	UXO Scrap
8	26	UXO Scrap
9	19	UXO Scrap
10	22	UXO Scrap
11	8	UXO Scrap
12	32	False Positive
13	14	UXO Scrap
14	19	False Positive
15	7	UXO Scrap
16	8	UXO Scrap
17	9	False Positive
18	14	UXO Scrap
19	7	UXO Scrap
20	27	UXO Scrap
21	10	False Positive
22	31	UXO Scrap
23	7	UXO Scrap
24	9	UXO Scrap
25	25	UXO Scrap
26	1	UXO Scrap
27	14	UXO Scrap
28	14	UXO Scrap
29	23	UXO Scrap
30	12	UXO Scrap
31	5	UXO Scrap
32	23	UXO Scrap
33	24	UXO Scrap
34	21	False Positive
35	9	False Positive
36	9	UXO Scrap
37	22	UXO Scrap
38	9	UXO Scrap
39	32	UXO Scrap
40	12	UXO Scrap
41	3	UXO Scrap
42	12	UXO Scrap
43	27	False Positive

44	27	UXO Scrap
45	2	False Positive
46	9	False Positive
47	7	False Positive
48	28	False Positive
49	22	UXO Scrap
50	3	UXO Scrap
51	2	False Positive
52	4	False Positive
53	14	False Positive
54	27	False Positive

GRID RESULTS

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-11
Date: 07 Feb 96

Number of Anomalies: 54
Length of Grid: 50 Feet
Width of Grid: 50 Feet
Grid Area: 2,500 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 17
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 16
Number of UXO Scrap Items Found: 1
Number of Surface UXO Items Found: 1
Sample Plan Number: 66

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 54

Cost Error: 1.0000
Risk Error: 0.0900

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-11
Date: 06 Feb 96

Sample Number	Sub-Grid Location	Description of Item
1	29	False Positive
2	25	False Positive
3	20	False Positive
4	9	False Positive
5	31	False Positive
6	8	False Positive
7	13	False Positive
8	27	False Positive
9	30	False Positive
10	4	False Positive
11	3	False Positive
12	22	False Positive
13	5	False Positive
14	17	UXO Scrap
15	7	False Positive
16	28	False Positive
17	1	False Positive

GRID RESULTS

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-12
Date: 06 Feb 96

Number of Anomalies: 146
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 29
Number of Sub-Surface UXO Items Found: 5
Number of False Positive Items Found: 13
Number of UXO Scrap Items Found: 11
Number of Surface UXO Items Found: 1
Sample Plan Number: 7

Expected Number of Sub-Surface UXO Items: 25
Expected Number of Non-UXO Items: 121

Cost Error: 0.1808
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-12
Date: 06 Feb 96

Sample Number	Sub-Grid Location	Description of Item
1	27	UXO Scrap
2	28	UXO Scrap
3	5	UXO Scrap
4	32	UXO Scrap
5	18	False Positive
6	18	UXO Scrap
7	13	False Positive
8	26	False Positive
9	12	UXO
10	9	False Positive
11	19	False Positive
12	22	UXO
13	32	UXO Scrap
14	13	UXO Scrap
15	6	UXO Scrap
16	3	False Positive
17	7	False Positive
18	15	False Positive
19	1	False Positive
20	27	UXO Scrap
21	30	False Positive
22	3	UXO
23	25	False Positive
24	17	False Positive
25	25	False Positive
26	12	UXO Scrap
27	14	UXO Scrap
28	16	UXO
29	12	UXO

GRID RESULTS

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-13
Date: 06 Feb 96

Number of Anomalies: 53
Length of Grid: 50 Feet
Width of Grid: 100 Feet
Grid Area: 5,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 20
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 20
Number of UXO Scrap Items Found: 0
Number of Surface UXO Items Found: 0
Sample Plan Number: 6

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 53

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-13
Date: 06 Feb 96

Sample Number	Sub-Grid Location	Description of Item
1	10	False Positive
2	14	False Positive
3	1	False Positive
4	1	False Positive
5	32	False Positive
6	30	False Positive
7	25	False Positive
8	4	False Positive
9	12	False Positive
10	28	False Positive
11	32	False Positive
12	20	False Positive
13	18	False Positive
14	21	False Positive
15	24	False Positive
16	14	False Positive
17	32	False Positive
18	6	False Positive
19	32	False Positive
20	24	False Positive

GRID RESULTS

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-14
Date: 06 Feb 96

Number of Anomalies: 89
Length of Grid: 50 Feet
Width of Grid: 100 Feet
Grid Area: 5,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 31
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 16
Number of UXO Scrap Items Found: 15
Number of Surface UXO Items Found: 0
Sample Plan Number: 32

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 89

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-14
Date: 06 Feb 96

Sample Number	Sub-Grid Location	Description of Item
1	21	UXO Scrap
2	29	False Positive
3	25	UXO Scrap
4	10	False Positive
5	19	UXO Scrap
6	30	UXO Scrap
7	20	UXO Scrap
8	23	UXO Scrap
9	23	UXO Scrap
10	20	UXO Scrap
11	31	UXO Scrap
12	26	UXO Scrap
13	19	UXO Scrap
14	5	UXO Scrap
15	12	UXO Scrap
16	14	False Positive
17	30	False Positive
18	31	False Positive
19	21	False Positive
20	32	False Positive
21	5	False Positive
22	12	False Positive
23	18	UXO Scrap
24	12	False Positive
25	18	False Positive
26	13	UXO Scrap
27	30	False Positive
28	31	False Positive
29	31	False Positive
30	11	False Positive
31	32	False Positive

GRID RESULTS

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-15
Date: 06 Feb 96

Number of Anomalies: 79
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 22
Number of Sub-Surface UXO Items Found: 5
Number of False Positive Items Found: 8
Number of UXO Scrap Items Found: 9
Number of Surface UXO Items Found: 0
Sample Plan Number: 80

Expected Number of Sub-Surface UXO Items: 18
Expected Number of Non-UXO Items: 61

Cost Error: 0.1947
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-15
Date: 06 Feb 96

Sample Number	Sub-Grid Location	Description of Item
1	31	UXO Scrap
2	6	UXO Scrap
3	19	False Positive
4	19	UXO Scrap
5	18	UXO Scrap
6	10	UXO
7	12	False Positive
8	22	UXO Scrap
9	30	UXO Scrap
10	17	UXO
11	4	UXO Scrap
12	12	False Positive
13	7	False Positive
14	24	False Positive
15	1	UXO
16	9	False Positive
17	25	UXO
18	13	UXO Scrap
19	7	UXO Scrap
20	7	False Positive
21	3	False Positive
22	4	UXO

GRID RESULTS

Site Name: Northwest Peninsula
ctor ID: 2
Grid Number: NP-16
Date: 12 Feb 96

Number of Anomalies: 140
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 28
Number of Sub-Surface UXO Items Found: 5
Number of False Positive Items Found: 17
Number of UXO Scrap Items Found: 6
Number of Surface UXO Items Found: 0
Sample Plan Number: 34

Expected Number of Sub-Surface UXO Items: 25
Expected Number of Non-UXO Items: 115

Cost Error: 0.1808
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-16
Date: 12 Feb 96

Sample Number	Sub-Grid Location	Description of Item
1	6	False Positive
2	11	False Positive
3	12	False Positive
4	25	UXO Scrap
5	14	False Positive
6	18	False Positive
7	25	UXO
8	20	False Positive
9	31	False Positive
10	23	UXO Scrap
11	18	UXO Scrap
12	29	UXO Scrap
13	5	False Positive
14	30	False Positive
15	1	False Positive
16	12	False Positive
17	7	UXO Scrap
18	8	False Positive
19	10	False Positive
20	16	False Positive
21	21	UXO
22	6	False Positive
23	8	UXO
24	28	False Positive
25	6	UXO
26	10	False Positive
27	25	UXO Scrap
28	20	UXO

GRID RESULTS

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-17
Date: 12 Feb 96

Number of Anomalies: 128
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 18
Number of Sub-Surface UXO Items Found: 5
Number of False Positive Items Found: 3
Number of UXO Scrap Items Found: 10
Number of Surface UXO Items Found: 2
Sample Plan Number: 42

Expected Number of Sub-Surface UXO Items: 36
Expected Number of Non-UXO Items: 92

Cost Error: 0.1677
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-17
Date: 12 Feb 96

Sample Number	Sub-Grid Location	Description of Item
1	13	False Positive
2	8	UXO
3	29	False Positive
4	27	UXO Scrap
5	5	False Positive
6	20	UXO Scrap
7	7	UXO Scrap
8	23	UXO Scrap
9	25	UXO Scrap
10	21	UXO
11	14	UXO Scrap
12	9	UXO
13	24	UXO Scrap
14	5	UXO Scrap
15	9	UXO
16	24	UXO Scrap
17	15	UXO Scrap
18	8	UXO

GRID RESULTS

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-18
Date: 12 Feb 96

Number of Anomalies: 51
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 23
Number of Sub-Surface UXO Items Found: 2
Number of False Positive Items Found: 11
Number of UXO Scrap Items Found: 10
Number of Surface UXO Items Found: 0
Sample Plan Number: 31

Expected Number of Sub-Surface UXO Items: 4
Expected Number of Non-UXO Items: 47

Cost Error: 1.0000
Risk Error: 0.0000

JTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-18
Date: 12 Feb 96

Sample Number	Sub-Grid Location	Description of Item
1	21	UXO Scrap
2	25	UXO Scrap
3	8	UXO Scrap
4	9	False Positive
5	5	UXO Scrap
6	29	UXO Scrap
7	9	UXO
8	18	UXO Scrap
9	9	UXO Scrap
10	4	False Positive
11	5	False Positive
12	1	False Positive
13	32	UXO
14	15	False Positive
15	11	False Positive
16	6	False Positive
17	20	UXO Scrap
18	12	False Positive
19	6	False Positive
20	11	UXO Scrap
21	5	False Positive
22	4	False Positive
23	31	UXO Scrap

GRID RESULTS

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-19
Date: 12 Feb 96

Number of Anomalies: 103
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 36
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 33
Number of UXO Scrap Items Found: 3
Number of Surface UXO Items Found: 1
Sample Plan Number: 94

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 103

Cost Error: 1.0000
Risk Error: 0.3288

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-19
Date: 12 Feb 96

Sample Number	Sub-Grid Location	Description of Item
1	6	False Positive
2	1	False Positive
3	11	False Positive
4	23	False Positive
5	25	False Positive
6	5	False Positive
7	32	False Positive
8	30	False Positive
9	13	False Positive
10	31	False Positive
11	24	False Positive
12	18	False Positive
13	24	False Positive
14	22	False Positive
15	26	False Positive
16	19	False Positive
17	16	False Positive
18	1	False Positive
19	2	False Positive
20	26	UXO Scrap
21	15	UXO Scrap
22	29	False Positive
23	24	False Positive
24	12	False Positive
25	31	False Positive
26	16	False Positive
27	1	False Positive
28	9	False Positive
29	27	False Positive
30	7	False Positive
31	30	False Positive
32	30	False Positive
33	16	False Positive
34	9	UXO Scrap
35	19	False Positive
36	16	False Positive

GRID RESULTS

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-20
Date: 08 Feb 96

Number of Anomalies: 131
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 44
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 35
Number of UXO Scrap Items Found: 9
Number of Surface UXO Items Found: 1
Sample Plan Number: 14

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 131

Cost Error: 1.0000
Risk Error: 0.0808

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-20
Date: 08 Feb 96

Sample Number	Sub-Grid Location	Description of Item
1	30	False Positive
2	7	False Positive
3	4	False Positive
4	22	False Positive
5	10	False Positive
6	24	False Positive
7	24	False Positive
8	15	False Positive
9	31	False Positive
10	11	UXO Scrap
11	23	False Positive
12	25	UXO Scrap
13	24	False Positive
14	23	False Positive
15	22	False Positive
16	13	UXO Scrap
17	6	False Positive
18	12	False Positive
19	9	False Positive
20	14	False Positive
21	10	False Positive
22	31	False Positive
23	24	UXO Scrap
24	20	False Positive
25	22	False Positive
26	27	False Positive
27	17	UXO Scrap
28	10	False Positive
29	27	False Positive
30	22	False Positive
31	3	False Positive
32	15	UXO Scrap
33	15	UXO Scrap
34	20	False Positive
35	14	False Positive
36	5	False Positive
37	10	False Positive
38	12	False Positive
39	21	False Positive
40	20	UXO Scrap
41	8	UXO Scrap
42	6	False Positive
43	32	False Positive
44	29	False Positive

GRID RESULTS

Site Name: Northwest Peninsula
ector ID: 2
Grid Number: NP-21
Date: 13 Feb 96

Number of Anomalies: 61
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 21
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 11
Number of UXO Scrap Items Found: 10
Number of Surface UXO Items Found: 4
Sample Plan Number: 13

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 61

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-21
Date: 13 Feb 96

Sample Number	Sub-Grid Location	Description of Item
1	14	UXO Scrap
2	21	UXO Scrap
3	29	False Positive
4	23	False Positive
5	5	False Positive
6	5	False Positive
7	4	False Positive
8	9	False Positive
9	2	UXO Scrap
10	2	UXO Scrap
11	17	UXO Scrap
12	31	False Positive
13	30	False Positive
14	27	UXO Scrap
15	32	UXO Scrap
16	16	UXO Scrap
17	2	False Positive
18	21	False Positive
19	17	UXO Scrap
20	20	UXO Scrap
21	8	False Positive

GRID RESULTS

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-22
Date: 13 Feb 96

Number of Anomalies: 91
Length of Grid: 100 Feet
Width of Grid: 100 Feet
Grid Area: 10,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 35
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 32
Number of UXO Scrap Items Found: 3
Number of Surface UXO Items Found: 2
Sample Plan Number: 53

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 91

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-22
Date: 13 Feb 96

Sample Number	Sub-Grid Location	Description of Item
1	15	False Positive
2	30	False Positive
3	26	False Positive
4	10	False Positive
5	26	False Positive
6	27	False Positive
7	27	UXO Scrap
8	1	False Positive
9	22	False Positive
10	4	False Positive
11	18	False Positive
12	20	False Positive
13	21	UXO Scrap
14	17	False Positive
15	27	False Positive
16	28	False Positive
17	3	False Positive
18	23	False Positive
19	17	False Positive
20	8	False Positive
21	21	False Positive
22	12	False Positive
23	13	False Positive
24	15	False Positive
25	12	False Positive
26	16	False Positive
27	3	False Positive
28	15	UXO Scrap
29	1	False Positive
30	15	False Positive
31	29	False Positive
32	16	False Positive
33	2	False Positive
34	14	False Positive
35	21	False Positive

GRID RESULTS

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-23
Date: 19 Feb 96

Number of Anomalies: 52
Length of Grid: 50 Feet
Width of Grid: 50 Feet
Grid Area: 2,500 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 18
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 8
Number of UXO Scrap Items Found: 10
Number of Surface UXO Items Found: 0
Sample Plan Number: 30

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 52

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-23
Date: 19 Feb 96

Sample Number	Sub-Grid Location	Description of Item
1	10	False Positive
2	9	False Positive
3	22	UXO Scrap
4	17	UXO Scrap
5	12	False Positive
6	21	UXO Scrap
7	4	False Positive
8	26	UXO Scrap
9	11	UXO Scrap
10	30	False Positive
11	16	UXO Scrap
12	5	UXO Scrap
13	30	False Positive
14	29	UXO Scrap
15	18	UXO Scrap
16	13	UXO Scrap
17	28	False Positive
18	32	False Positive

GRID RESULTS

Site Name: Northwest Peninsula
Sector ID: 1
Grid Number: NP-24
Date: 19 Feb 96

Number of Anomalies: 86
Length of Grid: 50 Feet
Width of Grid: 50 Feet
Grid Area: 2,500 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 28
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 12
Number of UXO Scrap Items Found: 16
Number of Surface UXO Items Found: 0
Sample Plan Number: 62

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 86

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 1
Grid Number: NP-24
Date: 19 Feb 96

Sample Number	Sub-Grid Location	Description of Item
1	20	UXO Scrap
2	14	False Positive
3	12	False Positive
4	29	False Positive
5	30	False Positive
6	13	UXO Scrap
7	29	UXO Scrap
8	10	UXO Scrap
9	24	False Positive
10	26	UXO Scrap
11	8	UXO Scrap
12	12	UXO Scrap
13	29	UXO Scrap
14	8	False Positive
15	13	UXO Scrap
16	25	False Positive
17	28	UXO Scrap
18	13	False Positive
19	15	UXO Scrap
20	23	UXO Scrap
21	2	False Positive
22	22	False Positive
23	24	UXO Scrap
24	11	False Positive
25	10	UXO Scrap
26	25	UXO Scrap
27	17	False Positive
28	10	UXO Scrap

GRID RESULTS

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-25
Date: 20 Feb 96

Number of Anomalies: 140
Length of Grid: 100 Feet
Width of Grid: 50 Feet
Grid Area: 5,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 45
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 27
Number of UXO Scrap Items Found: 18
Number of Surface UXO Items Found: 0
Sample Plan Number: 90

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 140

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-25
Date: 20 Feb 96

Sample Number	Sub-Grid Location	Description of Item
1	13	False Positive
2	13	False Positive
3	7	False Positive
4	11	UXO Scrap
5	31	UXO Scrap
6	12	UXO Scrap
7	31	UXO Scrap
8	21	UXO Scrap
9	5	False Positive
10	24	UXO Scrap
11	16	UXO Scrap
12	3	UXO Scrap
13	14	UXO Scrap
14	1	UXO Scrap
15	13	UXO Scrap
16	5	UXO Scrap
17	17	False Positive
18	15	UXO Scrap
19	32	False Positive
20	9	UXO Scrap
21	19	UXO Scrap
22	18	UXO Scrap
23	12	UXO Scrap
24	23	False Positive
25	1	UXO Scrap
26	28	False Positive
27	23	False Positive
28	19	False Positive
29	1	False Positive
30	25	False Positive
31	9	False Positive
32	1	False Positive
33	18	False Positive
34	2	False Positive
35	14	False Positive
36	13	False Positive
37	17	False Positive
38	26	False Positive
39	15	False Positive
40	11	False Positive
41	3	False Positive
42	31	False Positive
43	13	False Positive

44	18	False Positive
45	19	False Positive

GRID RESULTS

Site Name: Northwest Peninsula
Sector ID: 1
Grid Number: NP-26
Date: 20 Feb 96

Number of Anomalies: 83
Length of Grid: 50 Feet
Width of Grid: 50 Feet
Grid Area: 2,500 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 27
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 11
Number of UXO Scrap Items Found: 16
Number of Surface UXO Items Found: 0
Sample Plan Number: 77

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 83

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 1
Grid Number: NP-26
Date: 20 Feb 96

Sample Number	Sub-Grid Location	Description of Item
1	15	UXO Scrap
2	2	UXO Scrap
3	20	UXO Scrap
4	21	UXO Scrap
5	10	False Positive
6	31	UXO Scrap
7	15	UXO Scrap
8	14	UXO Scrap
9	14	False Positive
10	27	UXO Scrap
11	27	UXO Scrap
12	18	UXO Scrap
13	7	UXO Scrap
14	23	False Positive
15	19	False Positive
16	28	UXO Scrap
17	5	False Positive
18	15	False Positive
19	10	False Positive
20	16	False Positive
21	18	UXO Scrap
22	18	False Positive
23	1	UXO Scrap
24	6	UXO Scrap
25	18	UXO Scrap
26	12	False Positive
27	29	False Positive

GRID RESULTS

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-27
Date: 21 Feb 96

Number of Anomalies: 70
Length of Grid: 50 Feet
Width of Grid: 50 Feet
Grid Area: 2,500 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 25
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 6
Number of UXO Scrap Items Found: 19
Number of Surface UXO Items Found: 0
Sample Plan Number: 38

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 70

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-27
Date: 21 Feb 96

Sample Number	Sub-Grid Location	Description of Item
1	19	UXO Scrap
2	30	UXO Scrap
3	13	UXO Scrap
4	11	UXO Scrap
5	14	UXO Scrap
6	30	UXO Scrap
7	22	UXO Scrap
8	30	UXO Scrap
9	4	UXO Scrap
10	21	False Positive
11	28	False Positive
12	6	UXO Scrap
13	18	UXO Scrap
14	28	UXO Scrap
15	29	False Positive
16	11	False Positive
17	11	UXO Scrap
18	27	UXO Scrap
19	27	UXO Scrap
20	7	False Positive
21	26	UXO Scrap
22	12	UXO Scrap
23	17	False Positive
24	32	UXO Scrap
25	23	UXO Scrap

GRID RESULTS

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-28
Date: 21 Feb 96

Number of Anomalies: 97
Length of Grid: 100 Feet
Width of Grid: 50 Feet
Grid Area: 5,000 Square Feet
Clearance Depth: 3.00 Feet

Number of Samples: 32
Number of Sub-Surface UXO Items Found: 0
Number of False Positive Items Found: 20
Number of UXO Scrap Items Found: 12
Number of Surface UXO Items Found: 0
Sample Plan Number: 64

Expected Number of Sub-Surface UXO Items: 0
Expected Number of Non-UXO Items: 97

Cost Error: 1.0000
Risk Error: 0.0000

NOTE:

Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated.

Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated.

GRIDSTATS SAMPLING SEQUENCE

Site Name: Northwest Peninsula
Sector ID: 2
Grid Number: NP-28
Date: 21 Feb 96

Sample Number	Sub-Grid Location	Description of Item
1	7	UXO Scrap
2	5	False Positive
3	27	False Positive
4	31	UXO Scrap
5	28	False Positive
6	24	False Positive
7	8	False Positive
8	23	UXO Scrap
9	26	False Positive
10	32	UXO Scrap
11	4	False Positive
12	12	False Positive
13	6	UXO Scrap
14	5	False Positive
15	3	False Positive
16	19	UXO Scrap
17	1	False Positive
18	28	UXO Scrap
19	7	False Positive
20	24	UXO Scrap
21	9	False Positive
22	13	False Positive
23	27	UXO Scrap
24	15	False Positive
25	1	False Positive
26	1	False Positive
27	30	False Positive
28	3	UXO Scrap
29	32	False Positive
30	5	UXO Scrap
31	29	UXO Scrap
32	28	False Positive

APPENDIX F

ORS DELIVERY DOCUMENTS

I certify that the property listed here on has been inspected by me and to the best of my knowledge and belief, contains no item of a dangerous nature.

William A. Brindle JR.

22 Feb 96

William A. Brindle JR.
Field Operations Manager
Sr. UXO Site Supervisor

Date

DOC IDENT | RI FROM | M&S | FSC | STOCK NUMBER NIIN | ADD | UNIT OF ISSUE | QUANTITY | DOCUMENT NUMBER REQUISITIONER DATE SERIAL | DEMAND | SUPPLEMENTARY ADDRESS | SIGNAL | FUND | DISTRIBUTION | PROJECT | PRIORITY | REQD DEL DATE | ADVICE | COND CODE | UNIT PRICE DOLLARS CTS

SCRAP

1700 N2VGA 6051 0001

NA

S

SHIPPED FROM

(309) NAVAL STATION ROOS RDS PR

SHIP TO

DRMO
Box 3988
PR AA 34051

MARK FOR

PROJECT

TOTAL PRICE DOLLARS CTS

WAREHOUSE LOCATION | TYPE OF CARGO | UNIT PACK | UNIT WEIGHT | UNIT CUBE | UFC | NMFC | FREIGHT RATE | DOCUMENT DATE | SHIP CONT | QUANTITY

SUBSTITUTE DATA (ITEM ORIGINALLY REQUISITIONED)

FREIGHT CLASSIFICATION NOMENCLATURE

ITEM NOMENCLATURE

SCRAP STEEL

SHIPPERS USE: SELECTED BY AND DATE | TYPE OF CONTAINER(S) | TOTAL WEIGHT

PACKED BY AND DATE | NO. OF CONTAINER(S) | TOTAL CUBE

RECEIVERS USE: RECEIVED BY AND DATE

2-22-96

INSPECTED BY AND DATE

WAREHOUSED BY AND DATE

WAREHOUSE LOCATION

REMARKS

FIRST DESTINATION ADDRESS

DATE SHIPPED

PROOF OF DELIVERY

This stamp indicates physical receipt of property at the DRMO which is subject to inspection and verification of quantity. It does not constitute acceptance of accountability. Your "official receipt" will be forwarded at a later date.

12. TRANSPORTATION CHARGEABLE TO

14. BILL OF LADING, AWB, OR RECEIVER'S SIGNATURE AND DATE

15. RECEIVER'S DOCUMENT NUMBER

DD FORM 1348-1 1 MAR 74

DATE EXPENDED

DOD SINGLE LINE ITEM RELEASE/RECEIPT DOCUMENT

4

APPENDIX G

ORDNANCE ACCOUNTABILITY, DEMOLITION RECORD, EXPLOSIVES ACCOUNTABILITY LOG, AND ORDNANCE DATA

EODT ORDNANCE ACCOUNTABILITY LOG

Locaiton/Area: CULEBRITA IS 'Contract #: 5014 Log #: 01 (01 - 99)

DATE (m/d/y)	QTY/ UNIT	NOMENCLATURE †	FUZE/CONDITION ‡	LOCATION *	DISPOSITION !	VERIFIED Δ	PHOTO Y/N
12-14-95	1	20MM HEI	FIRED	IC6-1	BIP W DETCORD	MAB AQA	Y
12-14-95	1	20 MM HEI	FIRED	IC6-3	BIP W DETCORD	MAB AQA	Y
12-14-95	1	20 MM HEI	FIRED	IC6-5	BIP W DETCORD	MAB AQA	Y
12-14-95	1	20 MM HEI	FIRED	IC6-6	BIP W DETCORD	MAB AQA	N
12-14-95	1	20MM HEI	FIRED	IC6-6	BIP W DETCORD	MAB AQA	Y
12-14-95	1	20MM HEI	FIRED	IC6-7	BIP W DETCORD	MAB AQA	Y
12-14-95	1	20MM HEI	FIRED	IC6-7	BIP W DETCORD	MAB AQA	N
12-14-95	1	20MM HEI	FIRED	IC6-8	BIP W DETCORD	MAB AQA	N
12-14-95	1	20MM HEI	FIRED	IC6-10	BIP W DETCORD	MAB AQA	N
12-14-95	1	20 MM HEI	FIRED	IC6-10	BIP W DETCORD	MAB AQA	N
12-14-95	1	20 MM HEI	FIRED	IC6-12	BIP W DETCORD	MAB AQA	N
12-14-95	1	20 MM HEI	FIRED	IC6-15	BIP W DETCORD	MAB AQA	N
12-14-95	1	20 MM HEI	FIRED	IC6-17	BIP W DETCORD	MAB AQA	N
12-14-95	1	20 MM HEI	FIRED	IC6-18	BIP W DETCORD	MAB AQA	N
12-14-95	1	20MM HEI	FIRED	IC6-19	BIP W DETCORD	MAB AQA	N

† Description, with MK numbers, M number and Mods as applicable.

‡ Use M number, MK numbers and Mods as applicable, UNK = "Unknown", None or N/A = "No fuzing present".

* Include: Area & Sub-area designation or map reference.

! Enter Heading(s) and Date. Headings: DST = "Destroyed", MAG = "Magazine Holding Area", EOD = "Turned over to local EOD for disposal", DRMO = "Scrap turned into Defense Reutilization", BIP = "Blown-in-place".

Δ Initials - Site Supervisor/Sr. UXO Supervisor to verify Recovery/Disposal.

EODT ORDNANCE ACCOUNTABILITY LOG

Location/Area: Culebra, P.R. Contract #: 5014 Log #: 02 (01 - 99)

DATE (m/d/y)	QTY/ UNIT	NOMENCLATURE †	FUZE/CONDITION ‡	LOCATION *	DISPOSITION !	VERIFIED Δ	PHOTO Y/N
12-14-95	1	20mm HEI	FIRED	IC6-19	BIP W DETCORD	[illegible] HGA	N
12-14-95	1	20 MM HEI	FIRED	IC6-20	BIP W DETCORD	[illegible] HGA	N
12-14-95	1	20 MM HEI	FIRED	IC6-20	BIP W DETCORD	[illegible] HGA	N
12-14-95	1	20MM HEI	FIRED	IC6-22	BIP W DETCORD	[illegible] HGA	N
12-14-95	1	20 MM HEI	FIRED	IC6-22	BIP W DETCORD	[illegible] HGA	N
12-14-95	1	20 MM HEI	FIRED	IC6-22	BIP W DETCORD	[illegible] HGA	N
12-14-95	1	20 MM HEI	FIRED	IC6-23	BIP W DETCORD	[illegible] HGA	N
12-14-95	1	20 MM HEI	FIRED	IC6-23	BIP W DETCORD	[illegible] HGA	N
12-14-95	1	20 MM HEI	FIRED	IC6-25	BIP W DETCORD	[illegible] HGA	N
12-14-95	1	20 MM HEI	FIRED	IC6-27	BIP W DETCORD	[illegible] HGA	N
12-14-95	1	20 MM HEI	FIRED	IC6-28	BIP W DETCORD	[illegible] HGA	N
12-14-95	1	20 MM HEI	FIRED	IC6-29	BIP W DETCORD	[illegible] HGA	N
12-14-95	1	20MM HEI	FIRED	IC6-31	BIP W DETCORD	[illegible] HGA	N
12-14-95	1	20MM HEI	FIRED	IC6-32	BIP W DETCORD	[illegible] HGA	N
12-21-95	1	20MM HEI	FIRED	IC 5-5	BIP W DETCORD	[illegible] HGA	Y

† Description, with MK numbers, M number and Mods as applicable.
‡ Use M number, MK numbers and Mods as applicable, UNK = "Unknown", None or N/A = "No fuzing present".
* Include: Area & Sub-area designation or map reference.

! Enter Heading(s) and Date. Headings: DST = "Destroyed", MAG = "Magazine Holding Area", EOD = "Turned over to local EOD for disposal", DRMO = "Scrap turned into Defense Reutilization", BIP = "Blown-in-place".
Δ Initials - Site Supervisor/Sr. UXO Supervisor to verify Recovery/Disposal.

EODT ORDNANCE ACCOUNTABILITY LOG

Locaiton/Area: Culebra, P.R. Contract #: 5014 Log #: 03 (01-95)

DATE (m/d/y)	QTY/ UNIT	NOMENCLATURE †	FUZE/CONDITION ‡	LOCATION *	DISPOSITION !	VERIFIED Δ	PHOTO Y/N
12/21/95	1	20 MM HEI	FIRED	IC5-5'	BIP W/DETCORD	MAB AQA	Y
12/21/95	1	20 MM HEI	FIRED	IC5-5'	BIP W/DETCORD	MAB AQA	N
12/21/95	1	20 MM HEI	FIRED	IC5-5'	BIP W/DETCORD	MAB AQA	N
12/21/95	1	20 MM HEI	FIRED	IC5-5'	BIP W/DETCORD	MAB AQA	N
12/21/95	1	20 MM HEI	FIRED	IC4-5'	BIP W/DETCORD	MAB AQA	Y
12/21/95	1	20 MM HEI	FIRED	IC4-5'	BIP W/DETCORD	MAB AQA	Y
12/21/95	1	20 MM HEI	FIRED	IC4-5'	BIP W/DETCORD	MAB AQA	N
12/21/95	1	20 MM HEI	FIRED	IC4-5'	BIP W/DETCORD	MAB AQA	N
12/21/95	1	20 MM HEI	FIRED	IC4-5'	BIP W/DETCORD	MAB AQA	N
12/27/95	1	MK 76/CART	N/A	B01	VENTED	MAB AQA	Y
12/27/95	1	MK 76/W CART	N/A	B01	VENTED	MAB AQA	Y
12/27/95	1	MK-76/W CART	N/A	B01	VENTED	MAB AQA	Y
12/27/95	1	MK 76/W CART	N/A	B01	VENTED	MAB AQA	N
12/27/95	1	MK-76/W CART	N/A	B01	VENTED	MAB AQA	N
12/27/95	1	MK-76/CART	N/A	B01	VENTED	MAB AQA	N

† Description, with MK numbers, M number and Mods as applicable.
‡ Use M number, MK numbers and Mods as applicable. UNK = "Unknown", None or N/A = "No fuzing present".
* Include: Area & Sub-area designation or map reference.

! Enter Heading(s) and Date. Headings: DST = "Destroyed", MAG = "Magazine Holding Area", EOD = "Turned over to local EOD for disposal", DRMO = "Scrap turned into Defense Reutilization", BIP = "Blown-in-place".
Δ Initials - Site Supervisor/Sr. UXO Supervisor to verify Recovery/Disposal.

EODT ORDNANCE ACCOUNTABILITY LOG

Location/Area: Culebra P.R. Contract #: 5014 Log #: 04 (01 - 99)

DATE (m/d/y)	QTY/ UNIT	NOMENCLATURE †	FUZE/CONDITION ‡	LOCATION *	DISPOSITION !	VERIFIED Δ	PHOTO Y/N
12/27/95	1	NGF 6"	N/A	BO-1	BIP	UXO AGA	N
12/27/95	9	MK 76 w/cart	N/A	BO-2	VENTED	UXO AGA	Y
12/27/95	1	MK-76 w/cart	N/A	BO-2	VENTED	UXO AGA	Y
12/27/95	1	MK-76 w/cart	N/A	BO-2	VENTED	UXO AGA	Y
12/27/95	1	MK-76 w/cart	N/A	BO-2	VENTED	UXO AGA	N
12/27/95	1	MK-76 w/cart	N/A	BO-2	VENTED	UXO AGA	N
12/27/95	1	MK-76 w/cart	N/A	BO-2	VENTED	UXO AGA	N
12/27/95	1	MK-76 w/cart	N/A	BO-2	VENTED	UXO AGA	N
12/27/95	1	MK76 w/cart	N/A	BO-2	VENTED	UXO AGA	N
12/27/95	1	MK76 w/cart	N/A	BO-2	VENTED	UXO AGA	N
12/27/95	1	MK-76 w/cart	N/A	BO-2	VENTED	UXO AGA	N
12/27/95	1	MK-76 w/cart	N/A	BO-2	VENTED	UXO AGA	N
12/27/95	1	MK76 w/cart	N/A	BO-2	VENTED	UXO AGA	N
12/27/95	1	MK-4 cart	N/A	BO-2	VENTED	UXO AGA	N
12/27/95	1	5"38, HE, MK-50 MOD-2 FZ	FIRED	FR-6	BIP	UXO AGA	Y

† Description, with MK numbers, M number and Mods as applicable.
‡ Use M number, MK numbers and Mods as applicable, UNK = "Unknown", None or N/A = "No fuzing present".
* Include: Area & Sub-area designation or map reference.
! Enter Heading(s) and Date. Headings: DST = "Destroyed", MAG = "Magazine Holding Area", EOD = "Turned over to local EOD for disposal", DRMO = "Scrap turned into Defense Reutilization", BIP = "Blown-in-place".
Δ Initials - Site Supervisor/Sr. UXO Supervisor to verify Recovery/Disposal.

EODT ORDNANCE ACCOUNTABILITY LOG

Localton/Area: Culebra P.R. Contract #: 5014 Log #: 05

DATE (m/d/y)	QTY/ UNIT	NOMENCLATURE †	FUZE/CONDITION ‡	LOCATION ✱	DISPOSITION !	VERIFIED Δ	PHOTO Y/N
12/27/95	1	37mm PROJ, NO FUZE	N/A	FB-6	BIP	WB DEH	Y
12/27/95	1	5" BARRAGE RKT, W/A SAND FILLED	FIRED	FB-6	BIP	WB DEH	Y
12/27/95	1	5" ILLUM CANDLE, PARTIAL	N/A	FB-6	BIP	WB DEH	N
12/27/95	1	5" ILLUM CANDLE, PARTIAL	N/A	FB-6	BIP	WB DEH	N
01/05/96	1	76 mm PROJ.	NONE	found off AQ-1	BIP	WB AGA	N
01/05/96	1	MK 76 w/CART	N/A	AQ-1	BIP	WB AGA	Y
01/05/96	1	MK 76 w/CART	N/A	AQ-1	BIP	WB AGA	Y
01/05/96	1	MK 76 w/CART	N/A	AQ-1	BIP	WB AGA	N
01/05/96	1	MK 76 w/CART	N/A	AQ-1	BIP	WB AGA	N
01/05/96	1	MK 76 w/CART	N/A	AQ-1	BIP	WB AGA	N
01/05/96	1	MK 76 w/CART	N/A	AQ-1	BIP	WB AGA	N
01/05/96	1	MK 76 w/CART	N/A	AQ-1	BIP	WB AGA	N
01/05/96	1	MK 76 w/CART	N/A	AQ-1	BIP	WB AGA	N
01/05/96	1	MK 76 w/CART	N/A	AQ-1	BIP	WB AGA	N
01/05/96	1	MK 76 w/CART	N/A	AQ-1	BIP	WB AGA	N

† Description, with MK numbers, M number and Mods as applicable.
‡ Use M number, MK numbers and Mods as applicable, UNK = "Unknown", None or N/A = "No fuzing present".
✱ Include: Area & Sub-area designation or map reference.

! Enter Heading(s) and Date. Headings: DST = "Destroyed", MAG = "Magazine Holding Area", EOD = "Turned over to local EOD for disposal", DRMO = "Scrap turned into Defense Reutilization", BIP = "Blown-in-place".
Δ Initials - Site Supervisor/Sr. UXO Supervisor to verify Recovery/Disposal.

EODT ORDNANCE ACCOUNTABILITY LOG

Locaiton/Area: Culebra, P.R. Contract #: 5014 / 5014 B Log #: 06 (01 - 99)

DATE (m/d/y)	QTY/ UNIT	NOMENCLATURE †	FUZE/CONDITION ‡	LOCATION *	DISPOSITION !	VERIFIED Δ	PHOTO Y/N
01/05/96	1	MK 76 w/CART	N/A	AQ-1	BIP	MAB AQN	N
01/05/96	1	MK 76 w/CART	N/A	AQ-1	BIP	MAB AQN	N
01/05/96	1	MK 76 w/CART	N/A	AQ-1	BIP	MAB AQN	N
01/05/96	1	MK 76 w/CART	N/A	AQ-1	BIP	MAB AQN	N
01/05/96	1	MK 76 w/CART	N/A	AQ-1	BIP	MAB AQN	N
01/05/96	1	MK 76 w/CART	N/A	AQ-1	BIP	MAB AQN	N
01/16/96	1	5" ILLUM CANDLE	N/A	NP-4	BIP	MAB DGA	Y
01/16/96	1	5" ILLUM CANDLE	N/A	NP-4	BIP	MAB DGA	Y
01/16/96	1	5" ILLUM CANDLE	N/A	NP-4	BIP	MAB DGA	Y
01/16/96	1	3" PROJO	N/A FIRED	NP-1	BIP	MAB DGA	N
01/16/96	1	3" PROJO	N/A FIRED	NP-3	BIP	MAB DGA	Y
01/16/96	1	3" PROJO	N/A FIRED	NP-3	BIP	MAB DGA	Y
01/08/96	1	5" ROCKET, HAVAR	SHEARED	NP-11	BIP	MAB DGA	Y
02/08/96	1	3" PROJO	N/A	NP-12	BIP	MAB DGA	Y
02/08/96	1	3" PROJO	N/A	NP-12	BIP	MAB DGA	Y

† Description, with MK numbers, M number and Mods as applicable.

‡ Use M number, MK numbers and Mods as applicable, UNK = "Unknown", None or N/A = "No fuzing present".

* Include: Area & Sub-area designation or map reference.

! Enter Heading(s) and Date. Headings: DST = "Destroyed", MAG = "Magazine Holding Area", EOD = "Turned over to local EOD for disposal", DRMO = "Scrap turned into Defense Reutilization", BIP = "Blown-in-place".

Δ Initials - Site Supervisor/Sr. UXO Supervisor to verify Recovery/Disposal.

EODT ORDNANCE ACCOUNTABILITY LOG

Locaiton/Area: CULEBRA, P.R Contract #: 5014B Log #: 07 (01-30)

DATE (m/d/y)	QTY/ UNIT	NOMENCLATURE †	FUZE/CONDITION ‡	LOCATION *	DISPOSITION !	VERIFIED Δ	PHOTO Y/N
02/08/96	42	MK 76 w/ CART	MK-4 CART	NP-15	BIP	MAB	Y
02/08/96	1	3" ILLUM CANDLE	N/A	NP-15	BIP	MAB	Y
02/08/96	1	5" ILLUM CANDLE	N/A	NP-15	BIP	MAB	Y
02/08/96	1	5" ILLUM CANDLE	N/A	NP-15	BIP	MAB	Y
02/08/96	1	BASE FUSE, PROJ, UNK	SHEARED	NP-12	BIP	MAB	Y
02/08/96	1	BASE FUSE, PROJ UNK	SHEARED	NP-12	BIP	MAB	Y
02/08/96	1	20 MM, HE	N/A	NP-12	BIP	MAB	Y
02/08/96	1	MK-23 PRAC. BOMB	N/A	NP-12	BIP	MAB	Y
02/14/96	1	6" PROJ	SHEARED	NP 16	BIP	MAB	Y
02/14/96	1	81 MM MORTOR	NO FUSE	NP 16	BIP	MAB	Y
02/14/96	1	5" PROJ	SHEARED	NP 16	BIP	MAB	Y
02/14/96	1	3" PROJ	SHEARED	NP 16	BIP	MAB	Y
02/14/96	1	6" PROJ	SHEARED	NP 16	BIP	MAB	Y
02/14/96	1	3" PROJ	SHEARED	NP 17	BIP	MAB	Y
02/14/96	1	5" PROJ	SHEARED	NP 17	BIP	MAB	Y

† Description, with MK numbers, M number and Mods as applicable.
‡ Use M number, MK numbers and Mods as applicable, UNK = "Unknown", None or N/A = "No fuzing present".
* Include: Area & Sub-area designation or map reference.
! Enter Heading(s) and Date. Headings: DST = "Destroyed", MAG = "Magazine Holding Area", EOD = "Turned over to local EOD for disposal", DRMO = "Scrap turned into Defense Reutilization", BIP = "Blown-in-place".
Δ Initials - Site Supervisor/Sr. UXO Supervisor to verify Recovery/Disposal.

EODT ORDNANCE ACCOUNTABILITY LOG

Locaiton/Area: CULEBRA P.R. Contract #: 50148 Log #: 08 (01 - 99)

DATE (m/d/y)	QTY/ UNIT	NOMENCLATURE †	FUZE/CONDITION ‡	LOCATION *	DISPOSITION !	VERIFIED Δ	PHOTO Y/N
02/14/96	1	5" PROJO	SHEARED	NP 17	BIP	[illegible]	Y
02/14/96	1	5" PROJO	SHEARED	NP 17	BIP	[illegible]	Y
02/14/96	1	6" PROJO	SHEARED	NP 17	BIP	[illegible]	Y
02/14/96	1	GRENADE	NO FUZE	NP 17	BIP	[illegible]	Y
02/14/96	1	5" PROJO (PARTIAL)	NO FUZE	NP 17	BIP	[illegible]	Y
02/14/96	1	PROJO BASE FUSE	N/A	NP 21	BIP	[illegible]	Y
02/14/96	1	6" PROJO	SHEARED	NP 21	BIP	[illegible]	Y
02/14/96	1	6" PROJO	SHEARED	NP 21	BIP	[illegible]	Y
02/14/96	1	81 mm MORTOR	NO FUZE	NP 21	BIP	[illegible]	Y
02/15/96	1	5" PROJO	ERODED OFF	NP 20	~~BIP~~ BIP	[illegible]	Y
02/15/96	1	5" PROJO	NO FUZE	NP 18	BIP	[illegible]	Y
02/15/96	1	5" PROJO	NO FUZE	NP 18	BIP	[illegible]	Y
02/15/96	1	5" CANDLE (ILLUM)	N/A	NP 22	BIP	[illegible]	Y
02/15/96	1	5" CANDLE (ILLUM)	N/A	NP 22	BIP	[illegible]	Y
02/15/96	1	5" CANDLE (ILLUM)	N/A	NP 19	BIP	[illegible]	Y

† Description, with MK numbers, M number and Mods as applicable.

‡ Use M number, MK numbers and Mods as applicable, UNK = "Unknown", None or N/A = "No fuzing present".

* Include: Area & Sub-area designation or map reference.

! Enter Heading(s) and Date. Headings: DST = "Destroyed", MAG = "Magazine Holding Area", EOD = "Turned over to local EOD for disposal", DRMO = "Scrap turned into Defense Reutilization", BIP = "Blown-in-place".

Δ Initials - Site Supervisor/Sr. UXO Supervisor to verify Recovery/Disposal.

EODT BLAST RECORD

Site / Location: IC-6 / CULEBRITA		Date: 14 DEC 95
Blasting Supervisor: AL ASHTON	Signature: A.J. Ashton	License #: 001-0040-0002
Type of UXO/OEW Blasted: 20 MM HEI	Firing Method: NON. ELEC	Time of Blast: 1400
Type of Demolition Materials: (i.e. perforator/det cord/time fuze/elect/non-elect/2 Comp.) DET CORD / TIME FUSE / CAPS / FUSE LIGHT	Amount/# of Each Item Used: 44' DET, 14' TIME 2 CAPS 2 FUSE LIGHT	
Distance & Direction to Nearest Building, Road/Utility Line, etc. N/A	Temp 85 Wind Dir/Speed: 15 MPH Ceiling CLEAR Clouds/% Sun SUN	
Type/Amount of Stemming/Tamp: 3' SAND	Mat or Other Protection Used (list):	
Seismographic/Sound Level Meter Used: Yes___ No X	Readings:	

Site / Location: IC-5 / CULEBRITA		Date: 21 DEC 95
Blasting Supervisor: AL ASHTON	Signature: Alfred J Ashton	License #: 001-0040-0002
Type of UXO/OEW Blasted: 20MM HEI	Firing Method: NON ELEC	Time of Blast: 1529
Type of Demolition Materials: (i.e. perforator/det cord/time fuze/elect/non-elect/2 Comp.) DET CORD / TIME FUSE / CAPS / FUSE LIGHTERS	Amount/# of Each Item Used: 20' DET CORD - 14' TIME - 2 CAPS 2 FUSE LIGHT	
Distance & Direction to Nearest Building, Road, Utility Line, etc. N/A	Temp 75 Wind Dir/Speed: 5 MPH Ceiling CLEAR Clouds/% Sun SUN	
Type/Amount of Stemming/Tamp: 3' SAND	Mat or Other Protection Used (list):	
Seismographic/Sound Level Meter Used: Yes___ No X	Readings:	

Site / Location: IC-4 / CULEBRITA		Date: 21 DEC 95
Blasting Supervisor: AL ASHTON	Signature: Alfred J Ashton	License #: 001-0040-0002
Type of UXO/OEW Blasted: 20 MM HEI	Firing Method: NON ELEC	Time of Blast: 15:44
Type of Demolition Materials: (i.e. perforator/det cord/time fuze/elect/non-elect/2 Comp.) DET CORD / TIME FUSE / CAPS / FUSE LIGHTERS	Amount/# of Each Item Used: 2 CAPS 2 FUSE LIGHT 20' DET CORD - 14' TIME FUSE	
Distance & Direction to Nearest Building, Road, Utility Line, etc. N/A	Temp 75 Wind Dir/Speed: 5 MPH Ceiling CLEAR Clouds/% Sun SUN	
Type/Amount of Stemming/Tamp: 3' SAND	Mat or Other Protection Used (list):	
Seismographic/Sound Level Meter Used: Yes___ No X	Readings:	

EODT BLAST RECORD

Site / Location: BOI / BOTELLA		Date: 27 DEC 95
Blasting Supervisor: AL ASHTON	Signature: Alfred J Ashton	License #: 001-0040-0002
Type of UXO/OEW Blasted: (18) 76's (1) CARTridge (1) 1/2 OF 8" HE	Firing Method: NON-ELEC	Time of Blast: 15:17
Type of Demolition Materials: (i.e. perforator/det cord/time fuze/electric/non-elect/2 Comp.) ① DET CORD / ② TIME FUSE / ③ CAPS / ④ FUSE LIGHTERS ⑤ PERFS		Amount/# of Each Item Used: ① 28' / ② 14' / ③ 2 / ④ 2 / ⑤ 20
Distance & Direction to Nearest Building, Road, Utility Line, etc.: N/A	Temp 95 Wind Dir./Speed: 10 Ceiling CLEAR Clouds/% Sun SUN	
Type/Amount of Stemming/Tamp: 3' SAND		Mat or Other Protection Used (list):
Seismographic/Sound Level Meter Used: Yes ___ No X	Readings:	

Site / Location: FB-6 - FLAMENCO BEACH		Date: 27 DEC 95
Blasting Supervisor: DAVE GARRON	Signature: Dave Garron	License #: 001-0040-0001
Type of UXO/OEW Blasted: 1-5"38, 15" RKT w/1-37MM, 2-5" ILLUM CANDLE RKT	Firing Method: NON-ELEC	Time of Blast: 1510 HRS
Type of Demolition Materials: (i.e. perforator/det cord/time fuze/elect/non-elect/2 Comp.) ① DET CORD, ② TIME FUSE, ③ CAPS NE, ④ FUSE LITERS, ⑤ PERFS		Amount/# of Each Item Used: ① 65', ② 33', ③ 2, ④ 2, ⑤ 5
Distance & Direction to Nearest Building, Road, Utility Line, etc.: 1250 FT	Temp 95 Wind Dir./Speed: 10 Ceiling CLEAR Clouds/% Sun SUN	
Type/Amount of Stemming/Tamp: 3' TAMP SAND		Mat or Other Protection Used (list): N/A
Seismographic/Sound Level Meter Used: Yes ___ No X	Readings:	

Site / Location: AO-1 CAYO DEL AGUA		Date: 05 JAN 96
Blasting Supervisor: AL ASHTON	Signature: Alfred J Ashton	License #: 001-0040-0002
Type of UXO/OEW Blasted: (16) 76's W/CART (1) 75MM	Firing Method: NON-ELEC	Time of Blast: 10:41
Type of Demolition Materials: (i.e. perforator/det cord/time fuze/elect/non-elect/2 Comp.) ① DET CORD / ② TIME FUSE / ③ CAPS / ④ FUSE LIGHTERS ⑤ PERFS		Amount/# of Each Item Used: ① 20' / ② 14' / ③ 2 / ④ 2 / ⑤ 17
Distance & Direction to Nearest Building, Road, Utility Line, etc.: N/A	Temp 95 Wind Dir./Speed: 5 Ceiling CLEAR Clouds/% Sun SUN	
Type/Amount of Stemming/Tamp: 3' SAND		Mat or Other Protection Used (list): N/A
Seismographic/Sound Level Meter Used: Yes ___ No X	Readings:	

EODT BLAST RECORD

Site / Location: NORTH WEST PENNINSULA, SDA NP-3
Date: 1-16-96
Blasting Surpervisor: DAVE GARRON
Signature: Dave Garron
License #: 001-0040-00 01
Type of UXO/OEW Blasted: (3)-5" ILLUM, (3) 3" PROJOS (HE)
Firing Method: NON-ELEC.
Time of Blast: 1558
Type of Demolition Materials: (i.e. perforator/det cord/time fuze/elect/non-elect/2 Comp.) DET CORD, TIME FUSE, FUSE LIGHTERS, PERFS, CAPS
Amount/# of Each Item Used: 3', 28', 2EA, 4EA, 2EA
Distance & Direction to Nearest Building, Road, Utility Line, etc. N/A
Temp 85 Wind Dir./Speed: 10
Ceiling CLEAR Clouds/% Sun SUN
Type/Amount of Stemming/Tamp: 3' SAND
Mat or Other Protection Used (list):
Seismographic/Sound Level Meter Used: Yes__ No X
Readings: N/A

Site / Location: NORTHWEST PENNINSULA, SDA NP-3
Date: 2-08-96
Blasting Surpervisor: DAVE GARRON
Signature: Dave Garron
License #: 001-0040-0001
Type of UXO/OEW Blasted: (1) 5" HAVEN ROCKET (3) 5" ILLUM CANDLES (2) BASE FUSES (1) MK-[illegible] (3) 3" PROJO (1) 20 MM HE (1) MK-76 W/CART
Firing Method: NON-ELEC.
Time of Blast: 1509
Type of Demolition Materials: (i.e. perforator/det cord/time fuze/elect/non-elect/2 Comp.) DET CORD, TIME FUSE, FUSE LIGHTERS, PERFS, NON ELEC CAPS
Amount/# of Each Item Used: 11', 28', 2EA, [illegible] EA, 2EA
Distance & Direction to Nearest Building, Road, Utility Line, etc. N/A
Temp 85 Wind Dir./Speed: 10
Ceiling CLEAR Clouds/% Sun PT. CLOUDY
Type/Amount of Stemming/Tamp: 3' SAND
Mat or Other Protection Used (list):
Seismographic/Sound Level Meter Used: Yes__ No X
Readings: N/A

Site / Location: NORTHWEST PENNINSULA, NWP-17
Date: 2-14-96
Blasting Surpervisor: DAVID GARRON
Signature: Dave Garron
License #: 001-0040-001
Type of UXO/OEW Blasted: (4) 5" PROJOS (1) 3" PROJO (3) 6" PROJO (1) 81MM MORTAR (1) GRENADE (1) PROJ. BASE FUSE
Firing Method: NON ELEC
Time of Blast: 1504
Type of Demolition Materials: (i.e. perforator/det cord/time fuze/elect/non-elect/2 Comp.) PERF./DET CORD/TIME FUSE/FUSE LITER/NON ELEC CAP
Amount/# of Each Item Used: 21# 50' 28' 2EA 2EA
Distance & Direction to Nearest Building, Road, Utility Line, etc. N/A
Temp 85 Wind Dir./Speed: 8
Ceiling CLEAR Clouds/% Sun SUNNY
Type/Amount of Stemming/Tamp: 3' SAND OR EQUIV
Mat or Other Protection Used (list):
Seismographic/Sound Level Meter Used: Yes__ No X
Readings: N/A

EODT BLAST RECORD

Site / Location: NORTHWEST PENNINSULA NWP - 16		Date: 2-14-96
Blasting Supervisor: DAVID GARRON	Signature: Dave Garron	License #: 001-0042-0001
Type of UXO/OEW Blasted: (1) 5" PROJO (2) 6" PROJO (1) 81 MORTOR (1) 3" PROJO	Firing Method: NON-ELEC	Time of Blast: 13:48
Type of Demolition Materials: (i.e. perforator/det cord/time fuze/electric/non-elect/2 Comp.): PERFS / DET CORD / TIME FUSE / FUSE LITER / NON ELEC CAP		Amount/# of Each Item Used: 10 33' 28' 2EA 2EA
Distance & Direction to Nearest Building, Road, Utility Line, etc.: N/A	Temp 85 Wind Dir./Speed: 8 Ceiling CLEAR Clouds/% Sun SUNNY	
Type/Amount of Stemming/Tamp: 3' SAND OR EQUIV.		Mat or Other Protection Used (list): N/A
Seismographic/Sound Level Meter Used: Yes__ No X	Readings: N/A	

Site / Location: NORTHWEST PENNINSULA NWP - 20		Date: 2-15-96
Blasting Supervisor: DAVID GARRON	Signature: Dave Garron	License #: 001-0040-0001
Type of UXO/OEW Blasted: (2) 5" PROJO (2) 5" CANDLES ILLUM.	Firing Method: NON ELEC	Time of Blast: 1454
Type of Demolition Materials: (i.e. perforator/det cord/time fuze/electric/non-elect/2 Comp.): PERFS / DET CORD / TIME FUZE / FUZE LITE / NON ELEC CAP		Amount/# of Each Item Used: 15/135'/22'/3/2
Distance & Direction to Nearest Building, Road, Utility Line, etc.: N/A	Temp 85 Wind Dir./Speed: 10 Ceiling CLEAR Clouds/% Sun SUNNY	
Type/Amount of Stemming/Tamp: 3' SAND		Mat or Other Protection Used (list): N/A
Seismographic/Sound Level Meter Used: Yes__ No X	Readings: N/A	

Site / Location: NORTHWEST PENNINSULA NWP - 20		Date: 2-15-96
Blasting Supervisor: DAVID GARRON	Signature: Dave Garron	License #: 001-0040-0001
Type of UXO/OEW Blasted: (1) 5" PROJO (1) 5" CANDLE ILLUM	Firing Method: NON ELEC.	Time of Blast: 1456
Type of Demolition Materials: (i.e. perforator/det cord/time fuze/electric/non-elect/2 Comp.): PERFS / DET CORD / TIME FUZE / FUZE LITE / NON ELEC CAP		Amount/# of Each Item Used: 10/130'/22'/3/2
Distance & Direction to Nearest Building, Road, Utility Line, etc.: N/A	Temp 85 Wind Dir./Speed: 10 Ceiling CLEAR Clouds/% Sun SUNNY	
Type/Amount of Stemming/Tamp: 3' SAND		Mat or Other Protection Used (list): N/A
Seismographic/Sound Level Meter Used: Yes__ No X	Readings: N/A	

EODT BLAST RECORD

Site / Location: NORTHWEST PENNINSULA, SDA AP-3			Date: 2/22/96
Blasting Surpervisor: DAVE GARRON	Signature: Dave Garron		License #: OK-0040-0101
Type of UXO/OEW Blasted: CLEAN UP SHOT (BULK EXPL.)	Firing Method: NON ELEC		Time of Blast: 1500
Type of Demolition Materials: (i.e. perforator/det cord/time fuze/elect/non-elect/2 Comp.) PERFS/DET CORD/TIME FUZE/NON ELEC CAPS/FUSE LIGHTERS		Amount/# of Each Item Used: 137/4000'/1341/576/574	
Distance & Direction to Nearest Building, Road, Utility Line, etc.: N/A	Temp 88 Wind Dir./Speed: S Ceiling CLEAR Clouds/% Sun SUNNY		
Type/Amount of Stemming/Tamp: N/A		Mat or Other Protection Used (list): N/A	
Seismographic/Sound Level Meter Used: Yes__ No X	Readings: N/A		

Site / Location:			Date:
Blasting Surpervisor:	Signature:		License #
Type of UXO/OEW Blasted:	Firing Method:		Time of Blast:
Type of Demolition Materials: (i.e. perforator/det cord/time fuze/elect/non-elect/2 Comp.)		Amount/# of Each Item Used:	
Distance & Direction to Nearest Building, Road, Utility Line, etc.	Temp _____ Wind Dir./Speed: _____ Ceiling _____ Clouds/% Sun _____		
Type/Amount of Stemming/Tamp:		Mat or Other Protection Used (list):	
Seismographic/Sound Level Meter Used: Yes__ No __	Readings:		

Site / Location:			Date:
Blasting Surpervisor:	Signature:		License #
Type of UXO/OEW Blasted:	Firing Method:		Time of Blast:
Type of Demolition Materials: (i.e. perforator/det cord/time fuze/elect/non-elect/2 Comp.)		Amount/# of Each Item Used:	
Distance & Direction to Nearest Building, Road, Utility Line, etc.	Temp _____ Wind Dir./Speed: _____ Ceiling _____ Clouds/% Sun _____		
Type/Amount of Stemming/Tamp:		Mat or Other Protection Used (list):	
Seismographic/Sound Level Meter Used: Yes__ No __	Readings:		

EODT Explosive Accountability Record
(Magazine Data Card)

Product Code/FSN	Nonmenclature	Location
	CHG. PERFORATOR 19gm	Lower Camp Culebra Island NWR, PR
Date Code/Lot NR	**NR Package/Case**	**NR Cases**
# 33443	1 CS	

Date	Bill Lading/Voucher NR	Rcvd. From/Issued To	Qty. Received	Qty. Issued	Balance	Initials
12/6/95	HALIBURTON		50			
02/27/96		TEAM ONE		50	Ø	
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EODT Explosive Accountability Record
(Magazine Data Card)

Product Code/FSN	Nonmenclature	Location
	IGNITER, PULL	Lower Camp Culebra Island PR
Date Code/Lot NR	**NR Package/Case**	**NR Cases**

Date	Bill Lading/Voucher NR	Rcvd. From/Issued To	Qty. Received	Qty. Issued	Balance	Initials
12/14/95			600		600	
12/14/95		TEAM-TWO		2	598	
12/21/95		TEAM-TWO		4	594	
12/27/95		TEAM TWO		2	592	
12/27/95		TEAM ONE		2	590	
01/05/96		TEAM TWO		2	588	
01/16/96		TEAM ONE		2	586	
02/08/96		TEAM ONE		2	584	
02/14/96		TEAM ONE		4	580	
02/15/96		TEAM ONE		6	574	
02/22/96		TEAM ONE		574	0	
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EODT Explosive Accountability Record
(Magazine Data Card)

Product Code/FSN	Nonmenclature	Location
UN 0105	FUSE, Safety	Lower Camp Culebra Island PR, PR
Date Code/Lot NR	**NR Package/Case**	**NR Cases**
	1 CS	

Date	Bill Lading/Voucher NR	Rcvd. From/Issued To	Qty. Received	Qty. Issued	Balance	Initials
12/18/95	SLURRY		1,613'			JK
12/19/95		TEAM-TWO		19'	1594'	AJA/JK
12/21/95		TEAM TWO		28'	1566'	AJA/JK
12/27/95		TEAM TWO		14'	1552'	AJA/JK
12/27/95		TEAM ONE		33'	1519'	DLA/JK
01/05/96		TEAM TWO		14'	1505'	AJA/JK
01/16/96		TEAM ONE		28'	1477'	DLA/JK
02/08/96		TEAM ONE		28'	1449'	DLA/JK
02/14/96		TEAM ONE		56'	1385'	DLA/JK
02/15/96		TEAM ONE		44'	1341'	DLA/JK
02/22/96		TEAM ONE		1341'	0	DLA/JK
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EODT Explosive Accountability Record
(Magazine Data Card)

Product Code/FSN	Nonmenclature	Location
	CHG. PERFORATOR 13gm	Lower Camp Culebra Island PR, PR
Date Code/Lot NR	**NR Package/Case**	**NR Cases**
# 34339	2 BOX	

Date	Bill Lading/Voucher NR	Rcvd. From/Issued To	Qty. Received	Qty. Issued	Balance	Initials
12/6/95	HALIBURTON		200			
12/27/95		TEAM TWO		20	180	
12/27/95		TEAM ONE		5	175	
01/05/96		TEAM TWO		17	158	
01/16/96		TEAM ONE		4	154	
02/08/96		TEAM ONE		9	143	
02/14/96		TEAM ONE		31	112	
02/15/96		TEAM ONE		25	87	
02/22/96		TEAM ONE		87	0	
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EODT Explosive Accountability Record
(Magazine Data Card)

Product Code/FSN	Nonmenclature	Location
UN0325 1.4G	DETONATORS, NON ELEC #8	Lower Camp Culebra Island PR
Date Code/Lot NR	**NR Package/Case**	**NR Cases**
	6 BOX	

Date	Bill Lading/Voucher NR	Rcvd. From/Issued To	Qty. Received	Qty. Issued	Balance	Initials
12 18 195	SLURRY		600			
12/14/95		TEAM - TWO		2	598	
12/21/95		TEAM TWO		4	594	
12/27/95		TEAM TWO		2	592	
12/27/95		TEAM ONE		2	590	
01/05/96		TEAM TWO		2	588	
01/16/96		TEAM ONE		2	586	
02/08/96		TEAM ONE		2	584	
02/14/96		TEAM ONE		4	580	
02/14/96		TEAM ONE		4	576	
02/22/96		TEAM ONE		576	0	
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EODT Explosive Accountability Record
(Magazine Data Card)

Product Code/FSN	Nonmenclature	Location
UN0065	CORD, DETONATING	Lower Camp Culebra Island NWR, PR
Date Code/Lot NR	**NR Package/Case**	**NR Cases**
80 gr/ft #17936	9 CASES 500' ea	

Date	Bill Lading/Voucher NR	Rcvd. From/Issued To	Qty. Received	Qty. Issued	Balance	Initials
12/6/95	HALIBURTON		4500'			
12/14/95		TEAM-TWO		44'	4456'	
12/21/95		TEAM TWO		40'	4416'	
12/27/95		TEAM TWO		28'	4388'	
12/29/95		TEAM ONE		5'	4383'	
01/05/96		TEAM TWO		20'	4363'	
01/16/96		TEAM ONE		3'	4360'	
02/08/96		TEAM ONE		12'	4348'	
02/14/96		TEAM ONE		83'	4265'	
02/15/96		TEAM ONE		265'	4000	
02/22/96		TEAM ONE		4000'	Ø	
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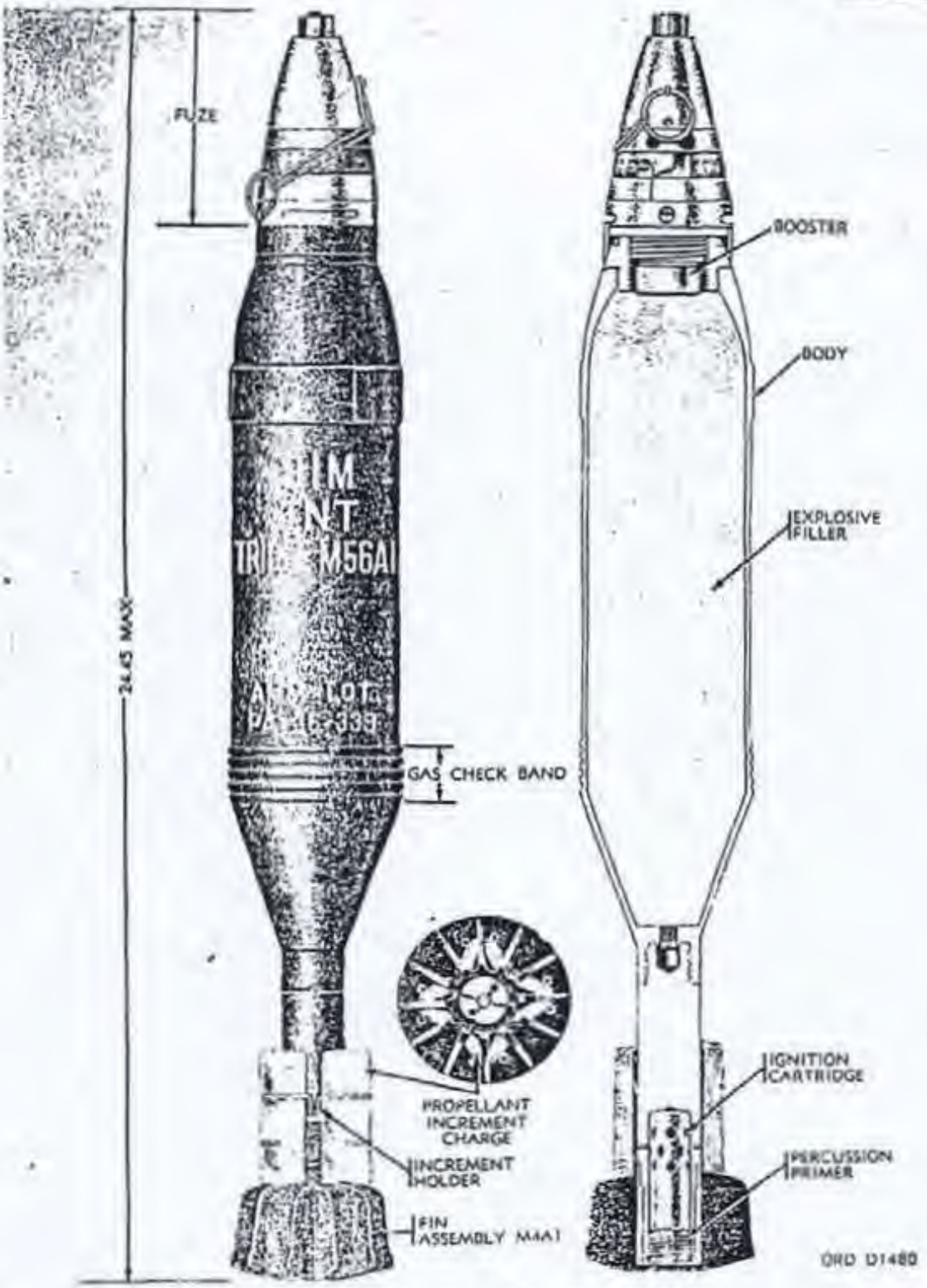

Figure 4-11. 81-mm HE cartridge M56A1.

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RA PD 1081748

[redacted] cartridge

2-15

PROJECTILE DATA

NATIONALITY: U.S. NAVY	INFORMATION DATE: April, 1943
CALIBER: 3" - Mk. 14	CLASSIFICATION: Field Common
TARGET: Bombardment purposes.	

1.	OVERALL LENGTH - With Fuze & Base Plug Without Fuze & Base Plug	10.845" 7.85"
2.	DIAMETER OF BASE	2.97"
3.	DISTANCE FROM BASE TO BAND	1.50"
4.	WIDTH OF BAND	.60"
5.	DIAMETER OF SHOULDER	2.97"
6.	TYPE OF FILLING	T.N.T.
7.	WEIGHT OF FILLING	1.06 lbs
8.	WEIGHT OF LOADED PROJECTILE	13.00 lbs
9.	CHARGE-WEIGHT RATIO	8.15 %
10.	TYPE OF GUN USED IN	3"/50
11.	FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk. 8 Mods 4 & 5; Mk. 8 Mod 9.
12.	CARTRIDGE CASE	Mk. 1
13.	PRIMER	Mk. 14
14.	REMARKS:	

For method of marking and painting projectile, see INTRODUCTION.

Note: - Projectile is fitted with a nose plug for testing purposes only.

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PROJECTILE DATA

NATIONALITY: U.S. NAVY	INFORMATION DATE: April, 1943
CALIBER: 3" - Mk. 14	CLASSIFICATION: Field Common
TARGET: Bombardment purposes.	

[redacted]

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PROJECTILE DATA: 147

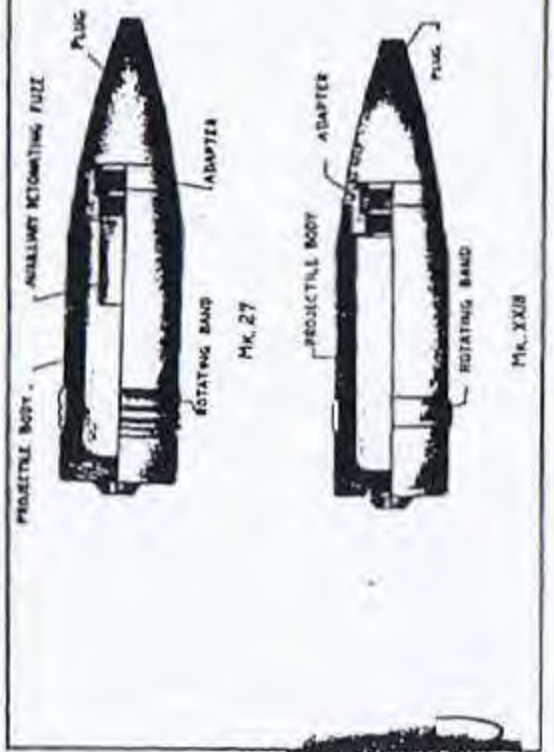
NATIONALITY: U.S. NAVY	INFORMATION DATE: April, 1943
CALIBER: 3"/50 - Mks. 22 & 27	CLASSIFICATION: A.A.
TARGET: Used against aircraft targets.	

		Mark 22	Mark 27
1.	OVERALL LENGTH - With Fuze	18.13"	18.13"
	Without Fuze	7.50"	7.50"
2.	DIAMETER OF BASE	3.00"	3.00"
3.	DISTANCE FROM BASE TO BAND	1.90"	1.35"
4.	WIDTH OF BAND	.70"	1.0"
5.	DIAMETER OF SHOULDER	3.00"	3.00"
6.	TYPE OF FILLING	Cast T.N.T.	
7.	WEIGHT OF FILLING	.74 lbs	.74 lbs
8.	WEIGHT OF LOADED PROJECTILE	13.06 lbs	13.05 lbs
9.	CHARGE-WEIGHT RATIO	5.67 %	5.67 %
10.	TYPE OF GUN USED IN	3"/50 A.A.	
11.	TRACER	Mk. 4	
12.	FUZES WHICH MAY BE USED IN PROJECTILE	None; Mk. 22; Mk. 22-Mods 1, 2, 3 & 4; Auxiliary Detonator Mk. 27 & Mods	
13.	CARTRIDGE CASE	Mk. 2	
14.	PRIMER	Mk. 24	
15.	REMARKS:		

For method of marking and painting projectiles, see INTRODUCTION.

PROJECTILE DATA

NATIONALITY: U.S. NAVY	INFORMATION DATE: April, 1943
CALIBER: 3"/50 - Mks. 22 & 27	CLASSIFICATION: A.A.
TARGET: Used against aircraft targets.	



PROJECTILE DATA

NATIONALITY: U.S. NAVY	INFORMATION DATE: April, 1943
CALIBER: 5" Mk. 27	CLASSIFICATION: Illuminating

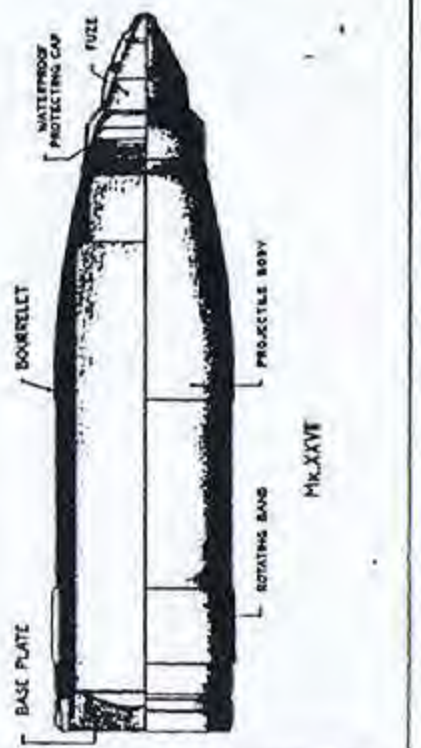
TARGET: The purpose of the illuminating or "Star" projectile is to illuminate the area around the target in night engagements.

1.	OVERALL LENGTH - With Fuze & Base Plug Without Fuze & Base Plug	30.0" 19.8"
2.	DIAMETER OF BASE	4.94"
3.	DISTANCE FROM BASE TO BAND	1.80"
4.	WIDTH OF BAND	2.00"
5.	DIAMETER OF BOURRELET	4.98"
6.	TYPE OF FILLING: The forward part of the projectile, just aft of the fuze, is filled with a small expelling charge. The flare composition is magnesium.	
7.	WEIGHT OF PROJECTILE LESS FUZE AND FILLER	34.8 lbs
8.	WEIGHT OF PROJECTILE COMPLETE	54.0 lbs
9.	FUZES WHICH MAY BE USED IN PROJECTILE	Navy Mk. 19-Mods 2, 3 & 4.
10.	CARTRIDGE CASE	Mk. 4
11.	PRIMER	Mk. 33
12.	TRACER	None
13.	REMARKS: The illuminating projectile is made of a thin case like the shrapnel projectiles. The expelling charge is placed well forward in the projectile. The flare is then placed in with seven parachutes attached. The flare or candle container is made of sheet steel and magnesium filling is placed in the container under pressure. The seven parachutes of varying sizes are connected to each other and to the flare container by a wire rope 40 feet long. The base plug is a push-fit in the base of the projectile and secured by twist pins. When the nose fuze operates, the expeller charge explodes blowing the flare and parachutes out the rear of the projectile. The explosion forces the base plug off. The seven parachutes open in order of size with the smallest one opening first. The largest parachute finally holds the candle or flare light suspended in mid-air. The largest parachute is furthest from the candle and is the last one to open. Markings and painting of the projectile is in accordance with instructions set out in the INTRODUCTION.	

PROJECTILE DATA

NATIONALITY: U.S. NAVY	INFORMATION DATE: April, 1943
CALIBER: 5" Mk. 27	CLASSIFICATION: Illuminating

TARGET: The purpose of the illuminating or "Star" projectile is to illuminate the area around the target in night engagements.



Primer.....Mk 13 and all Mods
Fuzes.....Nose—Mk 25 Mod 1

The Illuminating Contents Mk 4 Mod 5 are used in this projectile, modified to use a lengthened spacer sleeve.

This projectile is identical to the 5-inch Illuminating Projectile Mk 48, except that the latter has a double rotating band.

5-inch Illuminating Mk 44 Mod 1

Guns used in.....5"/38
Over-all length, inches
With nose fuze.....19.97
Without nose fuze.....16.465
Diameter of base, inches.....4.973
Distance base to band, inches.....2.43
Width of band, inches.....2.25
Diameter at bourrelet, inches.....4.985
Filling.....Expelling charge is black powder; flare, magnesium.
Weight of filling....Expelling charge is 2.5 ounces.
Weight of loaded projectile, pounds.....54.5
Cartridge Case.....Mk 5
Primer.....Mk 13 and all Mods
Fuzes
Nose.....Mk 18 Mods 2, 3, and 4
Mk 50 Mods 0–4
Mk 63 Mod 0

This projectile is currently assembled with the Illuminating Contents Mk 4 Mod 5

5-inch Illuminating and 5-inch W.P. Mk 45 Mod 0

Guns used in.....5"/25
Over-all length, inches
With nose fuze.....19.97
Without nose fuze.....16.465
Diameter of base, inches.....4.968
Distance base to band, inches.....1.93
Width of band, inches.....2.0
Diameter at bourrelet, inches.....4.985
Filling.....Expelling charge is black powder; flare, magnesium.
Weight of filling....Expelling charge is 2.5 ounces.
Weight of loaded projectile, pounds.....54.5
Cartridge Case.....Mk 4, Mk 4 Mod 2
Primer.....Mk 13 and all Mods
Fuzes
Nose.....Mk 18 Mods 2, 3, and 4
Mk 50 and all Mods
Mk 63 Mod 0

This projectile is loaded with the Illuminating Contents Mk 4 Mod 5.

The W.P. projectile uses the body of the Mk 45 and the incendiary contents of the W.P. shell.

5-inch Illuminating Mk 48 Mod 0

Guns used in.....5"/54
Over-all length, inches.....26.0
Without nose fuze.....22.28
Diameter of base, inches.....4.973
Diameter at bourrelet, inches.....4.985
Filling.....Expelling charge is black powder; flare, magnesium.
Weight of filling....Expelling charge is 2.5 ounces.

Figure 38. 5-inch Illuminating Mk 48 Mod 0

Fuzes.....Mk 18 Mods 2, 3, and 4
Mk 50 all Mods
Mk 63 Mod 0

The Fuze Mk 18 may be used in all Mods of this projectile; the Fuzes Mk 50 and Mk 63 are used only in the Mod 6 projectile.

Illuminating Contents Mk 3 are used in projectiles Mods 1–5; the Illuminating Contents Mk 4 Mod 4 are used in the Mod 6 projectile.

Part I — Chapter 1 — Section 4

5-INCH PROJECTILES

Figure 28. 5-inch Special Common Mk 38 Mods 1—3

5-inch Special Common Mk 38 Mods 1, 2, and 3

Guns used in.....5"/38
Over-all length, inches.....20.7
Diameter of base, inches.....4.985
Distance base to band, inches.....2.43
Width of band, inches.....2.25
Diameter at bourrelet, inches.....4.985
Filling.....Explosive D
Weight of filling, pounds.....2.04
Weight of loaded projectile, pounds.....55.18
Charge/weight ratio.....3.69%
Cartridge Case.....Mk 5
Primer.....Mk 13 and all Mods
Tracer.....Mk 9
Fuzes.....Base — Mk 20 and all Mods

Figure 29. 5-inch Special Common Mk 42 Mods 0 and 1

5-inch Special Common Mk 42 Mods 0 and 1

Guns used in.....5"/54
Over-all length, inches.....26.0
Without windshield.....15.605
Diameter of base, inches.....4.26
Distance base to band, inches.....3.75
Width of band, inches.....2.25

Use of the Nose Fuzes Mk 50 and Mk 63 is not authorized with rounds used in the 5"/25 and 5"/51 case guns.

The Illuminating Contents Mk 3 are used with projectiles Mods 1 through 4; projectiles Mods 5 and 6 are assembled with Illuminating Contents Mk 1 Mod 5 when used in the 5"/51 bag gun, Illuminating Contents Mk 3 when used in the 5"/51 case gun.

5-inch Illuminating and 5-inch W.P. Mk 27 Mods 1—10

Guns used in ..... 5"/25
Over-all length, inches
With nose fuze 20.0
Without nose fuze 15.8
Diameter of base, inches 4.968
Distance base to band, inches 1.93
Width of band, inches 2.00
Diameter at bourrelet, inches 4.985
Filling ..... Expelling charge is black powder; flare, magnesium.
Weight of filling ..... Expelling charge is 2.6 ounces.
Weight of loaded projectile
53.65 pounds — Mods 1–4
54.50 pounds — Mods 5–10
Cartridge Case ..... Mk 4, Mk 4 Mod 2
Primer ..... Mk 13 and all Mods
Fuzes
Nose ..... Mk 63 Mod 0
Mk 18 Mods 2, 3, 4
Mk 50 and all Mods

Mods 1, 2, 3, 4 have a band diameter of 5.10 inches, and Mods 5, 6, 7, 8, 9, and 10 have a band diameter of 5.12 inches.

The Illuminating Contents Mk 4 Mod 3 are used in this projectile.

The 5-inch W.P. projectile utilizes the Mk 27 body with incendiary contents.

5-inch Illuminating Mk 30 Mods 1—8

Guns used in ..... 5"/38
Over-all length, inches
With nose fuze 20.0
Without nose fuze 15.8
Diameter of base, inches 4.968
Distance base to band, inches 2.43
Width of band, inches 2.25

Figure 37. 5-inch Illuminating Mk 30 Mods 1—8

Diameter at bourrelet, inches 4.965
Filling ..... Expelling charge is black powder; flare, magnesium.
Weight of filling ..... Expelling charge is 2.5 ounces.
Weight of loaded projectile, pounds 51.5
Cartridge Case ..... Mk 5
Primer ..... Mk 13 and all Mods
Fuzes
Nose ..... Mk 63 Mod 0
Mk 18 Mods 2, 3, 4
Mk 50 and all Mods

The Illuminating Contents Mk 4 Mod 5 are used in this projectile.

5-inch Illuminating Mk 43 Mod 0

Guns used in ..... 5"/54
Over-all length, inches 26.0
Without nose fuze 22.28
Diameter of base, inches 4.973
Diameter at bourrelet, inches 4.985
Filling ..... Expelling charge is black powder; flare, magnesium.
Weight of filling ..... Expelling charge is 2.6 ounces.
Weight of loaded projectile, pounds 70
Cartridge Case ..... Mk 6

PROJECTILE DATA

NATIONALITY: U.S. NAVY	INTRODUCTION DATE: April, 1943
CALIBER: 6"/47 and 6"/53 Mk. 34	CLASSIFICATION: High Capacity (H.C.)

TARGET: Used effectively in bombarding shore installations because of high loading factor. Also, used against lightly armored vessels such as cruisers, aircraft carriers, etc.

1.	OVERALL LENGTH - With Fuze Without Fuze	87.06" 82.438"
2.	DIAMETER OF BASE	6.90"
3.	DISTANCE FROM BASE TO BAND	1.02"
4.	WIDTH OF BAND	0.80"
5.	DIAMETER OF SHOULDER	6.06"
6.	TYPE OF FILLING	Explosive D
7.	WEIGHT OF FILLING	13.33 lbs
8.	WEIGHT OF LOADED PROJECTILE	108 lbs
9.	CHARGE-WEIGHT RATIO	12.40 %
10.	TYPE OF GUN USED IN	6"/47 and 6"/53
11.	FUZES WHICH MAY BE USED IN PROJECTILE	Base: Mk. 28 Nose: Mk. 29; Mk. 10 Mods 2, 3 & 4; A.F. Base Plugs; Auxiliary Detonator Fuze Mk. 17 and Mods.
12.	TRACER	Mk. 8; Mk. 8 Mod 1
13.	PRIMER	Mk. 13
14.	REMARKS:	

A waterproof cap may be placed over the nose fuze for protection from moisture.

For method of marking and painting projectile, see INTRODUCTION.

Note: - The nose of this projectile may be fitted with a steel screw plugging plug instead of a nose fuze. The steel plug has two notches 180° apart which may be staked to hold the plug in position and prevent turning. When the A.P. plug is used, the detonation depends entirely on the base fuze alone.

PROJECTILE DATA

NATIONALITY: U.S. NAVY	INTRODUCTION DATE: April, 1943
CALIBER: 6"/47 and 6"/53 Mk. 34	CLASSIFICATION: High Capacity (H.C.)

TARGET: Used effectively in bombarding shore installations because of the high loading factor. Also, used against lightly armored vessels such as cruisers, aircraft carriers, etc.

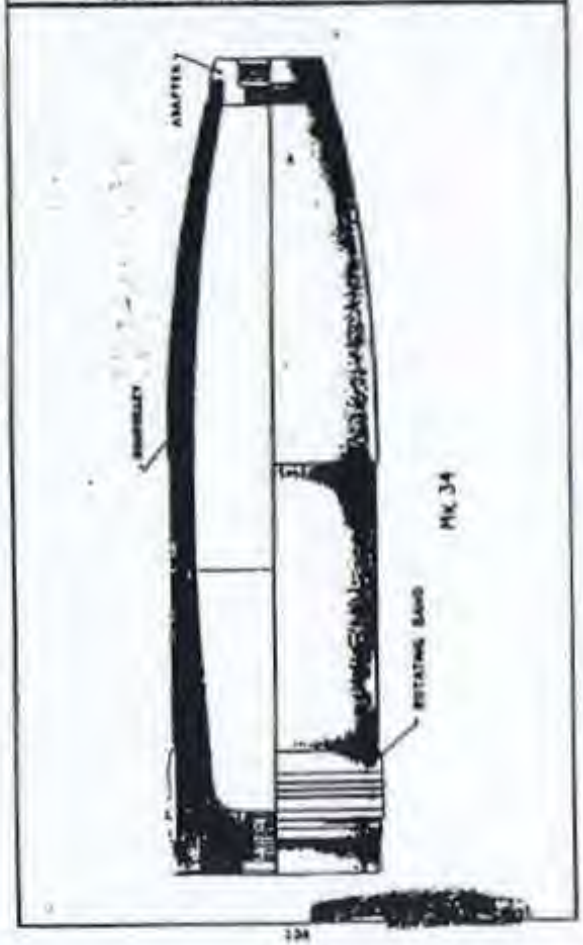


Figure 45. 6-inch Common Mk 20 Mods 0—4

Figure 46. 6-inch Common Mk 24 Mod 1

6-inch Common Mk 20 Mods 0—4 (Obsolete)

Guns used in.....6"/50
Over-all length, inches.....22.70
Diameter of base, inches.....5.94
Distance base to band, inches.....1.0
Width of band, inches.....2.0
Diameter at bourrelet, inches.....5.985
Filling.....Explosive D
Weight of filling, pounds.....7.08
Weight of loaded projectile, pounds.....105
Charge/weight ratio.....5.97%
Primer.....Mk 15 Mod 1
Tracer.....Mk 5
Fuzes.....Base—Mk 28 and all Mods

This projectile may be found fuzed with Base Fuze Mk 3 and Mods.

Mods 0, 2, and 4 may also be issued H.L. & T. with adapter and Mk 5 Mod 1 Tracer for target practice.

This projectile may be found loaded with 6.25 pounds of Explosive D.

6-inch Common Mk 24 Mods 1—5

Guns used in.....6"/53
Over-all length, inches.....27.0
Diameter of base, inches.....5.985
Distance base to band, inches.....1.0
Width of band, inches.....2.50
Diameter at bourrelet, inches.....5.985
Filling.....Explosive D
Weight of filling, pounds.....5.73
Weight of loaded projectile, pounds.....105
Charge/weight ratio.....5.46%
Primer.....Mk 15 Mod 1
Tracer.....Mk 5
Fuzes.....Base—Mk 19 Mods 0 and 1

This projectile is reserved for submarines.

This projectile may be fuzed with Base Fuzes Mk 3 and Mods. It is to be reloaded and refuzed with the Base Fuze Mk 19.

This projectile is also issued H.L. & T. with adapter and Tracer Mk 5 Mod 1 for target practice.

6-inch Common Mk 28 Mods 1 and 2

Guns used in.....6"/47 (bag)
Over-all length, inches.....27.0
Diameter of base, inches.....5.985
Distance base to band, inches.....1.55
Width of band, inches.....2.50
Diameter at bourrelet, inches.....5.985
Filling.....Explosive D
Weight of filling, pounds.....5.72
Weight of loaded projectile, pounds.....105
Charge/weight ratio.....5.45%
Primer.....Mk 15 Mod 1
Tracer.....Mk 5
Fuzes.....Base—Mk 19 Mods 0 and 1

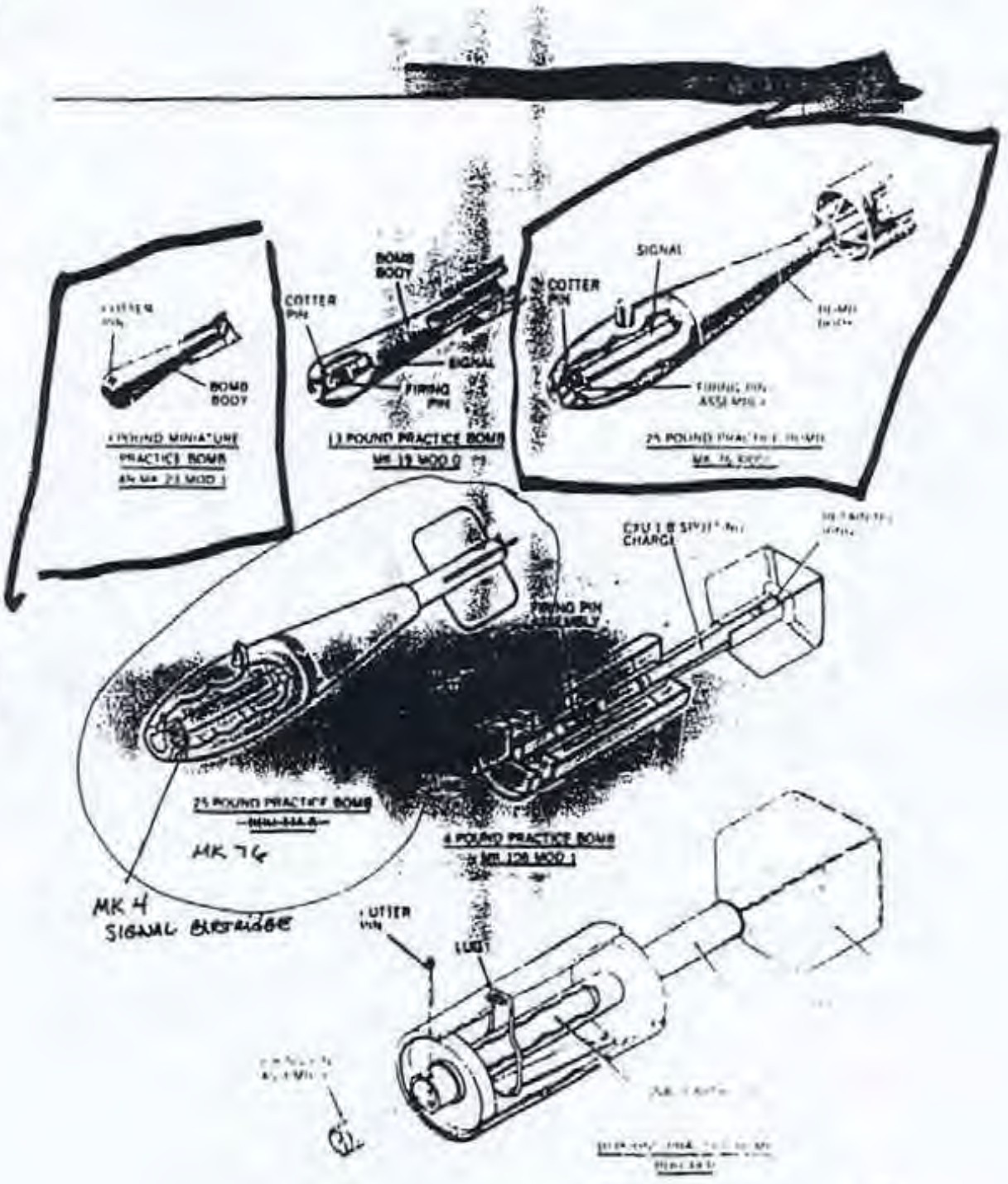
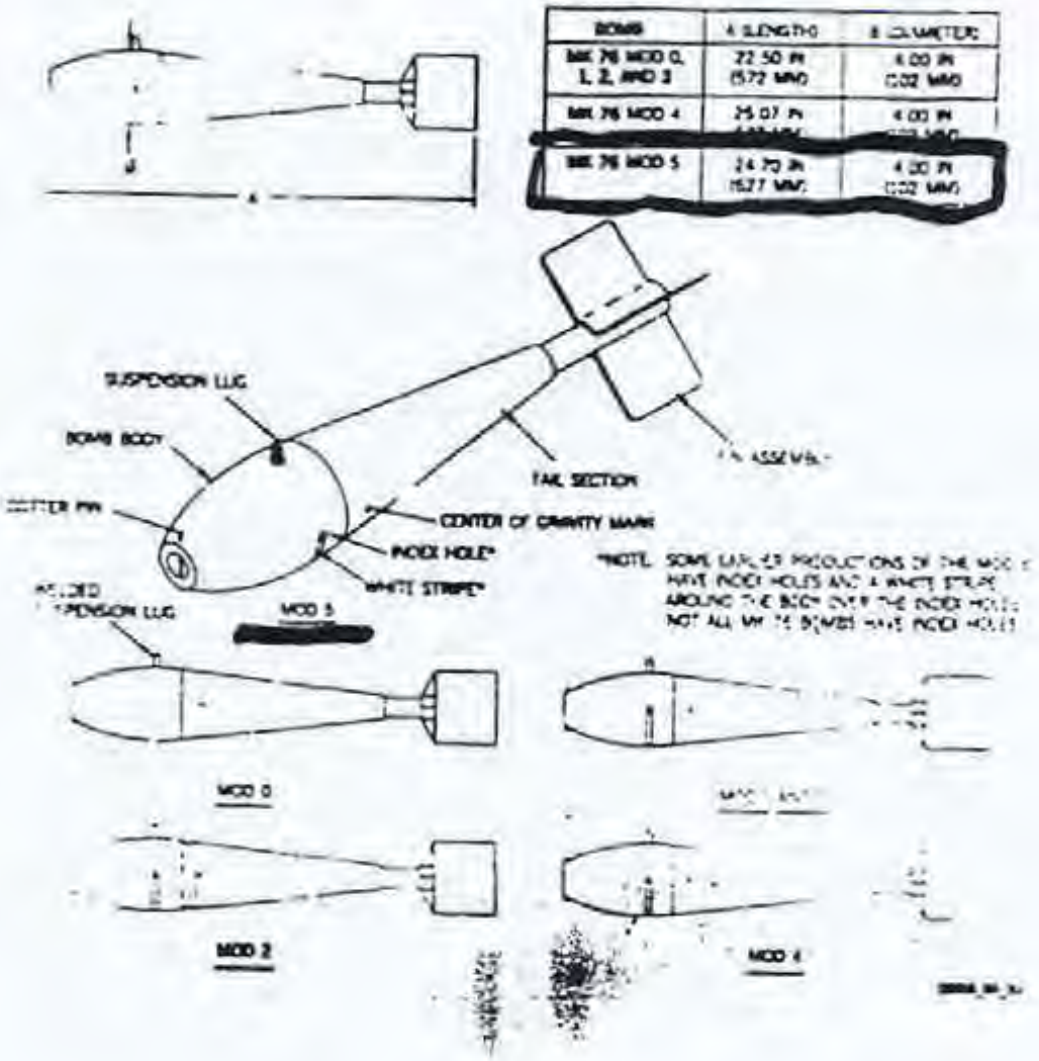


Figure 3-18. Typical Miniature Practice Bombs

1. IDENTIFICATION – CONT.

Figure 3 shows the appearance and dimensions of the Mk 76-series practice bombs.



BOMB	A LENGTH	B DIAMETER
MK 76 MOD 0, 1, 2, AND 3	72.50 IN (572 MM)	8.00 IN (202 MM)
MK 76 MOD 4	75.07 IN	8.00 IN
MK 76 MOD 5	74.70 IN (527 MM)	8.00 IN (202 MM)

*NOTE: SOME EARLY PRODUCTIONS OF THE MOD 0 HAVE INDEX HOLES AND A WHITE STRIPE AROUND THE BODY OVER THE INDEX HOLES. NOT ALL MK 76 BOMBS HAVE INDEX HOLES.

Figure 3. Dimensions of the Mk 76-Series Practice Bombs

[redacted]

U. S. NAVY

5.0" ROCKET
5.0" MOTOR

(unofficially designated as the M.Y.A.R.)

OVERALL LENGTH	89"
TOTAL WEIGHT	140 lbs.
DIAMETER OF HEAD	5.0"
LENGTH OF HEAD	20.3"
WEIGHT OF HEAD	52 lbs.
TAIL SPAN	
MOTOR LENGTH	51.4"
MOTOR DIAMETER	5.0"
RANGE	
FUZES: Mk 5-0 and Mk 6-0	Nose Fuze Mk 148
	Nose Fuze Mk 149
	Base Fuze Mk 139-0
	Base Fuze Mk 139-0
Mk 6-1 (only)	Nose Fuze Mk 139-1
	Base Fuze Mk 184-0

ROCKET HEAD:

The rocket heads used are the 5"D, Mk 8 Heads 0 and 1. The Mk 8 Mod 0 is filled with TNT and is equipped with a nose fuze and a nose plug. When thus used, the head will have the penetration and fragmentation characteristics of comparable projectiles of the AP/CP or Common projectile, of which it is a modified design. All 5"D rocket Heads Mk 8 Mods 0 and 1 are shipped with a base fuze installed and staked in place. The shipping shall be made to prevent the base fuze from the head prior to the firing. A metal gun-shroud thread protector protects the external threads on the base of the head and on the base fuze. The Mk 8 Mod 1 is similar to the Mk 8 Mod 0 with a pre-load added to the bomb fuze seat. The 5"D body Mk 8 Mod 0 is the initial CIT production which was adopted by BuOrd as the Mk 8 Mod 0. The two bodies are identical.

ROCKET MOTOR:

The 5"D Rocket Motor Mk 7 Mod 0 consists of a seamless steel tube with internal threads on both ends. Into the rear end is screwed the nozzle plate having 4 nozzles arranged in a circle, and a central blow-out nozzle. The central nozzle is closed by a disc of 0.024" thick copper, insulated against the heat of the motor by asbestos and hard fiber discs. The thickness of the disc is such that it shears and blows out at a pressure of approximately 740 lbs. per square inch, which is the normal maximum motor pressure when the propellant grain is at a temperature of 170° F. If the pressure rises above this, the disc and plug are ejected; this increases the usable temperature range of the rocket by about 40° F.

Seven of the rear nozzles are sealed longitudinally by a light steel cup and sealing compound. The eighth nozzle accommodates the electric igniter cable which is crimped into the steel nozzle closure. In shipment, a dome-shaped steel shipping cap fits into the sleeve of the fin assembly, acting as an auxiliary aerial and at the same time serving to enclose and protect the electrical pigtail in shipment.

Lugs for attaching the fins are mounted on the nozzle end of the motor. The fins are shipped with the motor and are attached when the round is assembled. The fins are held in place by spring-loaded latches within the fin sleeve. The fin lugs and rear suspension lugs are welded to the heads of the fin assembly, which is slipped on over the nozzle end of the motor. The front lug head is strapped to the motor. The motor is shipped with lug attachments on the motor tube for use with aircraft launcher Mk 5 Mod 1. An extra rail type lug is provided in the shipping box to adapt the rocket for use on the aircraft launcher Mk.4.

The front end of the motor is sealed by a steel diaphragm equipped with a blow-out disc in the center to allow easy passage of the motor gases to the pressure sensing fuze in the base of the body. In shipment, a cylindrical metal thread protector extends into the motor the same depth as the body and seats on a felt pad glued to the diaphragm seal.

The propellant is a grain of cruciform shaped ballistite weighing 24 lbs. The grain is inhibited on the outer web surfaces and is supported by a wooden and steel grid at the nozzle end. The propellant is ignited by a metal case igniter containing 20 grams of black powder.

The 5"D Mk 7 Mod 1 motor was never produced. The Mk 7 Mod 2 differs in that the tail fins are welded to a sleeve which slips over the rear of the tube and is clamped in place. The fin assembly is complete and separate from the motor. The rear suspension lug for use with the Mk 5 Mod 1 launcher is on an independent band. The Mk 7 Mod 3, which will supercede the Mod 0 and 2, is similar to the Mod 2 except except the nozzle plug is of slightly different construction.

The 5"D Mk 1 Mod 0 rocket motor (CIT Production) is the prototype of the Mk 7 Mod 0 (BuOrd issue). The two motors vary only in that the suspension lugs on the former are welded directly to the rocket motor.

REMARKS:

1. Using fuze Mk 139 Mod 0, this rocket will penetrate 3.75 ft. of reinforced concrete at normal incidence. At an angle of 30° obliquity, it should penetrate 7.75 ft. Fired from a plane travelling at 300 knots, fused with the Mk 148 Mod 0 fuze, serious damage will be caused to armor up to 1-5/8" in thickness. Using the Mk 139 Mod 0 fuze and a steel nose plug, this rocket will penetrate armor 1.5" thick before detonation.

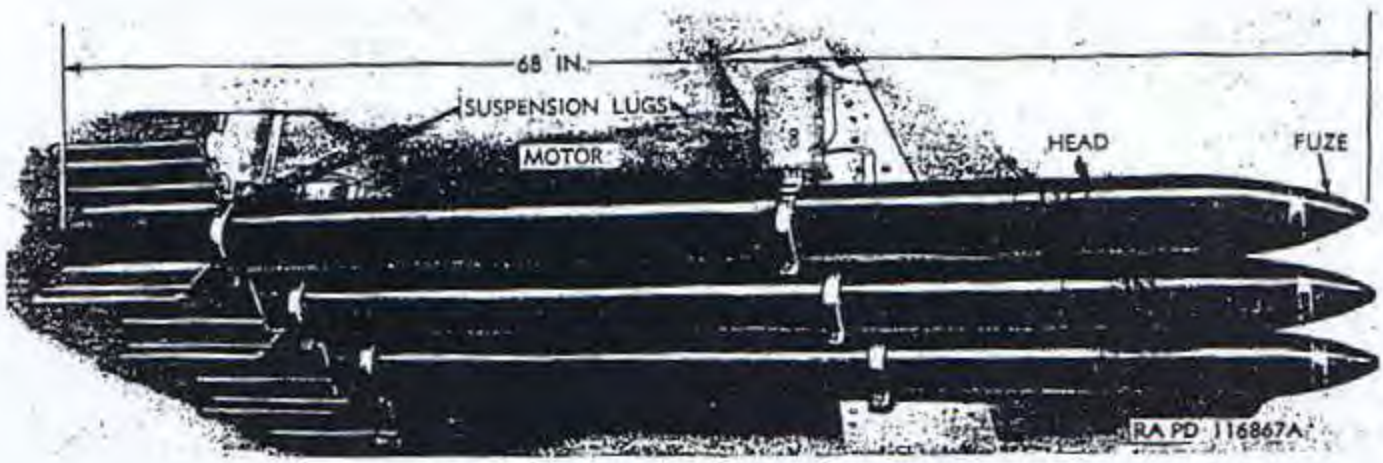


Figure 37. Rocket, high-explosive, 5.0-inch: HVAR.

GRENADES

Chapter 11 — HAND GRENADES

General

The design of hand grenades has been confined by several limiting technicalities, as follows: the grenade must be small and light; its range is short; there is no set-back or creep force of significance in the throwing operation; and the grenade must be rugged and safe enough to be carried on the bodies of troops.

Hence, despite the many tactical purposes—anti-tank, anti-personnel, screening, etc.—hand grenades are generally of the same shape, size, and fuze action.

Fragmentation Mk II, Mk IIA1; also Fuze M204

Over-all length, inches	4.5
Diameter, inches	2.25
Color	Olive drab
Weight, pounds	1.19
Filling	Flaked and granular TNT
Weight of filling, ounces	1.75

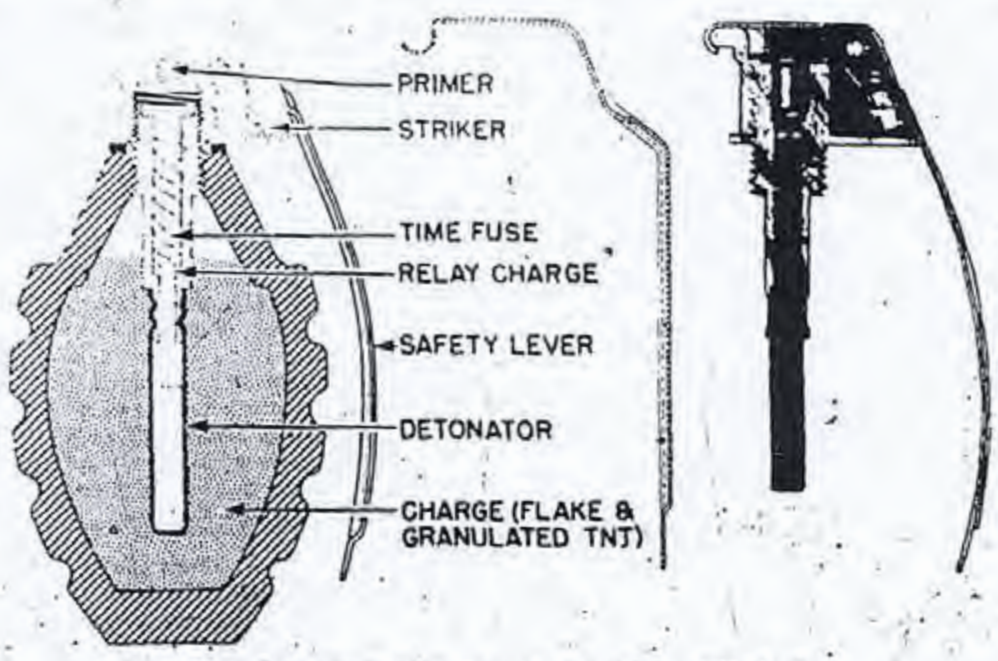


Figure 222. Fragmentation Grenade Mk II with Fuze M204 in place (At right is the Fuze M10A3, issued with an earlier model.)

MK2 FRAGMENTATION HAND GRENADE

This grenade is used to supplement small arms fire against the enemy in close combat (Figure D-3). The grenade produces casualties by high velocity projections of fragments.

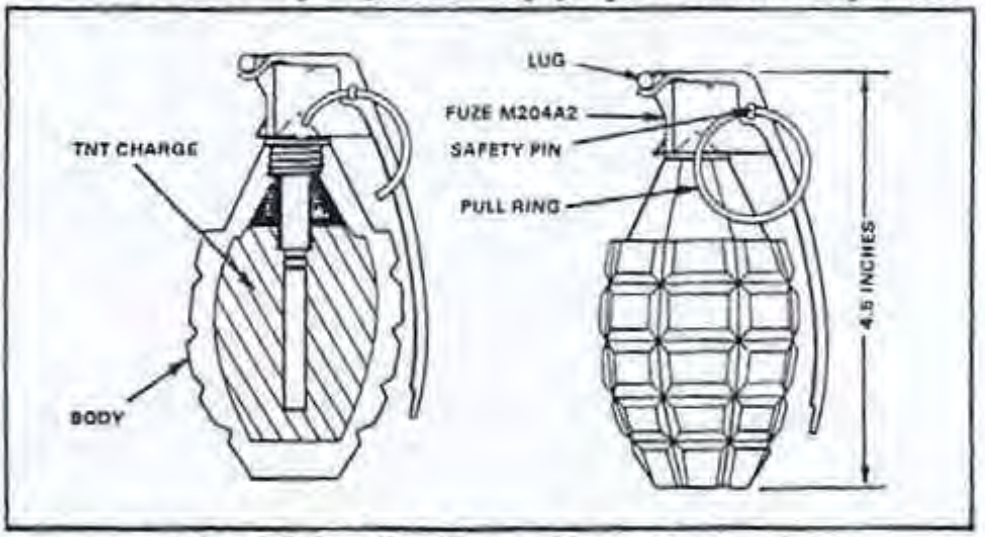


Figure D-3. MK2 fragmentation hand grenade.

a. Body. Cast iron.

b. Filler. TNT (flaked or granular).

c. Fuze. M204A1, M204A2.

d. Weight. 21 ounces.

e. Capabilities. The average soldier can throw the grenade 30 meters. The grenade has a bursting radius of 10 meters.

f. Color. Olive drab body with a single yellow band indicates a high explosive filler.

WARNING: IF THE FUZE IS LOOSE, DO NOT TRY TO TIGHTEN IT. THIS COULD SET OFF THE GRANULAR TNT IN THE GRENADE.

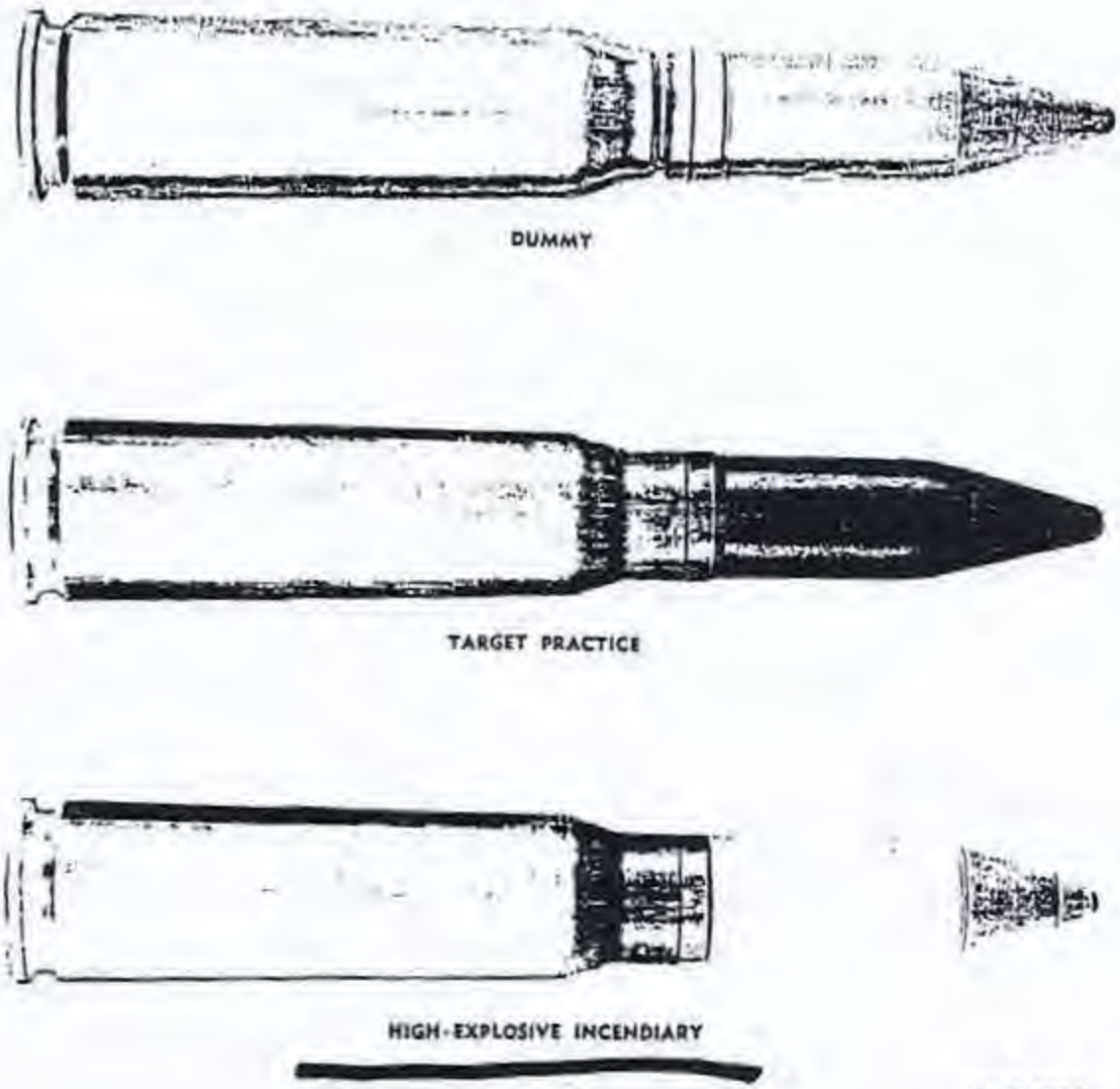


Figure 3-10. 50mm cartridges.

3-3. Ball Cartridge

The ball cartridge is intended for use in rifles, carbines, pistols, revolvers and/or machineguns against personnel and unarmored targets. The bullet, as designed for general purpose combat and training requirements, normally consists of a metal jacket and a lead slug. Caliber .50 ball bullet and 7.62-mm, Ball M59 bullet contain soft steel cores.

3-4. Tracer Cartridge

By means of a trail of flame and smoke, the tracer cartridge is intended to permit visible observation of the bullet's in-flight path or trajectory and the point of impact. It is used primarily to observe the line of fire. It may also be used to pinpoint enemy targets to ignite flammable materials and for signaling purposes. The tracer element consists of a compressed, flammable, pyrotechnic composition in the base of the bullet. This composition is ignited by the propellant when the cartridge is fired. In flight, the bullet emits a bright flame which is visible to the gunner. Trace burnout occurs at a

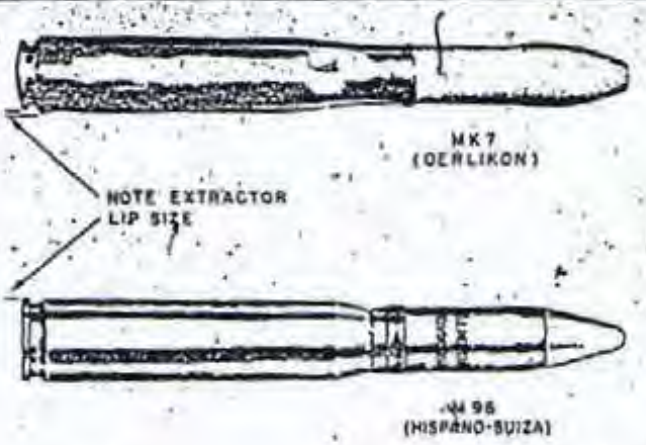


Figure 75 (Part 1). 20-mm Projectiles

This round is also issued B.L. & P., with an inert filler and a dummy nose cap.

Identification—marking and painting

Type	Color
H.E. (Tetryl)	White
H.E. (Pentolite)	Yellow
H.E.-I. (Tetryl)	Red
H.E.-I. (Pentolite)	Light pink
B.L. & P.	Dark gray green

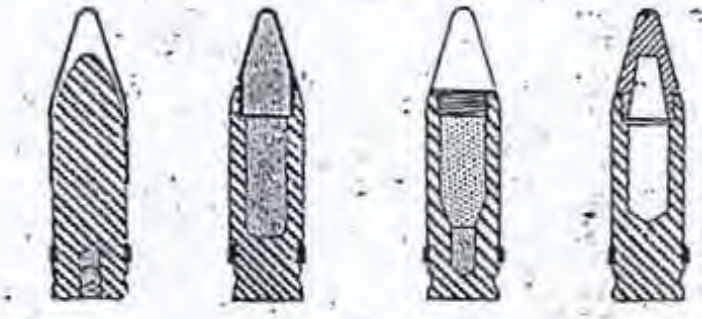
The many modification numbers are to distinguish between products from different contracts.

20-mm A.A. H.E.-T. and B.L. & T. Mk 4 Mods 1—28 and Mk 7

(May have Dark Ignition tracers.)

Over-all length, inches 3.025

MK9 AP-T MK1 HE-I MK1 BALL M 75 AP-T



M 75 APT M95 INCENDIARY M97 HE-I M99 PRACTICE

Figure 75 (Part 2). 20-mm Projectiles, continued

Without nose fuze	2.525
Diameter of base, inch	0.74
Distance base to band, inches	0.397
Width of band, inch	0.16
Diameter at bourrelet, inch	0.78
Filling	Tetryl or Pentolite
Weight of filling, pounds	
H.E.: 0.01 lb.	
Tracer; 0.0173 lb.	
Weight of loaded projectile, pound	0.2621
Cartridge Case	Mk 2
Primer	Mk 30
Tracer	Integral
Fuzes	
Nose	Projectile Mk 4—Mk 26 Mods 0 or 2 Projectile Mk 7—Mk 26 Mods 0 or 1

Length of tracer cavity, inches.....1.107
Diameter of tracer cavity, inches.....0.51

To eliminate the blinding flash characteristic of standard 20-mm tracers fired at night, a special Dark Ignition tracer has been developed, which does not light up until about 100 yards from the gun muzzle. Rounds are designated "H.E.-T.-D.I." Over-all burning time of this trace is four seconds; during the "dark" period there is a faint streaking in the projectile's path.

The Mk 4 and Mk 7 rounds are identical except for the dimensions of the tracer cavity, which is slightly greater in diameter and length in the Mk 4 than in the Mk 7. This somewhat reduces the tracer filling of the Mk 7.

The Mk 7 round is also issued B.L. & T. with an inert filler in the H.E. cavity and a dummy nose plug. The tracer cavity contains the standard tracer mixture.

The burster charge of the 20-mm is more sensitive than the usual projectile burster charge. Accordingly, greater caution should be observed in handling.

The tracer element in these projectiles is loaded in two increments. First increment is the tracer composition; which is pressed in the after compartment by hydraulic pressure; the second increment is the "starter" mixture, which is pressed in on top of the tracer composition and is more sensitive than the latter. When the projectile is fired, the heat from the propellent charge ignites the starter which, in turn, sets off the tracer composition.

Identification—marking and painting

TYPE	COLOR
*H.E.-T. (Tetryl) ..	Light gray
*H.E.-T. (Pentolite).	Blue
B.L. & T.	Dark gray green, with ¼-inch yellow band

20-mm A.P.-T. Mk 9

Over-all length, inches
With cap & windshield.....3.051
Without cap & windshield.....2.449
Diameter of base, inch.....0.742
Distance base to band, inch.....0.315
Width of band, inch.....0.154
Diameter at bourrelet, inch.....0.784
Weight of loaded projectile, pound.....0.2686
Cartridge Case.....Mks 3 and 4
Primer.....Mk 31
Tracer.....Integral

*When assembled with Dark Ignition tracers, a ¼-inch bright red band will be painted around the projectile midway between the bourrelet and the rotating band.

20-mm A/C A.P.-T. M95 (New Series)

Over-all length, inches
With cap & windshield.....3.27
Without cap & windshield.....2.40
Diameter of base, inch.....0.76
Distance base to band, inch.....0.39
Width of band, inch.....0.203
Diameter at bourrelet, inch.....0.78
Weight of loaded projectile, pound.....0.29
Cartridge Case.....M21A1
Primer.....M36A1
Tracer.....Integral

The tracer is red in color and burns for a period of about 2.25 seconds, equivalent to a range of about 1,400 yards. This round is superseding the A.P.-T. M75 round of the Old Series.

20-mm A/C Incendiary M96 (New Series)

Over-all length, inches
With nose cap.....3.245
Without nose cap.....2.30
Diameter of base, inch.....0.76
Distance base to band, inch.....0.39
Width of band, inch.....0.203
Diameter at bourrelet, inch.....0.78
Filling.....Incendiary Mixture
Weight of filling, pound.....0.020
Weight of loaded projectile, pound.....0.27
Cartridge Case.....M21A1
Primer.....M36A1

The incendiary mixture fills both the nose cap and the projectile body. No fuze is required, since the functioning is initiated by impact of the nose with the target.

20-mm A/C H.E.-I. M97 (New Series)

Over-all length, inches
With nose fuze.....3.28
Without nose fuze.....2.44
Diameter of base, inch.....0.76

Distance base to band, inch.....0.39
Width of band, inch.....0.203
Diameter at bourrelet, inch.....0.78
Filling.....Tetryl and Incendiary Mix
Weight of filling, pound.....0.017
Weight of loaded projectile, pound.....0.29
Cartridge Case.....M21A1
Primer.....M36A1
Fuzes.....Nose—M75

This round is superseding the H.E.-I. Mk 1 round of the Old Series.

20-mm A/C Practice M99 (New Series)

Over-all length, inches
With nose cap.....3.27
Without nose cap.....2.30
Diameter of base, inch.....0.76
Distance base to band, inch.....0.39
Width of band, inch.....0.203
Diameter at bourrelet, inch.....0.78
Filling.....None
Weight of loaded projectile, pound.....0.29
Cartridge Case.....M21A1
Primer.....M136A1

This round is superseding the Ball Mk 1 round of the Old Series.

20-mm A/C H.E.-I. Mk 1 (Old Series)

Over-all length, inches.....3.22
Diameter of base, inch.....0.770
Distance base to band, inch.....0.50
Width of band, inch.....0.203
Diameter at bourrelet, inch.....0.784
Filling.....Tetryl and Incendiary Mix
Weight of filling, pound.....0.025
Weight of loaded projectile, pound.....0.290
Cartridge Case.....M21A1
Primer.....M36
Fuzes.....No. 253 Mk 1

This round is to be superseded by the H.E.-I. M97 round of the new ballistically matched series. The H.E.-I. Mk 1 round is to be classified unserviceable by Naval activities as soon as replacement allowances or stocks of the M97 round are received.

20-mm A/C Ball Mk 1 (Old Series)

Over-all length, inches.....3.31
Diameter of base, inch.....0.770
Distance base to band, inch.....0.50
Width of band, inch.....0.203
Diameter at bourrelet, inch.....0.784
Filling.....None
Weight of loaded projectile, pound.....0.28
Cartridge Case.....M21A1
Primer.....M36

This round is to be superseded by the practice round M99 of the new ballistically matched series. The Ball Mk 1 round is to be classified unserviceable by Naval activities as soon as replacement allowances or stocks of the M97 round are received.

20-mm A/C A.P.-T. M75 (Old Series)

Over-all length, inches.....3.25
Diameter of base, inch.....0.770
Distance base to band, inch.....0.5
Width of band, inch.....0.203
Diameter at bourrelet, inch.....0.784
Filling.....None
Weight of loaded projectile, pound.....0.370
Cartridge Case.....M21A1
Primer.....M136
Tracer.....Integral

The tracer is red in color and burns for about four seconds, equivalent to a range of about 3,000 yards.

This round is to be superseded by the A.P.-T. M95 round of the new ballistically matched series. The A.P.-T. M75 round is to be classified unserviceable by Naval activities as soon as replacement allowances or stocks of the M95 round are received.

Table 2-2. Characteristics of typical U. S. and Soviet mortar, artillery, and tank rounds

Caliber	Rate of Fire rounds per minute	Muzzle Velocity fps	Maximum Range m	Projectile			
				Type	Total Weight, lb	Explosive Type	Weight of Explosive, lb
				U.S. Mortars			
60 mm	18–30	522	1,814	HE	3.2	TNT	0.84
81	18–30	875	4,595	HE	9.4	COMP B	2.1
4.2 in.	5–20	960	6,650	HE	27	TNT	7.1
				Soviet Mortars			
82 mm	15–25	680	3,000	HE	6.8	TNT/AMATOL	0.91
120	12–15	820	6,700	HE	35.2	AMATOL	3.48
160	2–3	1,125	8,040	HE	90.7	AMATOL	17.63
240	1	1,180	9,700	HE	330.2	TNT	70.54
240	1	---	---	Concrete Penetrating	332.0	TNT	---
				U. S. Artillery			
105 mm	3–4	1,621	11,500	HE	33	COMP B	5.08
155	1–2	1,852	14,600	HE	94.6	TNT	15.4
175	1	3,000	32,700	HE	147	COMP B	61.0
8 in.	0.5	1,950	16,800	HE	200	TNT	36.75
				Soviet Artillery			
122 mm	6–7	2,956	21,200	HE	47.8	AMATOL	8.1
130	6–7	3,024	31,000	HE	73.6	TNT	10.2
152	4	2,130	17,200	HE	95.9	TNT	12.7
180	1	2,500	30,000	HE	225.0	---	---
203	0.5	1,990	18,000	Concrete Penterating	220.5	TNT	33.9
				U.S. Tank			
90	8–9	2,400	17,900	HEAT	21.4	TNT	2.15
				Soviet Tank			
115	5	---	---	HEAT	39.08	TNT	5.0

APPENDIX H
SURVEY DATA

EE/CA
CULEBRA ISLAND, PUERTO RICO
PROJECT NO: 3195803G-0500-3100

DESIGNATION: Culebra-1 U.S.G.S. QUAD: Culebra STATE/COUNTY: PR/Culebra

HORIZONTAL DATUM - NAD-83 POSITION: Culebrita Island

The horizontal coordinates were established by GPS observations using monuments designated as "L284" and "Control".

	NORTH	EAST
(METER)	254490.4850	326777.4550
(FEET)	834940.8661	1072102.3670

Monument CULEBRA-1, established by R. López de Azúa & Associates, Land Surveyors, P.O. Box 41033, Minillas Sta., San Juan, Puerto Rico 00940-1033, Tel. (809) 268-6097, during the months of November, 1995 through February, 1996.

Begin at the island of Culebrita, located at approximately 1.2 kilometers from the island of Culebra, and from the northeastern peninsula of Culebrita locate a small rock formation or key north of Culebrita Island, 100 meters north of the northern shore. The station is located on the southwest of this rock formation and on the highest point. The station is a 3 1/2" dome aluminum cap, set flush in concrete over natural rocks and stamped "CULEBRA-1".

EE/CA
CULEBRA ISLAND, PUERTO RICO
PROJECT NO: 3195803G-0500-3100

DESIGNATION: Culebra-2 U.S.G.S. QUAD: Culebra STATE/COUNTY: PR/Culebra

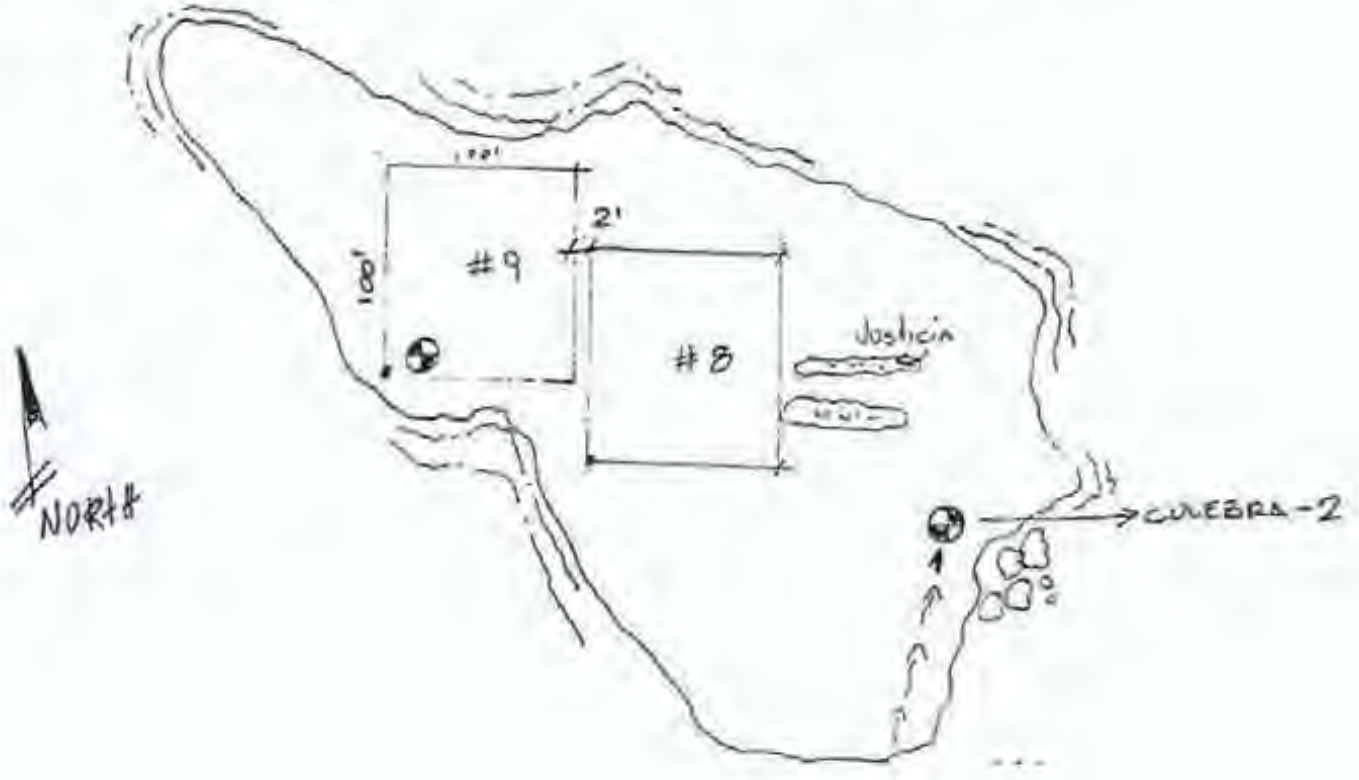
HORIZONTAL DATUM - NAD-83 POSITION: Cayo Botella

The horizontal coordinates were established by GPS observations using monuments designated as "L284" and "Control".

	NORTH	EAST
(METER)	254811.4750	326138.9870
(FEET)	835993.9808	1070007.6600

Monument CULEBRA-2, established by R. López de Azúa & Associates, Land Surveyors, P.O. Box 41033, Minillas Sta., San Juan, Puerto Rico 00940-1033, Tel. (809) 268-6097, during the months of November, 1995 through February, 1996.

Begin at the island of Culebrita, located at approximately 1.2 kilometers from the island of Culebra, and from the northeastern peninsula of Culebrita locate a small key named "Cayo Botella" 420 meters approximately northwest of Culebrita Island northwestern shore. Approach Botella key from the southeastern shore and hike on a rock trail on a northerly direction for approximately .5 kilometers. The station is located on the natural ground and on the highest point. The station is a 3 1/2" dome aluminum cap, set flush in concrete monument on the ground and stamped "CULEBRA-2".



EE/CA
CULEBRA ISLAND, PUERTO RICO
PROJECT NO: 3195803G-0500-3100

DESIGNATION: Culebra-3 U.S.G.S. QUAD: Culebra STATE/COUNTY: PR/Culebra

HORIZONTAL DATUM - NAD-83 POSITION: Cayo del Agua

The horizontal coordinates were established by GPS observations using monuments designated as "L284" and "Control".

	NORTH	EAST
(METER)	253239.6980	314785.2160
(FEET)	830837.2424	1032757.8290

Monument CULEBRA-3, established by R. López de Azúa & Associates, Land Surveyors, P.O. Box 41033, Minillas Sta., San Juan, Puerto Rico 00940-1033, Tel. (809) 268-6097, during the months of November, 1995 through February, 1996.

Begin at the island of Culebra, and go past the island "Cayo Luis Peña" located at 1.5 kilometers approximately west of Culebra. "Cayo del Agua" island is located approximately 0.8 kilometers west from the northwest peninsula of the island. Round the island and land on the south shore. Go north-northwest for approximately .5 kilometers on a trail until you reach the top of a hill. The station is located approximately 25 meters northwest from a target located on the hill. The station is a 3 1/2" dome aluminum cap, set flush in concrete on natural ground and stamped "CULEBRA-3".

Vegetation:
High Grass (2'-3')
FOR ENIRE GRID

EE/CA
CULEBRA ISLAND, PUERTO RICO
PROJECT NO: 31958036-0500-3100

DESIGNATION: Culebra-4 U.S.G.S. QUAD: Culebra STATE/COUNTY: PR/Culebra

HORIZONTAL DATUM - NAD-83 POSITION: Cayo Lobo

The horizontal coordinates were established by GPS observations using monuments designated as "L284" and "Control".

	NORTH	EAST
(METER)	254569.0750	311578.5670
(FEET)	835198.7068	1022237.3480

Monument CULEBRA-4, established by R. López de Azúa & Associates, Land Surveyors, P.O. Box 41033, Minillas Sta., San Juan, Puerto Rico 00940-1033, Tel. (809) 268-6097, during the months of November, 1995 through February, 1996.

Begin at the island of Culebra, Cayo Lobo island is located approximately 5 kilometers from Tamarindo Grande Point on the western shore of Culebra island. Go around the southern shore and land on this shore. Go on shore and hike for approximately 300 meters until reaching a rocky area within the brush. The station is located approximately 400 meters south from an observation point shack and 175 meters southeast from a helicopter landing pad. The station is a 3 1/2" dome aluminum cap, set flush in concrete on natural ground and stamped "CULEBRA-4".

EE/CA
CULEBRA ISLAND, PUERTO RICO
PROJECT NO: 3195803G-0500-3100

DESIGNATION: Culebra-5 U.S.G.S. QUAD: Culebra STATE/COUNTY: PR/Culebra

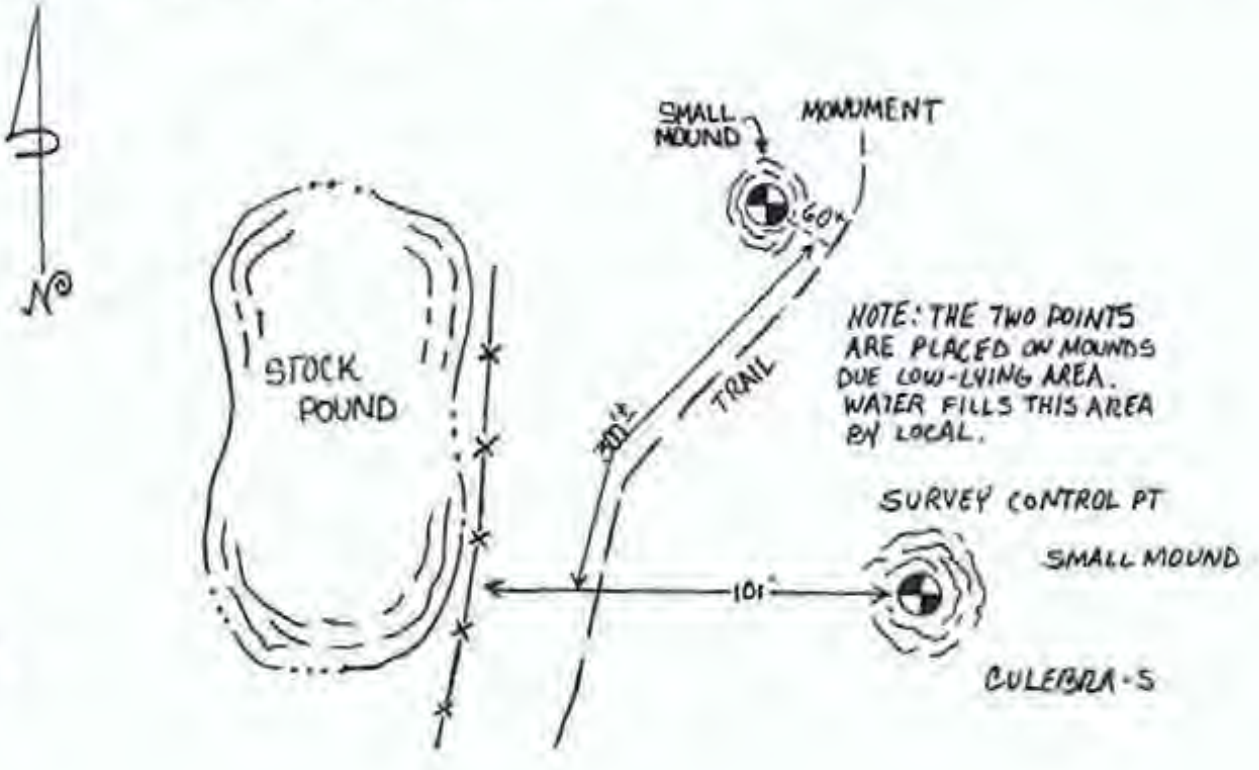
HORIZONTAL DATUM - NAD-83 POSITION: North West Peninsula

The horizontal coordinates were established by GPS observations using monuments designated as "L284" and "Control".

	NORTH	EAST
(METER)	253685.1340	322748.5980
(FEET)	832298.6437	1058884.3590

Monument CULEBRA-5, established by R. López de Azúa & Associates, Land Surveyors, P.O. Box 41033, Minillas Sta., San Juan, Puerto Rico 00940-1033, Tel. (809) 268-6097, during the months of November, 1995 through February, 1996.

Begin at the island of Culebra from downtown travel north-northeast on the main road for approximately 2 kilometers until reaching the Natural Resources Department building entrance. Continue northeasterly on a trail for approximately for .5 kilometers where there is a galvanized cattle gate with limb frame flagged. Follow a very rocky trail for approx. 1.6 kilometers and east of a pond. The station is located approx. 33 meters east of the pond. The station is a 3 1/2" dome aluminum cap, set flush in concrete on natural sandy ground and stamped "CULEBRA-5".



EE/CA
CULEBRA ISLAND, PUERTO RICO
PROJECT NO: 3195803G-0500-3100

DESIGNATION: Culebra-7 U.S.G.S. QUAD: Culebra STATE/COUNTY: PR/Culebra

HORIZONTAL DATUM - NAD-83 POSITION: North West Peninsula

The horizontal coordinates were established by GPS observations using monuments designated as "L284" and "Control".

	NORTH	EAST
(METER)	257191.8810	315401.6020
(FEET)	843803.6962	1034780.0890

Monument CULEBRA-7, established by R. López de Azúa & Associates, Land Surveyors, P.O. Box 41033, Minillas Sta., San Juan, Puerto Rico 00940-1033, Tel. (809) 268-6097, during the months of November, 1995 through February, 1996.

Begin at the island of Culebra, from downtown travel north-northwest on the main road for approximately 7 kilometers reaching the end of the road at Flamenco Peninsula. Here you will encounter a fence, walk west for 10 meters where you will find a concrete slab which resembles a helicopter landing pad. The station is located on the center of this "helo pad" and 25 meters approximately from a gate and 85 meters approximately from a concrete/metal bunker structure. The station is a 3 1/2" dome aluminum cap, set flush in concrete slab and stamped "CULEBRA-7".

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	839560.3806	1041003.5843	10.000	HVC CONTROL
	834302.5039	1072114.4865	10.000	IR IC-2
	834287.5747	1072844.4135	10.000	IR IC-3
	838043.3358	1041268.4772	10.000	IR 5
	838070.6023	1041789.3252	10.000	IR SE-7
)	834941.034	1072103.4220	10.000	HVC CUL-1
)1	834941.0340	1072103.4222	10.000	HVC
)2	830837.2433	1032757.8317	10.000	HVC
)4	832298.0104	1058885.2002	10.000	HVC
)5	829321.3136	1055802.5794	10.000	HVC
)6	833170.0720	1072381.9610	10.000	IR SW-6
)7	833236.0270	1072308.3910	10.000	IR SW-6A
)8	833701.1510	1071970.6560	10.000	IR SW-5
)9	833792.3530	1071943.2900	10.000	IR SW-5A
10	833761.1270	1071258.8230	10.000	IR NW-4
11	833779.5270	1071294.8180	10.000	IR NW-4A
34	838955.3566	1041313.9141	10.000	HVC L284
)00	839570.1262	1039638.1626	10.000	IR 1000
)01	839664.1810	1039627.0333	10.000	IR 1001
)02	839474.5502	1039618.7304	2.856	PT 1002
)04	839383.9704	1038779.0835	10.000	IR 1004
)05	840213.7176	1037896.6052	10.000	IR 1005
)06	840331.0428	1037855.5375	10.000	PR 1006
)11	835996.3945	1070006.6870	10.000	HVC
[redacted]	836041.4059	1069741.9879	10.000	HVC
)13	836030.3114	1069711.2616	23.777	PT
)14	836072.1443	1069808.9005	23.330	PT
)15	836040.4548	1069810.6771	23.290	PT
)16	835976.9109	1069910.9756	18.044	PT
)17	835970.2978	1069810.6488	23.010	PT
)18	835198.7070	1022237.3495	10.000	HVC
)19	836030.1110	1022793.9726	10.000	HVC
)20	835514.6548	1022204.6189	44.989	PT
)21	835598.9444	1022154.4703	67.584	PT
)22	835653.6553	1022239.1316	70.523	PT
)23	835566.0673	1022290.9470	41.337	PT
)24	835292.9715	1022388.9768	15.858	PT
)25	835374.5963	1022331.1877	22.309	PT
)28	835031.3274	1022480.0460	8.9199	PT
)29	835115.5066	1022435.4421	8.6458	PT
)30	835167.1594	1022517.9516	10.143	PT
)31	835084.8085	1022573.3496	10.627	PT
)32	835915.3171	1022677.5072	59.698	PT
)33	836007.6479	1022710.7826	80.978	PT
)34	835976.6220	1022805.7305	84.860	PT
)35	835884.8595	1022772.1398	64.912	PT
)36	834284.4436	1072044.7835	7.1779	PT SW-IC2
)37	834367.4730	1072099.7212	2.8051	PT NW-IC2
)38	834171.5401	1072828.9086	17.718	PT SW-3
[redacted]	834143.2844	1072733.5073	28.236	PT NW-3
[redacted]	839590.5083	1039611.7357	16.978	PT NP-2
)41	839535.0408	1039690.9294	0.3052	PT NP-2
)42	839038.9024	1039714.7314	2.8560	PT NP-3
)43	839029.1376	1039685.8689	2.8560	PT NP-3
)44	839679.9164	1039559.8154	22.758	PT SE-4
)45	839642.7124	1039526.3875	6.0000	PT SW-4A
)47	[illegible]	[illegible]	[illegible]	[illegible]

49	840402.9257	1038089.6678	10.000	PT SE
50	840368.8698	1038053.5576	10.000	PT SW
51	840362.4753	1037786.1280	10.000	PT SE-5
52	840288.7770	1037719.9315	10.000	PT SE-5

	838043.2256	1041268.4772	100.000	IR SE 7
	838070.6023	1041789.3252	100.000	IR 5
)	837690.9686	1041905.8301	100.000	PK 10
	837724.9268	1041736.8864	100.000	IR NE1
	837631.5696	1041779.6324	100.000	IR SE1
	837160.4688	1041479.4688	100.000	IR SE6
	837240.1075	1041419.5036	100.000	IR NE6
	838765.6910	1041321.2390	100.000	IR SEFB4
	838865.6910	1041321.2390	100.000	IR NEFB4
	838140.1600	1041250.7351	100.000	IR NE-7
004	839383.9700	1038779.0835	100.000	PK
005	840213.7176	1037898.6052	100.000	PK
013	836030.3114	1069711.2616	100.000	IR
014	836072.1443	1069808.9005	100.000	IR
053	840775.9424	1037472.1035	100.000	IR NENP-5
054	841037.1783	1037300.0387	100.000	IR SENP8
055	840892.8425	1037405.7577	100.000	GP
056	840727.1327	1037482.9023	100.000	IR SE7
057	841029.1027	1037250.0743	100.000	IR NE8
058	841163.4128	1037388.0615	100.000	IR SE10
059	841262.7643	1037376.9452	100.000	IR NE10
060	841280.8526	1036983.4990	100.000	IR SW 11
061	842665.7133	1036148.3810	100.000	CL
062	841293.4551	1037031.7908	100.000	IR SE11
	841381.8932	1036901.9623	100.000	CL
	841496.2666	1036515.7604	100.000	CL
065	841858.4622	1036383.9664	100.000	IR NE12
066	841760.0722	1036402.9880	100.000	IR SE12
067	842647.0988	1036156.4420	100.000	IR NE13
068	842565.0745	1036212.5389	100.000	IR SE13
069	842735.9397	1036191.5334	100.000	IR SW14
070	842835.4337	1036183.4219	100.000	IR NW14
071	843342.2241	1035817.5800	100.000	IR SW15
072	843240.5196	1035730.3196	100.000	HVC EARIN
073	843520.3276	1035834.4716	100.000	PK CONTROL
074	843385.1880	1035908.1968	100.000	SE 15
075	843211.1360	1036500.2372	100.000	IR SW16
076	843275.5852	1036576.2638	100.000	IR SE16
077	843869.0027	1036231.8421	100.000	IR SE17
078	843842.7695	1036134.2754	100.000	IR SW17
079	844568.2141	1035824.6111	100.000	IR SW18
080	844642.7415	1035891.0531	100.000	IR SE18
081	843677.2626	1035075.9226	100.000	IR SE19
082	843765.2166	1035122.0755	100.000	IR NE19
083	832650.0027	1060631.2721	100.000	IR
084	832298.6443	1058885.6723	100.000	IR
085	832820.5279	1060735.5413	100.000	IR SWCB2
086	832544.0229	1060521.1538	100.000	IR SECB3
087	832528.1097	1060422.7622	100.000	IR CB3
088	832572.5886	1060364.4780	100.000	IR SECB4
	832559.5109	1060265.5659	100.000	IR SWCB4
090	832846.8170	1060479.4251	100.000	IR SWCB1
091	832865.8392	1060577.1476	100.000	IR SECB1
093	842723.3951	1036146.2577	100.000	PK CONTROL
094	842820.7929	1036288.0327	100.000	IR SE14
095	842862.2948	1036261.3653	100.000	IR SW14

001	844232.8460	1035605.9015	100.000	IR NE22
002	844260.2739	1035916.0955	100.000	IR NW20
003	844327.4311	1035990.2581	100.000	IR NE20
004	843548.0467	1036241.5550	100.000	IR NW21
005	843601.0876	1036326.6598	100.000	IR NE21
007	832644.9117	1060352.3353	100.000	PK CONTROL
008	832803.9885	1060200.7600	100.000	CLF
009	832683.9277	1059833.7992	100.000	IR CB5
010	832729.3361	1059854.5845	100.000	IR CBNW5
013	839571.9788	1038342.8571	100.000	IR NW23
014	839597.4752	1038385.8128	100.000	IR NE23

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284	838955.35660	1041313.91410	100.000	IR
053	840775.94240	1037472.10385	100.000	IR
054	841037.17834	1037300.03874	100.000	IR
060	841280.85268	1036983.49946	100.000	IR
061	842665.71337	1036148.38174	100.000	IR
071	843342.22414	1035817.58027	100.000	IR
072	843240.51963	1035730.31965	100.000	IR
081	843677.28267	1035075.92264	100.000	IR
082	843765.21669	1035122.07551	100.000	IR
083	832850.00270	1060831.27216	100.000	IR
084	832298.64430	1058885.67234	100.000	IR
092	843605.81732	1035279.71223	100.000	IR
015	843738.55123	1034783.56865	100.000	IR
023	843738.55123	1034783.56865	100.000	IR
040	837251.20963	1042132.40951	100.000	IR
050	840259.13595	1037684.27277	100.000	IR

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9	839224.856	1041188.374	100.000	IR SWFB-9
284	838955.3566	1041313.9141	100.000	HVC L284
2015	843738.5512	1034783.5686	100.000	HVC
2016	843779.833	1034550.6855	100.000	IR
2017	843880.782414	1034554.04252	106.055	IR NWNP29
2018	843735.678956	1034712.33651	100.062	GP
2019	843735.230751	1034714.45875	100.243	GP
2020	843804.351474	1034780.74601	98.6315	CLF
2021	843521.465078	1034946.74682	170.648	BC CONCB
2022	843567.707495	1034908.02007	154.220	BC METALB
2025	839374.751766	1040808.82091	100.000	GP
2026	839386.606538	1040808.19253	100.000	GP
2027	839371.234636	1040902.96154	100.000	CL
2028	839357.352505	1040998.41812	100.000	CL
2029	839335.288467	1041082.71069	100.000	CL
2030	839309.593555	1041110.71609	100.000	CL
2031	839249.268534	1041158.99257	100.000	CL
2032	839160.162298	1041223.13257	100.000	CL
2033	839120.080057	1041241.28965	100.000	CL
2034	839097.895534	1041248.59784	100.000	CL
2035	839067.851527	1041256.63113	100.000	CL
2036	839033.345111	1041275.40795	100.000	CL
2037	838989.649589	1041307.69178	100.000	CL
2038	838428.091808	1039367.02537	100.000	BC TANK
2039	839379.76506	1041309.34956	100.000	BC TANK
2040	839317.172	1039185.978	100.000	IR NENP25
2041	839320.238	1039235.655	100.000	IR SENP25
2042	839117.750462	1039090.97643	148.887748826	BC TANK
2043	839229.774908	1039681.44868	24.5478659485	IR NWNP26
2044	839202.114638	1039724.74078	15.0744937289	IR SWNP26
2050	840259.1359	1037664.2727	100.000	IR 2050
2051	841037.1783	1037300.0387	100.000	IR NP 8
2053	841130.346799	1037056.44166	100.000	CL
2054	841128.892962	1037054.66196	100.000	CL
2055	840891.345137	1037401.79062	100.000	GP
2056	840269.122578	1037632.24172	95.6308143078	IR NENP27
2057	840275.397609	1037582.3629	88.7710500879	IR NWNP27

058	836907.112153	1041425.58146	220.783	IR 10
059	836936.339569	1041482.49942	206.407	BC WTANK
060	836948.108982	1041475.3754	207.063646225	BC WTANK
061	836945.53811	1042010.72984	100.000	CLF
062	837061.96219	1042158.55543	100.000	CLF
063	837204.287163	1042336.97709	100.000	BC
064	837226.619672	1042368.94395	100.000	BC
065	837222.823705	1042410.8262	100.000	BC
066	837234.920189	1042386.8486	100.000	CL
067	837237.52134	1042362.20217	100.000	CL
068	837230.281832	1042212.54177	100.000	CL
069	837247.776537	1042160.44005	100.000	CL
070	837324.57111	1042123.84279	100.000	CL
071	837413.486705	1042107.35394	100.000	CL

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40	837251.29096	1042132.4095	100.000	IR 2040
41	837123.485	1041339.891	100.000	IR 2041
58	837080.174744	1041365.12326	220.783239666	IR SE10
59	837095.431436	1041427.26124	206.407927309	TANK
60	837108.530358	1041423.05543	207.063646225	TANK
61	836982.092671	1041943.27124	100.000	CLF
62	837061.131765	1042114.03363	100.000	CLF
63	837158.285018	1042320.55707	100.000	BC SW
64	837173.073397	1042354.87991	100.000	BC NW
65	837159.221637	1042396.69128	100.000	CL ROAD
66	837176.540416	1042376.16544	100.000	CL ROAD
67	837184.776649	1042352.79073	100.000	CL ROAD
68	837212.380781	1042205.52004	100.000	CL ROAD
69	837241.461977	1042158.8838	100.000	CL ROAD
70	837324.642755	1042141.05899	100.000	CL ROAD
71	837414.960101	1042145.60238	100.000	CL ROAD

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284	838955.35660	1041313.91410	100.000	IR	
002	837785.32741	1041512.95454	100.000	IR	SWFB2
003	838237.59789	1041444.35352	100.000	IR	SEFB3
004	838642.05759	1041380.11138	100.000	IR	SEFB4
005	838070.60233	1041789.32520	100.000	IR	
008	838575.73513	1040616.52393	100.000	IR	NEFB8
288	841373.70300	1036449.72900	100.000	IR	NENP28
028	841332.55460	1036423.08330	100.000	IR	SENP28
033	838334.42170	1041418.47708	100.000	IR	NEFB3
088	838581.84516	1040519.21963	100.000	IR	NWFB8
222	837874.61611	1041455.07451	100.000	IR	NWFB2

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284	255714.104119	317393.1158026	100.000	HVC
1053	256269.019781	316222.1296355	100.000	IR
1054	256348.644654	316169.6841461	100.000	IR
1060	256422.916742	316073.2027605	100.000	IR
1061	256845.023124	315818.6583904	100.000	IR
1071	257051.224019	315717.8299007	100.000	IR
1072	257020.224423	315691.2328105	100.000	IR
1081	257153.343967	315491.772203	100.000	IR
1082	257180.152406	315505.8396259	100.000	IR
1083	253792.228406	323342.0184371	100.000	IR
1084	253685.134152	322748.9984259	100.000	IR
1092	257131.567381	315553.8873942	100.000	IR
2015	257172.024758	315402.6625286	100.000	IR
2023	257172.024758	315402.6625286	100.000	IR
2040	255194.679084	317642.5937026	100.000	IR
2050	256111.49686	316280.7029004	100.000	IR
1	255898.509707	317298.5270904	100.000	HVC CONTROL
2	254295.91178	326781.1490462	100.000	IR IC-2
3	254291.36135	327003.6312408	100.000	IR IC-3
5	255436.119623	317379.2666078	100.000	IR 5
7	255444.430469	317538.0213957	100.000	IR SE-7
10	254490.536143	326777.7765798	100.000	HVC CUL-1
101	254490.536143	326777.7768408	100.000	HVC
102	253239.698236	314785.2166713	100.000	HVC
104	253884.940939	322748.8545174	100.000	HVC
105	252777.64194	321809.2698184	100.000	HVC
106	253950.745846	326862.6754368	100.000	IR SW-6
107	253970.84897	326840.251256	100.000	IR SW-6A
108	254112.619049	326737.3094221	100.000	IR SW-5
109	254140.417474	326728.9682486	100.000	IR SW-5A
110	254130.89977	326520.3422898	100.000	IR NW-4
111	254136.508102	326531.3135877	100.000	IR NW-4A
284	255714.104119	317393.1158026	100.000	HVC L284
1000	255901.486268	316881.7361227	100.000	IR 1000
1001	255930.154228	316878.9535065	100.000	IR 1001
1002	255872.354645	316876.4227775	100.000	PT 1002
1004	255844.745866	316620.4978905	100.000	IR 1004
1005	256097.653319	316351.5179667	100.000	IR 1005
1006	256133.41405	316339.0005067	100.000	PK 1006
1011	254812.210667	326138.6904737	100.000	HVC
1012	254825.930169	326058.0100286	100.000	HVC
1013	254822.548559	326048.6446317	100.000	PT
1014	254835.299252	326078.4050279	100.000	PT
1015	254825.640273	326078.9465367	100.000	PT
1016	254806.272054	326109.5175806	100.000	PT
1017	254804.256377	326078.9379108	100.000	PT
1018	254569.075031	311578.5672835	100.000	HVC
1019	254822.487477	311748.2263437	100.000	HVC
1020	254665.376113	311568.5909767	100.000	PT
1021	254691.067634	311553.3056528	100.000	PT
1022	254707.74355	311579.1104687	100.000	PT
1023	254681.046674	311594.9038342	100.000	PT
1024	254597.806908	311624.783377	100.000	PT
1025	254622.686197	311607.1722721	100.000	PT
1028	254518.057627	311655.5893307	100.000	PT
1029	254543.715498	311638.9460287	100.000	PT
1030	254559.459309	311684.0949748	100.000	PT

1014	254835.299252	326078.4050279	100.000	PT
1015	254825.640273	326078.9465367	100.000	PT
1016	254806.272054	326109.5175806	100.000	PT
1017	254804.256377	326078.9379108	100.000	PT
1018	254569.075031	311578.5672835	100.000	HVC
1019	254822.487477	311748.2263437	100.000	HVC
1020	254665.376113	311568.5909767	100.000	PT
1021	254891.087834	311553.3056528	100.000	PT
1022	254707.74355	311579.1104687	100.000	PT
1023	254681.046674	311594.9038342	100.000	PT
1024	254597.806908	311624.783377	100.000	PT
1025	254622.686197	311607.1722721	100.000	PT
1028	254518.057627	311655.5893307	100.000	PT
1029	254543.715498	311638.9460287	100.000	PT
1030	254559.459303	311684.0949746	100.000	PT
1031	254534.297738	311680.9803188	100.000	PT
1032	254787.498226	311712.7276188	100.000	PT
1033	254815.64071	311722.869981	100.000	PT
1034	254806.183997	311751.8101588	100.000	PT
1035	254778.153771	311741.5716929	100.000	PT
1036	254290.406989	326759.9035293	100.000	PT SW-IC2
1037	254315.714401	326776.6485738	100.000	PT NW-IC2
1038	254255.993933	326998.9053378	100.000	PT SW-3
1039	254247.381579	326969.8269634	100.000	PT NW-3
1040	255907.698744	316874.2907887	100.000	PT NP-2
1041	255890.792216	316898.4290767	100.000	PT NP-2
1042	255739.56893	316905.6839408	100.000	PT NP-3
1043	255736.592613	316890.790621	100.000	PT NP-3
1044	255934.950388	316858.4654496	100.000	PT SE-4
1045	255923.610586	316848.2766053	100.000	PT SW-4A
1047	256213.947462	316480.1727191	100.000	PT SE
1048	256224.108081	316469.6585799	100.000	PT SE
1049	256155.324063	316410.3635649	100.000	PT SE
1050	256144.943804	316399.3571539	100.000	PT SW
1051	256142.994756	316317.8444488	100.000	PT SE-5
1052	256120.53147	316297.6677153	100.000	PT SE-5
7	255436.086095	317379.2666076	100.000	IR SE 7
5	255444.430469	317538.0213957	100.000	IR 5
10	255328.717886	317573.5321603	100.000	PK 10
11	255339.068366	317522.6476187	100.000	IR NE1
12	255310.61913	317535.0670244	100.000	IR SE1
13	255167.021223	317443.5769761	100.000	IR SE6
14	255191.295148	317425.2995466	100.000	IR NE6
15	255656.293928	317395.3484366	100.000	IR SEFB4
16	255686.773989	317395.3484366	100.000	IR NEFB4
77	255465.831698	317373.8588049	100.000	IR NE-7
1004	255844.745744	316620.4978905	100.000	PK
1005	256097.653319	316351.5179867	100.000	PK
1013	254822.548559	326048.6446317	100.000	IR
1014	254835.299252	326078.4050279	100.000	IR
1053	256269.019781	316222.1295898	100.000	IR NENP-5
1054	256348.644642	316169.6841339	100.000	IR SENPB
1055	256304.651002	316201.9073495	100.000	GP
1056	256254.142554	316225.4210706	100.000	IR SE7
1057	256348.183194	316154.4549543	100.000	IR NE8
1058	256387.120895	316196.513537	100.000	IR SE10
1059	256417.403392	316193.1252819	100.000	IR NE10
1060	256422.916717	316073.2026403	100.000	IR SW 11
1061	256845.023103	315818.6581649	100.000	CL
1062	256426.757967	316087.9220104	100.000	IR SE11
1063	256453.713954	316048.3502045	100.000	CL
1064	256488.575036	315930.6356299	100.000	CL
1065	256598.972475	315890.4647384	100.000	IR NE12
1066	256568.983144	315896.2625337	100.000	IR SE12

1051	256142.984758	316317.8444488	100.000	PT SE-5
1052	256120.53147	316297.6677153	100.000	PT SE-5
7	255436.086095	317379.2666078	100.000	IR SE 7
5	255444.430469	317536.0213957	100.000	IR 5
10	255328.717886	317573.5321603	100.000	PK 10
11	255339.068366	317522.6476187	100.000	IR NE1
12	255310.61913	317535.0670244	100.000	IR SE1
13	255167.021223	317443.5769761	100.000	IR SE6
14	255191.295148	317425.2995466	100.000	IR NE6
15	255656.293928	317395.3484366	100.000	IR SEFB4
16	255686.773989	317395.3484368	100.000	IR NEFB4
77	255465.631698	317373.8588049	100.000	IR NE-7
1004	255844.745744	316620.4978905	100.000	PK
1005	256097.653319	316351.5179667	100.000	PK
1013	254822.546559	326048.6446317	100.000	IR
1014	254835.299252	326078.4050279	100.000	IR
1053	256269.019781	316222.1295898	100.000	IR NENP-5
1054	256348.644642	316169.6841339	100.000	IR SENP8
1055	256304.651002	316201.9073495	100.000	GP
1056	256254.142554	316225.4210706	100.000	IR SE7
1057	256346.183194	316154.4549543	100.000	IR NE8
1058	256387.120995	316196.513537	100.000	IR SE10
1059	256417.403392	316193.1252819	100.000	IR NE10
1060	256422.918717	316073.2026403	100.000	IR SW 11
1061	256645.023103	315818.6581649	100.000	CL
1062	256426.757967	316087.9220104	100.000	IR SE11
1063	256453.713954	316048.3502045	100.000	CL
1064	256488.575036	315930.6356299	100.000	CL
1065	256598.972475	315890.4647384	100.000	IR NE12
1066	256568.983144	315896.2625337	100.000	IR SE12
1067	256839.349392	315821.1151626	100.000	IR NE13
1068	256814.348335	315838.2135319	100.000	IR SE13
1069	256866.428152	315831.8110427	100.000	IR SW14
1070	256896.753984	315829.3386525	100.000	IR NW14
1071	257051.224007	315717.8298184	100.000	IR SW15
1072	257020.224414	315691.2327953	100.000	HVC EARIN
1073	257105.510082	315722.9783884	100.000	PK CONTROL
1074	257064.31943	315745.4498743	100.000	SE 15
1075	257011.268274	315925.9041491	100.000	IR SW16
1076	257030.908334	315949.0771031	100.000	IR SE16
1077	257211.786446	315844.097159	100.000	IR SE17
1078	257203.79055	315814.3587694	100.000	IR SW17
1079	257424.906506	315719.972902	100.000	IR SW18
1080	257447.622503	315740.2244641	100.000	IR SE18
1081	257153.343946	315491.7721908	100.000	IR SE19
1082	257180.152379	315505.8396228	100.000	IR NE19
1083	253792.228406	323342.0184188	100.000	IR
1084	253685.134152	322748.9984137	100.000	IR
1085	253783.244469	323312.8396126	100.000	IR SWCB2
1086	253759.925699	323247.4941719	100.000	IR SECB3
1087	253754.465744	323217.5043523	100.000	IR CB3
1088	253768.626446	323199.7392926	100.000	IR SECB4
1089	253764.646451	323168.5908242	100.000	IR SWCB4
1090	253852.217525	323234.7752387	100.000	IR SWCB1
1091	253858.015503	323264.5611163	100.000	IR SECB1
1093	256862.604551	315818.0109817	100.000	PK CONTROL
1094	256892.291459	315861.2240881	100.000	IR SE14
1095	256804.941264	315853.0958484	100.000	IR SW14
1096	255796.255503	317354.8128816	100.000	IR SE9
2000	257313.727619	315662.2615024	100.000	IR SE22
2001	257322.686105	315653.3100826	100.000	IR NE22
2002	257331.046146	315747.8574029	100.000	IR NW20
2003	257351.515701	315770.4622085	100.000	IR NE20
2004	257113.958861	315847.0576568	100.000	IR NW21
2005	257130.12576	315872.9976518	100.000	IR NE21

1084	253685.134152	322748.9984137	100.000	IR
1085	253783.244469	323312.8396126	100.000	IR SWCB2
1086	253759.925699	323247.4941719	100.000	IR SECB3
1087	253754.465744	323217.5043523	100.000	IR CB3
1088	253768.826446	323199.7392926	100.000	IR SECB4
1089	253764.646451	323169.5906242	100.000	IR SWCB4
1090	253852.217525	323234.7752387	100.000	IR SWCB1
1091	253858.015503	323264.5611163	100.000	IR SECB1
1093	256862.604551	315818.0109817	100.000	PK CONTROL
1094	256892.291459	315861.2240881	100.000	IR SE14
1095	256904.941264	315853.0958484	100.000	IR SW14
1096	255796.255503	317354.8128816	100.000	IR SE9
2000	257313.727619	315682.2815024	100.000	IR SE22
2001	257322.688105	315653.3100826	100.000	IR NE22
2002	257331.046146	315747.8574029	100.000	IR NW20
2003	257351.515701	315770.4622085	100.000	IR NE20
2004	257113.958861	315847.0576569	100.000	IR NW21
2005	257130.12576	315872.9976518	100.000	IR NE21
2007	253790.676666	323196.0381902	100.000	PK CONTROL
2008	253839.163372	323149.8379464	100.000	CLF
2009	253802.568767	323037.9880708	100.000	IR CB5
2010	253816.409275	323044.323443	100.000	IR CBNW5
2013	255902.050941	316487.5358179	100.000	IR NW23
2014	255909.82226	316500.6287414	100.000	IR NE23
9	255796.2477	317354.8511036	100.000	IR SWFB-9
284	255714.104119	317393.1158026	100.000	HVC L284
2015	257172.024749	315402.6625133	100.000	HVC
2016	257184.807467	315331.6796025	100.000	IR
2017	257215.37691	315332.7028181	100.000	IR NWNP29
2018	257171.149287	315380.9509258	100.000	GP
2019	257171.012874	315381.5977737	100.000	GP
2020	257192.080712	315401.8021831	100.000	CLF
2021	257105.856786	315452.3993282	100.000	BC CONCB
2022	257119.951483	315440.5953759	100.000	BC METALB
2025	255841.936021	317239.1630874	100.000	GP
2026	255845.549363	317238.9715598	100.000	GP
2027	255840.863998	317267.8572118	100.000	CL
2028	255836.632716	317296.9524356	100.000	CL
2029	255829.907584	317322.6448623	100.000	CL
2030	255822.075759	317331.1809253	100.000	CL
2031	255803.688656	317345.8956259	100.000	CL
2032	255776.52902	317365.445537	100.000	CL
2033	255764.311929	317370.979826	100.000	CL
2034	255757.550073	317373.2073668	100.000	CL
2035	255748.392641	317375.6559185	100.000	CL
2036	255737.875065	317381.3791046	100.000	CL
2037	255724.556643	317391.2192357	100.000	CL
2038	255553.393489	316799.7029309	100.000	BC TANK
2039	255843.464076	317391.7245281	100.000	BC TANK
2040	255824.385673	316744.5195822	100.000	IR NENP25
2041	255825.320192	316759.6611621	100.000	IR SENP25
2042	255763.801867	316715.5630457	100.000	BC TANK
2043	255797.746986	316895.5393475	100.000	IR NWNP26
2044	255789.316119	316908.7348059	100.000	IR SWNP26
2050	256111.496844	316280.7028791	100.000	IR 2050
2051	256348.644642	316169.6841339	100.000	IR NP 8
2053	256377.042457	316095.4356076	100.000	CL
2054	256376.599327	316094.8931539	100.000	CL
2055	256304.194605	316200.6981811	100.000	GP
2056	256114.54079	316270.9398169	100.000	IR NENP27
2057	256116.453423	316255.7367221	100.000	IR NWNP27
2058	255089.797963	317427.152082	100.000	IR 10
2059	255098.706497	317444.5007109	100.000	BC WTANK
2060	255102.293821	317442.3293053	100.000	BC WTANK
2061	255101.510218	317605.505665	100.000	CLF

	[illegible]	[illegible]	[illegible]	IR SWPB-8
284	255714.104119	317393.1158026	100.000	HVC L284
2015	257172.024749	315402.6625133	100.000	HVC
2016	257184.607467	315331.6796025	100.000	IR
2017	257215.37691	315332.7028181	100.000	IR NWNP29
2018	257171.149287	315380.9509256	100.000	GP
2019	257171.012674	315381.5977737	100.000	GP
2020	257192.080712	315401.8021831	100.000	CLF
2021	257105.856766	315452.3993282	100.000	BC CONCB
2022	257119.951483	315440.5953759	100.000	BC METALB
2025	255841.936021	317239.1630674	100.000	GP
2026	255845.549363	317238.9715598	100.000	GP
2027	255840.863898	317267.8572118	100.000	CL
2028	255836.632716	317296.9524356	100.000	CL
2029	255829.907584	317322.6448623	100.000	CL
2030	255822.075759	317331.1809253	100.000	CL
2031	255803.688656	317345.8956259	100.000	CL
2032	255776.52902	317365.445537	100.000	CL
2033	255764.311929	317370.979826	100.000	CL
2034	255757.550073	317373.2073668	100.000	CL
2035	255748.392641	317375.6559185	100.000	CL
2036	255737.675065	317381.3791046	100.000	CL
2037	255724.556643	317391.2192357	100.000	CL
2038	255553.393489	316799.7029309	100.000	BC TANK
2039	255843.464076	317391.7245281	100.000	BC TANK
2040	255824.385673	316744.5195822	100.000	IR NENP25
2041	255825.320192	316759.6611621	100.000	IR SENP25
2042	255763.601867	316715.5630457	100.000	BC TANK
2043	255797.746986	316895.5393475	100.000	IR NWNP26
2044	255789.318119	316908.7348059	100.000	IR SWNP26
2050	256111.496844	316280.7028791	100.000	IR 2050
2051	256348.644642	316169.6841339	100.000	IR NP 8
2053	256377.042457	316095.4356076	100.000	CL
2054	256376.599327	316094.8931538	100.000	CL
2055	256304.194805	316200.6981811	100.000	GP
2056	256114.54079	316270.9398169	100.000	IR NENP27
2057	256116.453423	316255.7367221	100.000	IR NWNP27
2058	255089.797963	317427.152082	100.000	IR 10
2059	255098.706497	317444.5007109	100.000	BC WTANK
2060	255102.293821	317442.3293053	100.000	BC WTANK
2061	255101.510218	317605.505665	100.000	CLF
2062	255136.998348	317650.5629949	100.000	CLF
2063	255180.377087	317704.9480257	100.000	BC
2064	255187.184049	317714.0799428	100.000	BC
2065	255186.027036	317727.4552794	100.000	BC
2066	255189.714052	317720.1468923	100.000	CL
2067	255190.506884	317712.6346454	100.000	CL
2068	255188.300278	317667.0180643	100.000	CL
2069	255193.632675	317651.1374282	100.000	CL
2070	255217.039707	317639.9825611	100.000	CL
2071	255244.141235	317634.9567498	100.000	CL

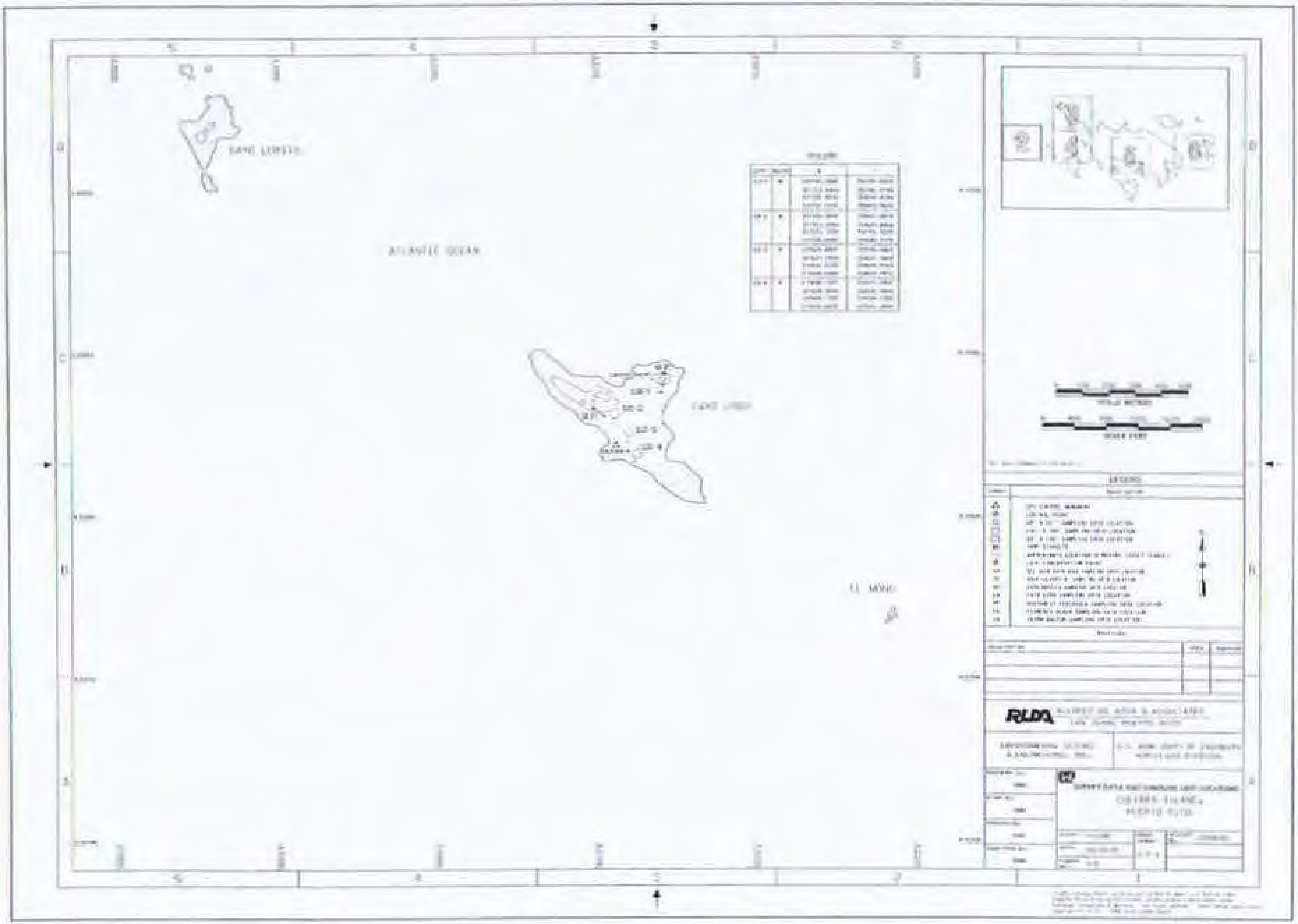
SYSTEM PARAMETERS

Network status = reduced computed adjusted
Datum = NAD-83
Coordinate System = 1983 State Plane Lambert
Zone unit = P.R. and V.I.
Linear units = meter

NP-24 Quadrant

1	0001	255841.1575	316539.3155	SOUTH WEST CORNER
2	0002	255844.3705	316554.2729	SOUTH EAST CORNER
3	0003	255856.1150	316536.1040	NORTH WEST CORNER
4	0004	255859.3270	316551.0610	NORTH EAST CORNER


OCEANO ATLANTICO
CARIBBEAN SEA
MUNICIPAL ISLAND OF CULEBRA
PUERTO RICO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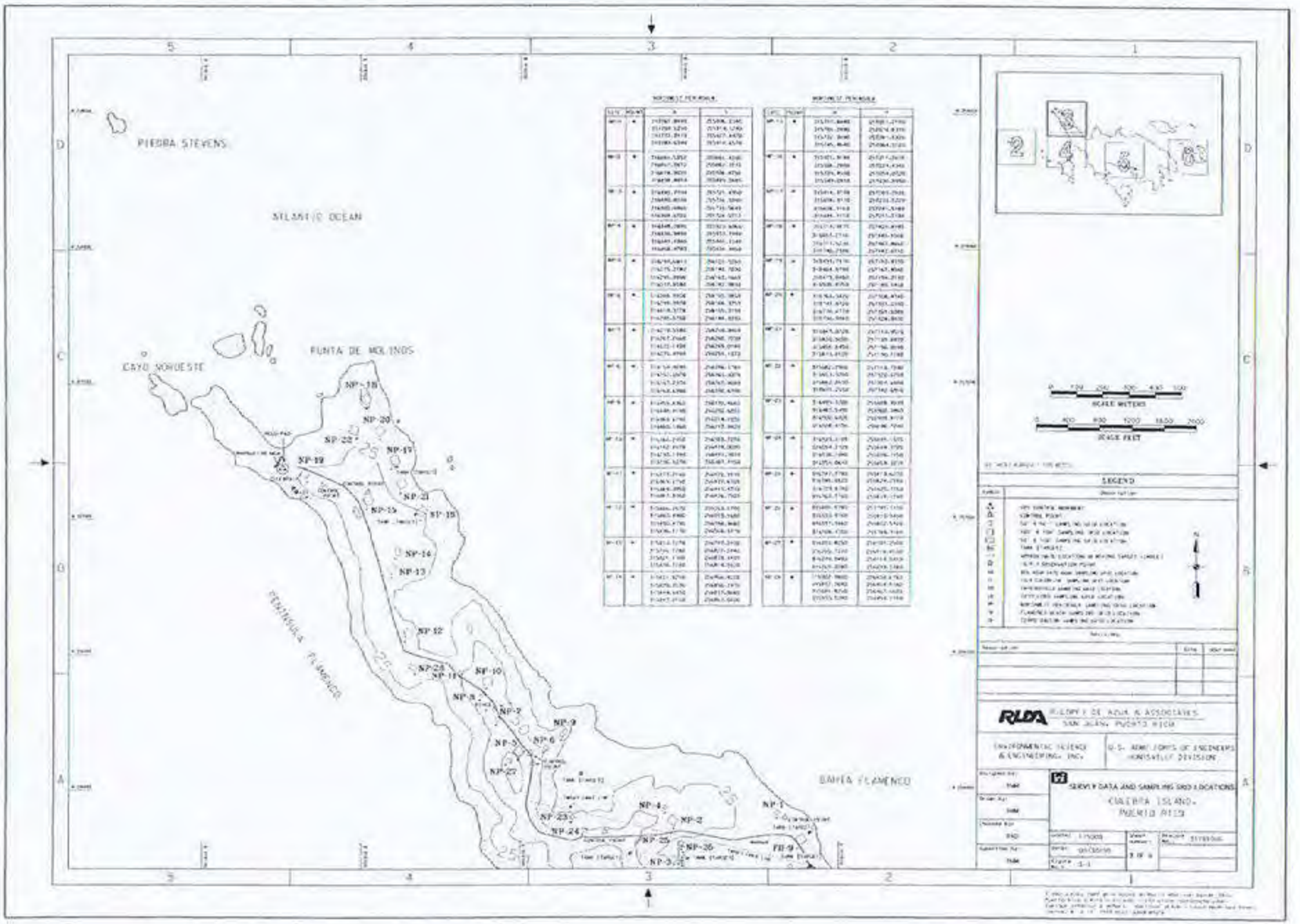
LEGEND
RLDA
CULEBRA ISLAND,
PUERTO RICO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ATLANTIC OCEAN
CAYO NORDESTE
PUNTA DE MOLINOS
PENINSULA FLAMENCO
BAHIA FLAMENCO
NP-1
NP-2
NP-3
NP-4
NP-5
NP-6
NP-7
NP-8
NP-9
NP-10
NP-11
NP-12
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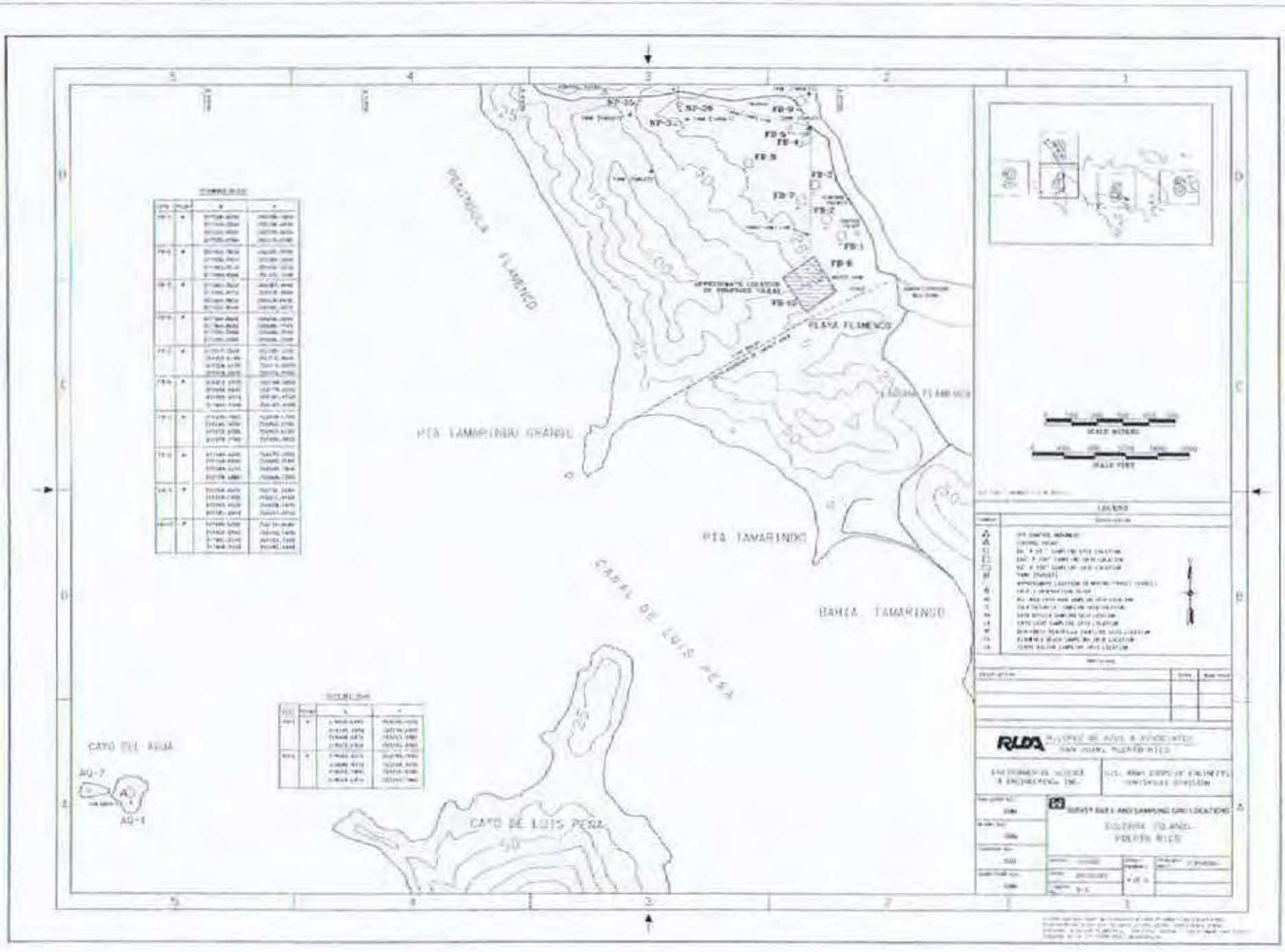
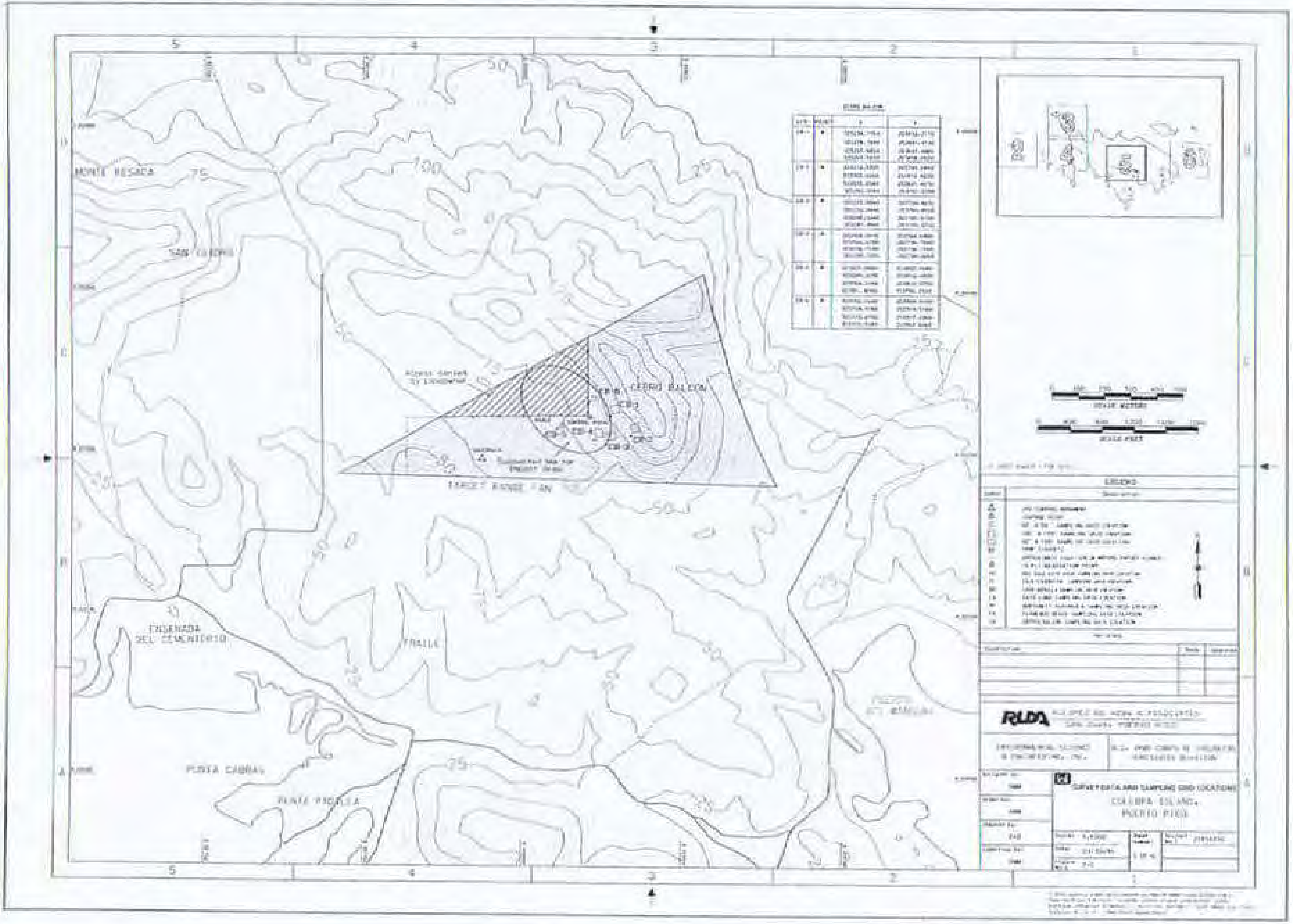
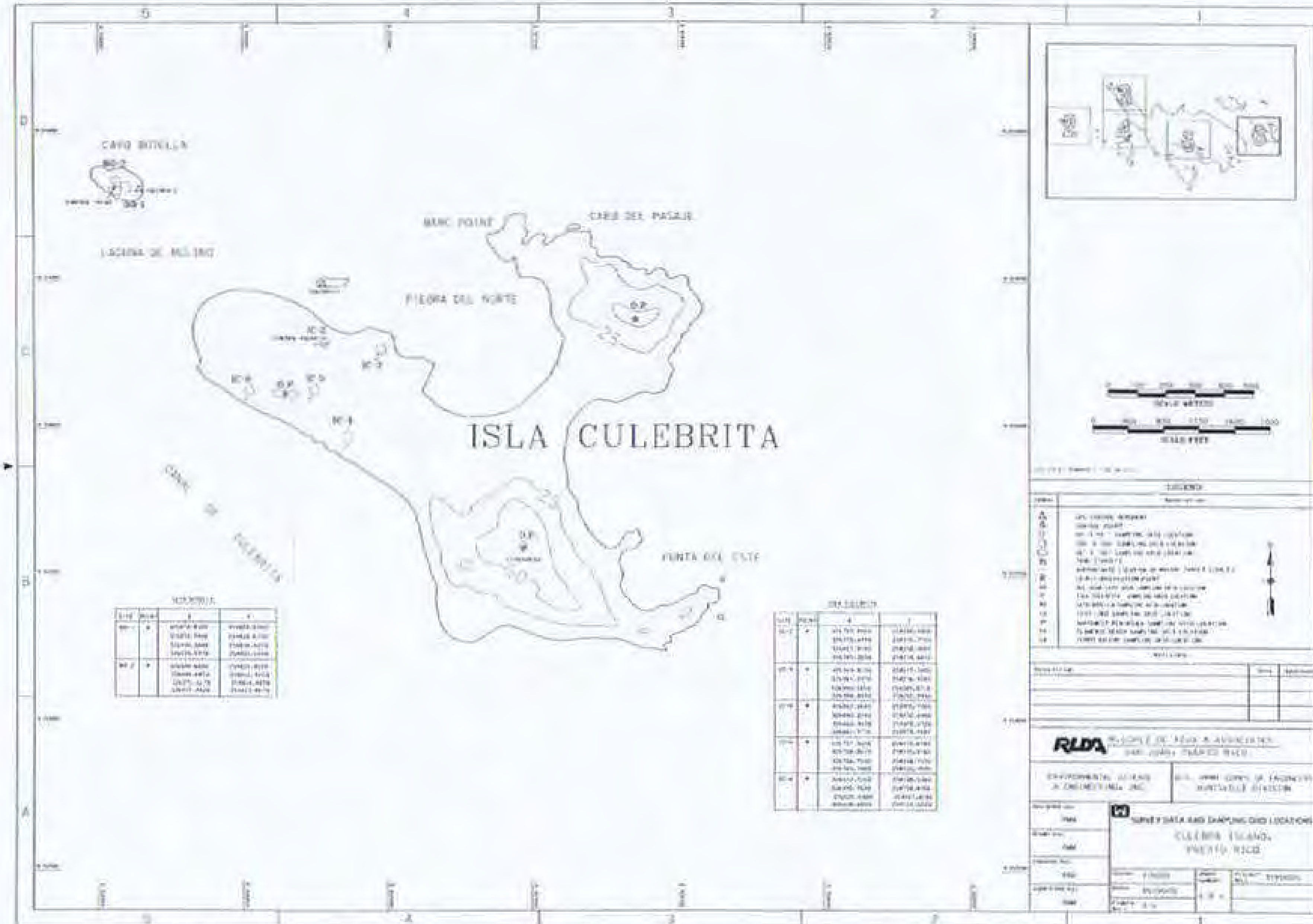
NP-16
NP-17
NP-18
NP-19
NP-20
NP-21
NP-22
NP-23
NP-24
NP-25
NP-26
NP-27
FB-9
SCALE METERS
SCALE FEET
LEGEND
RLDA
SURVEY DATA AND SAMPLING GRID LOCATIONS
CULEBRA ISLAND,
PUERTO RICO


PTA TAMARINDO GRANDE
PENINSULA FLAMENCO
PLAYA FLAMENCO
LAGUNA FLAMENCO
PTA TAMARINDO
BAHIA TAMARINDO
CANAL DE LUIS PEÑA
CAYO DE LUIS PEÑA
CAYO DEL AGUA
AQ-7
AQ-1
SP-3A
SP-3B
SP-3
FB-9
FB-8
FB-5
FB-4
FB-3
FB-7
FB-2
FB-1
FB-6
FB-10
APPROXIMATE LOCATION OF PROPOSED CANAL
LEGEND
RUDA
SURVEY BUS AND SAMPLING GRID LOCATIONS
CULEBRA ISLAND
PUERTO RICO



MONTE RESACA
ENSENADA
DEL CEMENTERIO
FRAILE
PUNTA CABRAS
CERRO BALCON
TARGET RANGE FAN
LEGEND
SURVEY DATA AND SAMPLING GRID LOCATIONS
CULEBRA ISLAND,
PUERTO RICO



ISLA CULEBRITA
CAYO BOTELLA
LAGUNA DE MOLINO
PIEDRA DEL NORTE
CABO DEL PASAJE
PUNTA DEL ESTE
CANAL DE CULEBRITA
SURVEY DATA AND SAMPLING GRID LOCATIONS
CULEBRA ISLAND,
PUERTO RICO
ENVIRONMENTAL SCIENCE
& ENGINEERING, INC.

APPENDIX I

INTERVIEWS

MEETING MINUTES

Subject: Interview w/ Sr. Juan Matta - worked as a civilian contractor to the navy.

Attendees: Mark Bagel - ESE Gainesville
Alphonso O'neil - USACE -Antilles
Sr. Juan Matta - DNER - Culebra
Date: 13 Feb 96
Time: 1435

Sr. Matta was born on Culebra and spent most of his life here. When he was younger he was hired as a civilian construction contractor by the U.S> Navy to help build structures and help with upkeep of targets. HE has been to many of the cays and was involved with placing many of the targets and construction of the bunkers and observation posts.

FLAMENCO BEACH
Targets were placed near the beach. On target was approximately 500 feet from where the tank presently exists. Many targets were painted on the ground with lyme and water mixture. A moving target was installed across theridge above Flamenco Beach all the way to the USF&WS Fence. He constructed the foundation for the cable system which pulled the target. The aluminum target was pulled from the area of the water tanks to a tank location then up and down a valley to the present location of the USF&WS fence. This area was used unsucessfully for bombing. The bombing area was then moved to a target on the other side of the USF&Ws fence behind a hill not visable from the road.

The Observation Post that was bombed in 1945/46 was painted silver with aluminum paint by him before he had left to spend a few years in New York. The aircraft pilot mistook the silver for a target and killed 8 people and injured one. The end of the northwest peninsula was used for a ship target. Targets were painted on the ground and the side of the hills with white lyme and water mixture. He would have to go out several times a day to repaint the lines when the targets were most actively used.

MGB asked him about a thick metal plate located near theend of the peninsula by the helipad. He said it was an observation post to observe the bombing of Cayo Lobo and Cayo Del Agua. It was built with thick metal cover and supports against projectiles from the ships which were often being fired concurrently with the bombing of the Cayos. St. Matta also constructed the helipad.

The end of NW Peninsula had four painted targets on the ground. These were used for naval gunfire.

CAYO DE LUIS PENA
There was never any bombing activities on Cayo de Luis Pena. The two buildings were observation posts and held generators for a huge speaker system to warn people from the area.THis was an observation post for the bombing of Cayo Lobo and Cayo Del Agua

CAYO LOBO
Sr. Matta installed the bunkers. The bunkers were observation posts for Caro Del Agua.

CAYO ALCARAZA
B-52 bombers would bomb Cayo Alcarazza. This was the only Cayo that B-52s were used for bombing.

CULEBRITA and Cayo Botella
Lighthouse was an observation post and so were two wooden houses (MGB observed the foundation for both on opposite ends of Culebrita). The only side that was used for straffing fire was the west. Only a short time. He helped place Page

targets on poles in the water between Culebrita and Cayo Botella. This area was a major bombing area. Cayo Botella was also a major target for bombing.

Sr.Matta will meet with us next Tuesday to show us additional target areas. He will also check with friends for additional information.

APPENDIX J

ACCIDENT REPORTS

EODT ACCIDENT/ILLNESS/NEAR MISS REPORT

SECTION 1 - GENERAL INFORMATION

Name: King, Edward D. | SSN: 318-38-0440

Job Title: UXO Specialist | D.O.B.: 3 Mar 46 | Sex: M | Age: 49

Site Name: Culebra Island NWR, PR | SSO: Thomas E. Selfridge

Date of Report: 20 Feb 96 | Date of Incident: 16 Feb 96 | Time of Incident: unKnown

Task/Operation Being Conducted: After Duty use.

PPE Worn: None

Site Conditions at Time of Incident

Temperature: unKnown | Humidity: unKnown
Wind Speed: unKnown Direction: _____ | Cloud Cover: unKnown
Precipitation: unKnown | Other: _____

Type of Incident: ☐ Personal Injury ☐ Personal Illness ☐ Chemical Exposure ☑ Motor Vehicle ☐ Property Damage ☐ Near Miss

If chemical exposure, what material(s) was(were) involved: N/A
What was the nature of exposure (contact, inhalation, etc.):

Other Individual(s) Involved: None

SECTION 2 - PERSONAL INJURY/ILLNESS INFORMATION

Nature/Type of Injury/Illness (laceration, strain, etc.):

Cause of Injury/Illness:

Body Part(s) Affected: Primary _____ Secondary _____

Injury/Illness Required: ☐ On Site First Aid Treatment ☐ Emergency Room Treatment ☐ Hospitalization

Injury/Illness Resulted In: ☐ Loss of Work Time ☐ Limitation of Duties ☐ Fatality
☐ Other: (Explain)

Status at Time of Report: ☐ Returned to Work: (Date _____) ☐ Hospitalized: (Anticipated Stay _____)
☐ Convalescing: (Anticipated Length of Convalescence _____)
☐ Other:

On Site First Aid Treatment Given:

Off Site Medical Treatment (attach documentation, including Physician statement):

Figure 6

EODT ACCIDENT/ILLNESS/NEAR MISS REPORT (cont.)

SECTION 3 - MOTOR VEHICLE ACCIDENT

Type of Vehicle/Equipment	Type of Collision	Seat Belt Use N/A
☐ Automobile ☐ Van/Truck ☐ Bush Hog ☑ Other: Trooper 4X4	☐ Side Swipe ☑ Rear End ☐ Backing ☐ Head on ☐ Broadside ☐ Roll	Front Seat ☐ Yes ☐ No Back Seat ☐ Yes ☐ No

Property/Material/Items Involved

Name of Item	Owner	$ Amount of Damage
Isuzu Trooper II 4X4	Jerry's Jeeps	$500.00 (estimated)

Accident Description (Use additional paper if needed)

The vehile in question was in the posession of Mr. King on Friday, 16 Feb 96. Some time that day, the spare tire which was mounted on the back door, received enough pressure to bend ~~forward~~ the door enough that it could not be opened. Mr. King states he has no idea how it happened. See attached photos.

SECTION 4 - POST ACCIDENT/INJURY/ILLNESS REVIEW

Has *EODT* Home Office been notified? ☑ Yes ☐ No, If Yes, When? 19 Feb 96 By Whom? B. Brindle

Were operations conducted using approved *EODT* CSHP or a SSHP?
N/A ☐ Yes Reference: _____
☐ No Explain: _____

SSO's Comments: Conclusions are that Mr. King hit something while backing and braking, or someone hit the vehicle while it was parked.

Employee Comments: I was driving the vehicle Friday. Friday evening I parked the vehicle. On Sunday when I went to open the back door it wouldn't open. I then noticed the left side of door was dented in.

Witnesses

Name	Organization	Phone Number
None		

Employee Signature: Edward D. Kings Date: 20 Feb 96

SSO Signature: Thomas E. Selfridge Date: 20 Feb 96

Actions to be taken to prevent future occurrence: Due to the circumstances leading to the damage being unknown, preventive measures cannot be determined.

Actions Completed By: Thomas E. Selfridge Date: 20 Feb 96

EODT Corp. Review By: Date:

Figure 6

Inside of door

Left side of vehicle.

Left side of vehicle, Tire removed

Left side of vehicle, looking down.

EODT ACCIDENT/ILLNESS/NEAR MISS REPORT

SECTION 1 - GENERAL INFORMATION

Name: Thomas E. Selfridge | SSN: 190-50-8554

Job Title: Site Safety and Health Officer | D.O.B.: 14 Jan 58 | Sex: M | Age: 37

Site Name: Culebra Island NWR, PR | SSO: Same as above

Date of Report: 8 Jan 96 | Date of Incident: 8 Jan 96 | Time of Incident: 1130

Task/Operation Being Conducted: EE/CA

PPE Worn: Level D

Site Conditions at Time of Incident

Temperature: 85° | Humidity:
Wind Speed: 15 mph | Direction: E. | Cloud Cover: Partly Cloudy
Precipitation: None | Other:

Type of Incident: ☐ Personal Injury ☐ Personal Illness ☐ Chemical Exposure ☒ Motor Vehicle ☐ Property Damage ☐ Near Miss

If chemical exposure, what material(s) was(were) involved: N/A
What was the nature of exposure (contact, inhalation, etc.):

Other Individual(s) Involved: None

SECTION 2 - PERSONAL INJURY/ILLNESS INFORMATION

Nature/Type of Injury/Illness (laceration, strain, etc.):

Cause of Injury/Illness:

Body Part(s) Affected: Primary _____ Secondary _____

Injury/Illness Required: ☐ On Site First Aid Treatment ☐ Emergency Room Treatment ☐ Hospitalization

Injury/Illness Resulted In: ☐ Loss of Work Time ☐ Limitation of Duties ☐ Fatality
☐ Other: (Explain)

Status at Time of Report: ☐ Returned to Work: (Date _____) ☐ Hospitalized: (Anticipated Stay _____)
☐ Convalescing: (Anticipated Length of Convalescence _____)
☐ Other:

On Site First Aid Treatment Given:

Off Site Medical Treatment (attach documentation, including Physician statement):

Figure 6

EODT ACCIDENT/ILLNESS/NEAR MISS REPORT (cont.)

SECTION 3 - MOTOR VEHICLE ACCIDENT

Type of Vehicle/Equipment	Type of Collision	Seat Belt Use
☐ Automobile ☐ Van/Truck ☐ Bush Hog ☒ Other: 4X4 SUV	☐ Side Swipe ☐ Rear End ☑ Backing ☐ Head on ☐ Broadside ☐ Roll	Front Seat ☑ Yes ☐ No Back Seat ☐ Yes ☐ No

Property/Material/Items Involved

Name of Item	Owner	$ Amount of Damage
Suzuki Samurai	Jerry's Jeeps	~~$117.50~~ $142.60

Accident Description (Use additional paper if needed)

While backing into ~~an~~ an open area on a dirt road, The ~~we~~ evidence indicates a branch got caught in the open right side pop-out window, stressing the glass and shattering it.

SECTION 4 - POST ACCIDENT/INJURY/ILLNESS REVIEW

Has *EODT* Home Office been notified? ☐ Yes ☐ No, If Yes, When? _____ By Whom? _____

Were operations conducted using approved *EODT* CSHP or a SSHP?
☒ Yes Reference: Culebra Island NWR, PR SSHP.
☐ No Explain: _____

SSO's Comments: We learned a lesson about backing up in general, and specifically about these side windows on the Samurais. The owner did state this definately not the first one he's had this happen to.

Employee Comments: _____

Witnesses

Name	Organization	Phone Number
None		

Employee Signature: T Thomas E. Selfridge Date: 8 Jan 96

SSO Signature: T Thomas E. Selfridge Date: 8 Jan 96

Actions to be taken to prevent future occurrence: Pay closer attention when backing up and use a ground guide when available. Review incident during Tailgate Safety Briefing for benefit of whole team.

Actions Completed By: T Thomas E. Selfridge Date: 9 Jan 96

EODT Corp. Review By: _____ Date: _____

Figure 6

Environmental Science & Engineering, Inc.

REPORT OF OCCUPATIONAL ACCIDENT, INJURY, OR ILLNESS

OFFICE & DEPARTMENT | DEPT. NO. | CENTER NO. | DATE OF REPORT

VEGA ENRIQUE — INITIAL REPORT

Last Name	First Name	Initial	Home Address (Street, City, State, Zip Code)
		M	HC 01 BOX 12647 CAROLINA PR 00985

Sex	Employee No.	Social Security No.	Birth Date	Occupation (Job Title)
		582-65-4909		00731 SURVEYOR HELPER/BOAT OPERATOR

Date of Accident	Time of Accident	Exact Location of Accident	Did Accident Occur On ESE Property?
12-07-95	1:05 ☐A.M. ☑P.M.	CULEBRA ISLAND, PUERTO RICO	☐YES ☑NO

Employee's Home Office & Dept. No.: 809-268-6097

Result of Accident (Check All That Apply): ☐Near Miss ☑Injury ☐Illness

Project No.	Supervisor Name	Project Manager Name
31958036	FERNANDO BIASCOECHEA	MARK BAGEL

What was employee doing at time of accident? (Be specific. Include information on tools, equipment, materials in use and what employee was doing with them.)* WALKING DOWN A ROCKY TRAIL RETURNING TO THE STAGING AREA. HE WAS CARRYING NO EQUIP.

How did the accident occur?*

INJURY/ILLNESS INFORMATION

Type of Injury or Illness	Part(s) of Body Affected (Be Specific)
BONE FRACTURE	LEFT ANKLE

Object or Substance Responsible for Injury/Illness	Date of Injury or Initial Diagnosis of Illness
FALL	12/07/95

Name and Address of Treating Physician	Date Treated	Did Employee Die?	Was Employee Admitted to Hospital?
JOSE ROBERTO FUMERO PEREZ P. DE LEON #1507 SUITE I-C SANTURCE PRICO 00907	12/11/95	☐YES* ☑NO	☐YES* ☑NO

Treatment Received (Be Specific): FULL ANKLE CAST

Name and Address of Hospital	Date Treated
AVE. PONCE DE LEON #1501 SANTURCE, P.R. 00907	12/11/95

Treatment Received (Be Specific): ANKLE CAST

Reported By	Title	Phone No.
FERNANDO BIASCOECHEA	OFFICE MANAGER	809-268-6097

*Attach Additional Sheets as Necessary

Please print clearly or type. **Notify Corporate Health & Safety of Death or Hospital Admission Immediately!

8901 North Industrial Road

ANALYSIS RESULTS

Detailed description of the accident. State clearly how it happened. Attach separate sheet and photographs/diagrams as appropriate.

MR VEGA'S ACCIDENT OCCURRED WHILE WALKING ON A ROCKY TRAIL. DUE TO THE TERRAIN CONDITION HE SLIPPED, CAUSING HIS ANKLE TO TWIST, THUS THE FRACTURE IN HIS LEFT ANKLE OCCURED

Who Was in Charge of Work? | Was He/She Present? ☐YES ☐NO | What Instructions Were Given?

Witnesses* | Years Employee Has with ESE | Years on Present Job | Amount of Experience with Task Being Performed

Proper Protective Tools & Equipment in Use? ☐YES ☐NO | If Not, Why Not?*

What Hazardous Condition(s) Contributed to the Accident? Explain Each.* (See Suggestions Below)

ROCKY, STEEP, UNEAVEN TERRAIN SURFACE

What Unsafe Act(s) Caused/Contributed to the Accident? Explain Each.* (See Suggestions Below)

POOR JUDGEMENT ON FOOTING

Involved Employee's Recommendation(s) To Prevent a Similar Occurrence.*

TO BE MORE CAREFUL AND AWARE OF TERRAIN SURFACE SO THAT SAFE TRAVEL BY FOOT IS ALWAYS ATTAINED

What Action(s) Will Be Taken To Prevent a Similar Occurrence? Be Specific.*

TO HAVE A BETTER JUDGEMENT WHILE TRAVELING BY FOOT ON THE ROCKY TRAILS OF CULEBRA ISLAND

Discussed With Employee By: FERNANDO BIASCOECHEA | Date: 12/11/95 | Involved Employee's Immediate Supervisor's Signature: Fernando Biascoechea

Report Approved By

Employee Comments*: I will be more careful while walking.

Employee Signature: [signature] | Date: 12-12-95

HAZARDOUS CONDITIONS
Congested area-
Insufficient workspace
Defective apparel
Defective equipment
Environmental factor
Improper apparel
Improper design
Improper equipment
Improper illumination
Improper ventilation
Improperly guarded
Inclement weather
Lack of proper tools/equipment
Obscured vision
Poor housekeeping
Slick surface
Special task assignment
No hazardous condition

UNSAFE ACTS
Disregard of instructions
Disregard of safety rules
Due to vehicular accident
Failure to use/improper use of protective equipment
Horseplay
Improper lifting method
Improper positioning of tool
Improper operating method
Improper use of hands or body parts
Improper use of tools/equipment
Inattention
Inexperience
Lack of communication
Lack of knowledge/skills
Lack of proper equipment/tools
Overestimation of personal capability
Poor judgement
Unsafe loading, pulling or [illegible]
Unsafe lifting
Unsafe speed
Using defective equipment
Working on moving equipment
No unsafe act

*Attach Additional Sheets as Necessary

Please print clearly or type

APPENDIX K

QUANTITECH OE*CERT* REPORT

QUANTITECH
6703 ODYSSEY DRIVE • SUITE 304 • HUNTSVILLE, AL 35806
(205) 922-9650 • FAX (205) 922-9655

CULEBRA ISLAND NATIONAL WILDLIFE REFUGE OE*Cert* ANALYSIS DRAFT REPORT

For U.S. Army Engineer and Support Center
Huntsville, Alabama

TECHNICAL REPORT 96R008

Purchase Order: DACA87-95-D-0029 (0012)

Prepared by:
QuantiTech, Inc.
6703 Odyssey Drive
Suite 304
Huntsville, AL 35805

15 May 1996

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CULEBRA ISLAND NATIONAL WILDLIFE REFUGE
OE*Cert* ANALYSIS

DRAFT REPORT

EXECUTIVE SUMMARY

QuantiTech, Inc., was contracted by the U.S. Army Engineer and Support Center, Huntsville, (USAESCH) to apply the Ordnance and Explosives Cost-Effectiveness Risk Tool (OE*Cert*) in evaluation of the ordnance and explosives (OE) contamination at Culebra Island National Wildlife Refuge in Puerto Rico. QuantiTech was to provide an estimate of risk for each sector both in terms of the individual and the total population. OE*Cert* measures risk in terms of how often people are exposed to OE when participating in commonly performed activities at a site, e.g., hiking, construction, camping, etc.

The sector map of Culebra Island National Wildlife Refuge is shown in Figure ES-1. The cays on which sampling was done are identified as separate sectors.

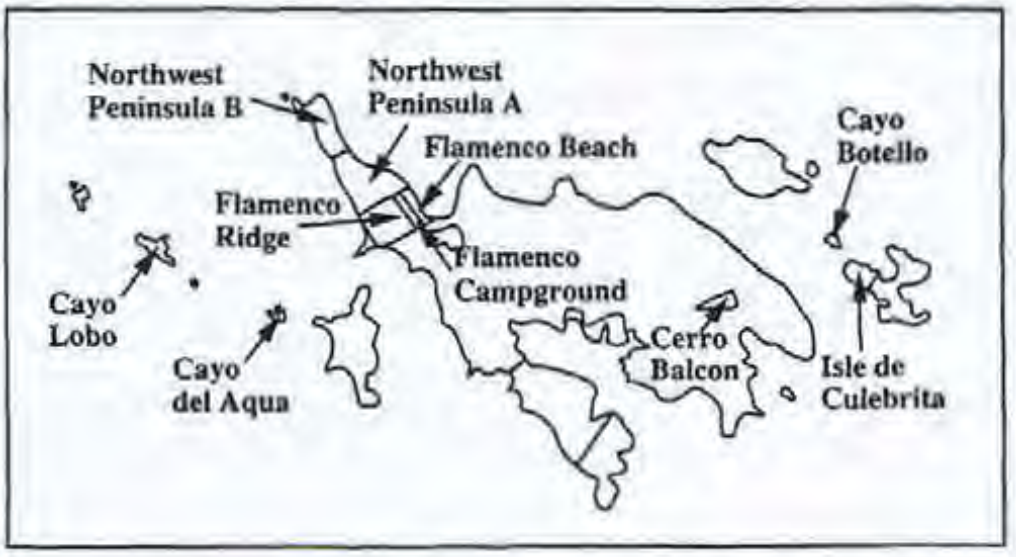

Figure ES-1. Culebra Island National Wildlife Refuge

The removal options to be considered in the analysis were provided by USAESCH to QuantiTech and are identified in Table ES-1.

Table ES-1. Removal Options for Culebra Island National Wildlife Refuge

Sector	No Action	Surface Removal	1 Foot Removal	4 Foot Removal	10 Foot Removal
Isle Culebrita	X	X	X	X	X
Cayo Botello	X	X	X	X	X
Cayo del Agua	X	X	X	X	X
Cayo Lobo	X	X	X	X	X
Cerro Balcon	X	X	X	X	X
Northwest Peninsula - A	X	X	X	X	X
Northwest Peninsula - B	X	X	X	X	X
Flamenco Area - Beach	X	X	X	X	X
Flamenco Area - Campground	X	X	X	X	X
Flamenco Area - Ridge	X	X	X	X	X

Two density estimates, high density and low density, were used in the calculation of risk to completely reflect all data collected at the site and to address the sensitivity of risk to the ordnance density estimate. Data collected during the Time Critical Removal Action performed by MTA (May 1995) at Flamenco Area Campground and sampling data collected during the EE/CA fieldwork performed by ESE, Inc. (November 1995 - February 1996) was used to calculate the density estimates. Details of the density estimating analysis can be found in Appendix D, Density Estimates. Table ES-2 presents the expected annual exposures at Culebra Island National Wildlife Refuge for the high density estimates. An expected exposure, as defined by OE*Cert* methodology, is a participant in an activity being in the proximity of ordnance, with or without knowledge by the participant to the presence of the ordnance. Table ES-3 reflects the expected annual exposures for the low density estimates. The expected annual exposures are driven by population/tourist estimates provided by the Department of Natural Resources to the EE/CA contractor. The number of expected exposure would decrease with the decrease in tourist/population estimates.

Table ES-2. Expected Annual Exposures for Culebra Island National Wildlife Refuge: High Density Estimates

Sector	No Action	Surface Removal	1 Foot Removal	4 Foot Removal	10 Foot Removal
Isle Culebrita	182,822	9620	9156	9156	9156
Flamenco Area - Beach	16,062	996	809	809	809
Flamenco Area-Campground	12,759	836	648	648	648
Northwest Peninsula - A	7576	380	380	380	380
Northwest Peninsula - B	7037	353	353	353	353
Cayo del Agua	4806	241	241	241	241
Cerro Balcon	2528	139	139	139	139
Flamenco Area - Ridge	1956	125	121	108	102
Cayo Botello	1045	53	53	53	53
Cayo Lobo	568	29	29	29	29
SITE TOTAL	237,159	12,772	11,929	11,916	11,910

Table ES-3. Expected Annual Exposures for Culebra Island National Wildlife Refuge: Low Density Estimates

Sector	No Action	Surface Removal	1 Foot Removal	4 Foot Removal	10 Foot Removal
Isle Culebrita	112,361	5913	5628	5628	5628
Northwest Peninsula - B	5320	267	267	267	267
Northwest Peninsula - A	3679	184	184	184	184
Cayo del Agua	1402	71	71	71	71
Cayo Botello	493	25	25	25	25
Flamenco Area - Beach	138	138	11	11	11
Flamenco Area-Campground	138	138	11	11	11
Flamenco Area - Ridge	19	19	16	7	3
Cayo Lobo	0	0	0	0	0
Cerro Balcon	0	0	0	0	0
SITE TOTAL	123,550	6755	6213	6204	6200

CULEBRA ISLAND NATIONAL WILDLIFE REFUGE
OE*Cert* ANALYSIS

DRAFT REPORT

1.0 BACKGROUND

QuantiTech, Inc., was contracted by the U.S. Army Engineer and Support Center, Huntsville, (USAESCH) to apply the Ordnance and Explosives Cost-Effectiveness Risk Tool (OE*Cert*) in evaluation of the ordnance and explosives (OE) contamination at Culebra Island National Wildlife Refuge in Puerto Rico. QuantiTech was to provide an estimate of risk for each sector both in terms of per individual and total population. OE*Cert* measures risk in terms of how often people are exposed to OE when participating in commonly performed activities at a site, e.g., hiking, camping, etc. Appendix A provides a brief description of the OE*Cert* risk estimating methodology.

Sectors are defined as physically contiguous areas with homogeneous OE contamination density and terrain factors such as vegetation density, terrain slope, and soil type. In this analysis, seven "ordnance operable units" (or sectors) were identified by USAESCH and provided to QuantiTech. (See Figure ES-1 for the sector identification.) Further refinement was necessary in the original Flamenco Beach Sector and the Northwest Peninsula Sector for the OE*Cert* analysis. The original Flamenco Beach Sector was divided into three sectors for the OE*Cert* analysis due to terrain factors and activities expected to be present in the these areas. These sectors were named Flamenco Area - Beach, Campground, and Ridge. The Northwest Peninsula was divided into two sectors, Northwest A and Northwest B, at the United States Fish and Wildlife Service fence line. This division was made due to this fence barrier and terrain present into Northwest Peninsula B which created a difference in the number of possible entrants into each of the two sectors.

Sector OE density estimates were developed using the results of the EE/CA grid sampling data for the site as well as data from the Time Critical Removal Action that was performed on Flamenco Beach. Details of the density estimate calculations can be found in Appendix D, Density Estimates. Tourist and population data used for participation rates for activities were provided by the EE/CA Contractor ESE to QuantiTech, Inc. These

population/tourist numbers were used in conjunction with population from the U.S. Census Bureau data for the OE*Cert* analysis.

The data collected for use in the OE*Cert* analysis, along with the source for each, is provided in Appendix B. The assumptions made in the OE*Cert* analysis, along with the rationale for each, are provided in Appendix C.

2.0 ANALYSIS

2.1 RISK ESTIMATING INPUTS

The analysis performed to estimate exposures for the ten identified risk analysis sectors contained within Culebra Island National Wildlife Refuge included the consideration of five removal options. Each removal action was evaluated using two density estimates. The removal options and contamination density estimates are:

- No action: low density estimate and high density estimate.
- OE removed from surface: low density and high density.
- OE removed to a depth of 1 foot: low density and high density.
- OE removed to a depth of 4 feet: low density and high density.
- OE removed to a depth of 10 feet: low density and high density.

Activities which were identified in each sector are listed in Appendix C. OE*Cert* methodology calculates public and individual risk according to participation rates in activities identified in each sector. The methodology considers whether the activities are surface only or include a ground intrusive component and uses the number of participants in each activity. Appendix A provides details of the risk estimating methodology. Appendix C also provides information regarding participation numbers for each sector.

2.2 ANALYSIS RESULTS

Figure 2.2-1 shows the expected annual exposures for each removal option for "No Action" in each sector in Culebra Island National Wildlife Refuge given the "low" density estimate for ordnance. The "No Action" removal option is included to represent the current expected exposures for the site.

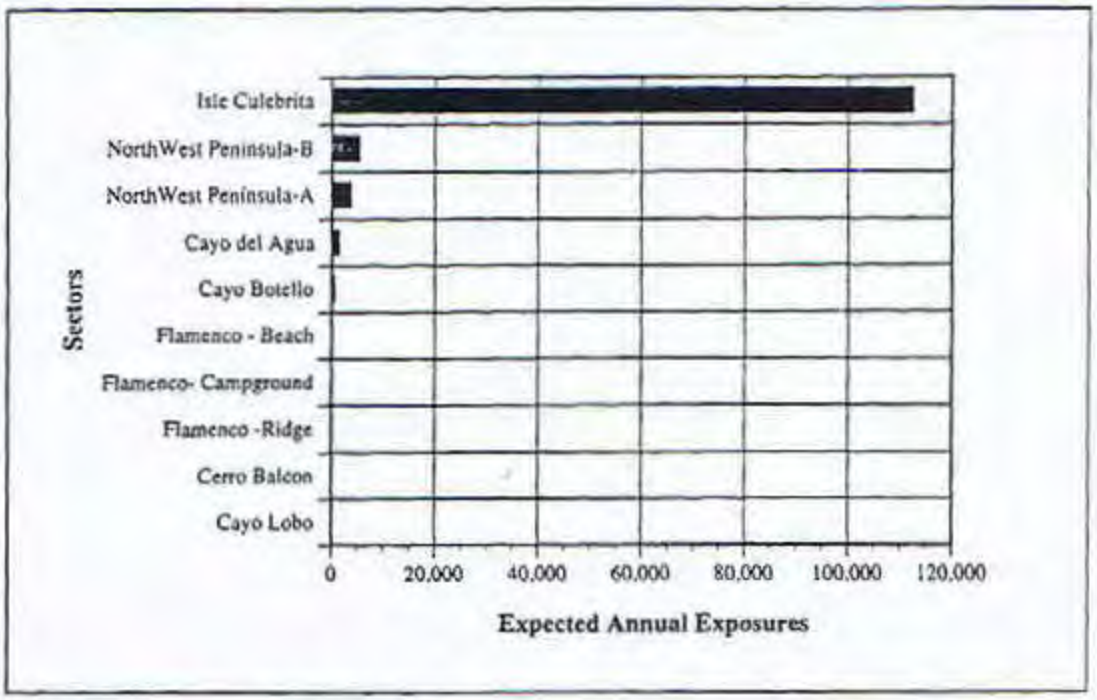

Figure 2.2-1. Low Density Expected Annual Exposures for Population: No Action

Figure 2.2-2 shows the expected annual exposures after surface removal of OE from each sector at Culebra Island National Wildlife Refuge given the "low" density estimate for ordnance. The values associated with surface removal represent the expected annual exposures remaining after surface clearance of OE for each sector identified.

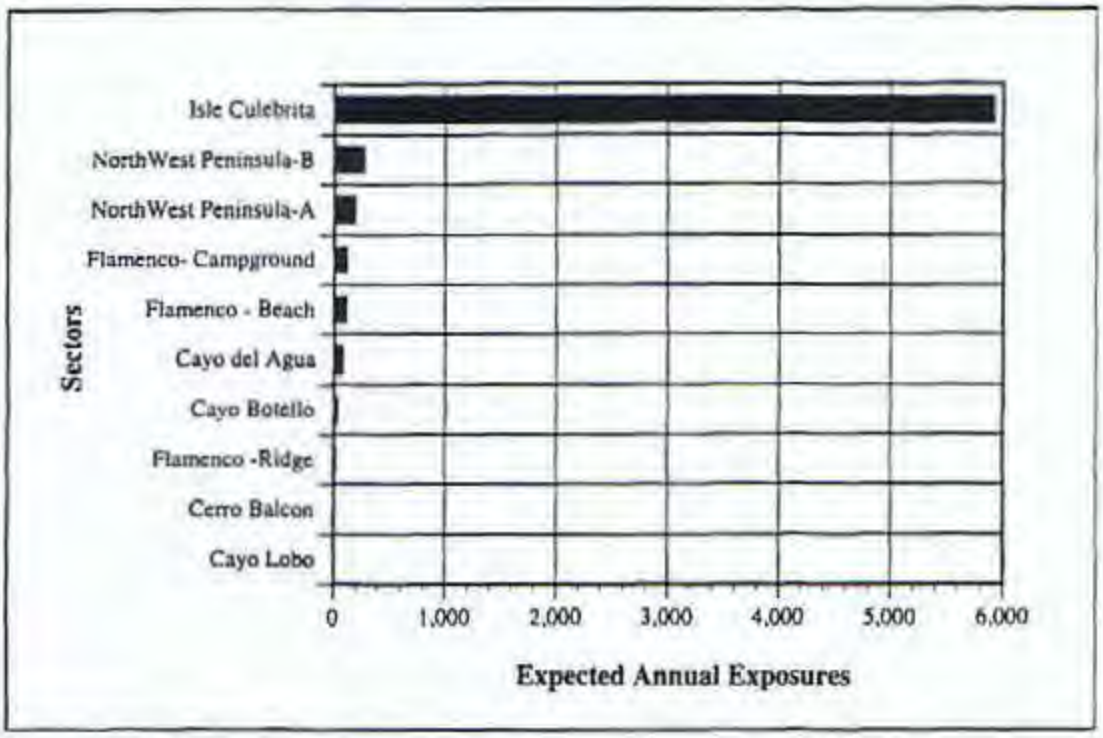

Figure 2.2-2. Low Density Expected Annual Exposures for Population: Surface Removal

Figure 2.2-3 shows the expected annual exposures after 1 foot removal of OE from each sector at Culebra Island National Wildlife Refuge given the "low" density estimate for ordnance. The values associated with the 1 foot removal option represent the expected annual exposures remaining after 1 foot removal of OE for each sector identified.

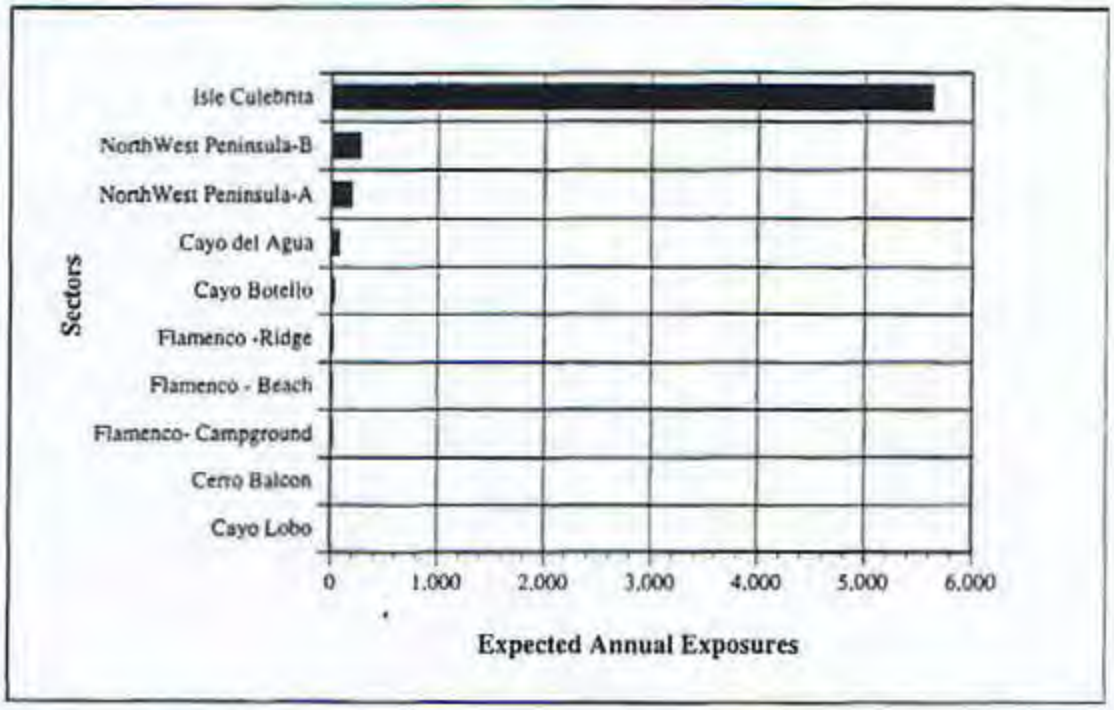

Figure 2.2-3. Low Density Expected Annual Exposures for Population: 1 Foot Removal

Expected annual exposures for 4 and 10 foot removal of OE for "low" density estimates are shown in Figures 2.2-4 and 2.2-5 respectively. The values associated with 4 and 10 foot removal of OE represent expected annual exposures remaining after removal of OE at these respective depths for each sector listed.

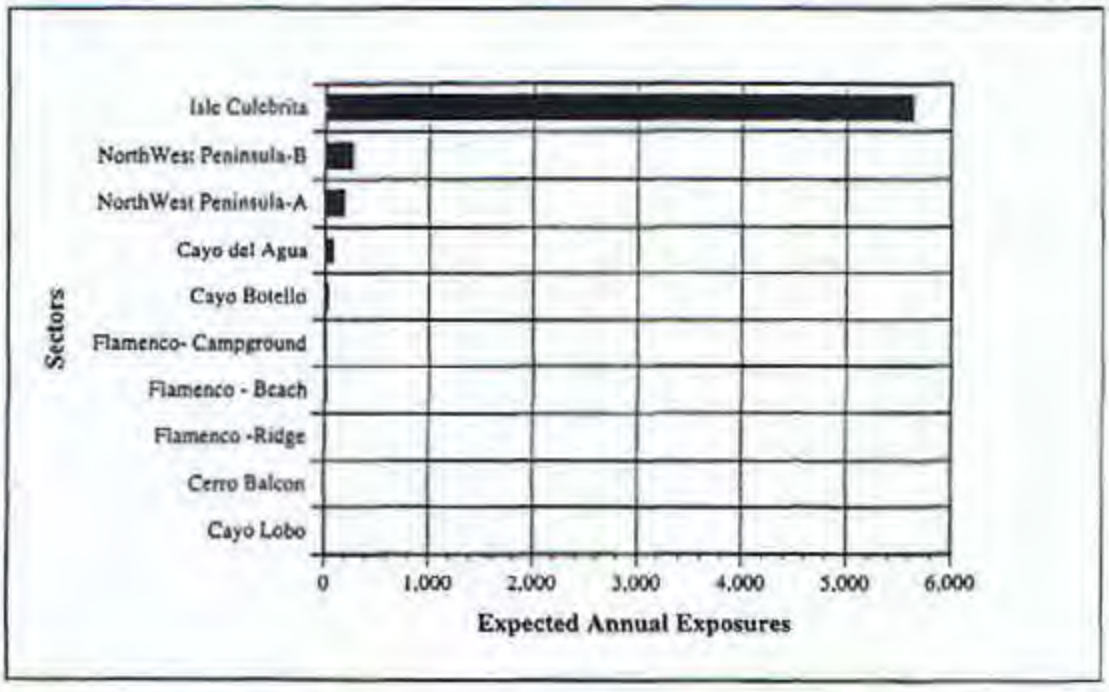

Figure 2.2-4. Low Density Expected Annual Exposures for Population: 4 Foot Removal

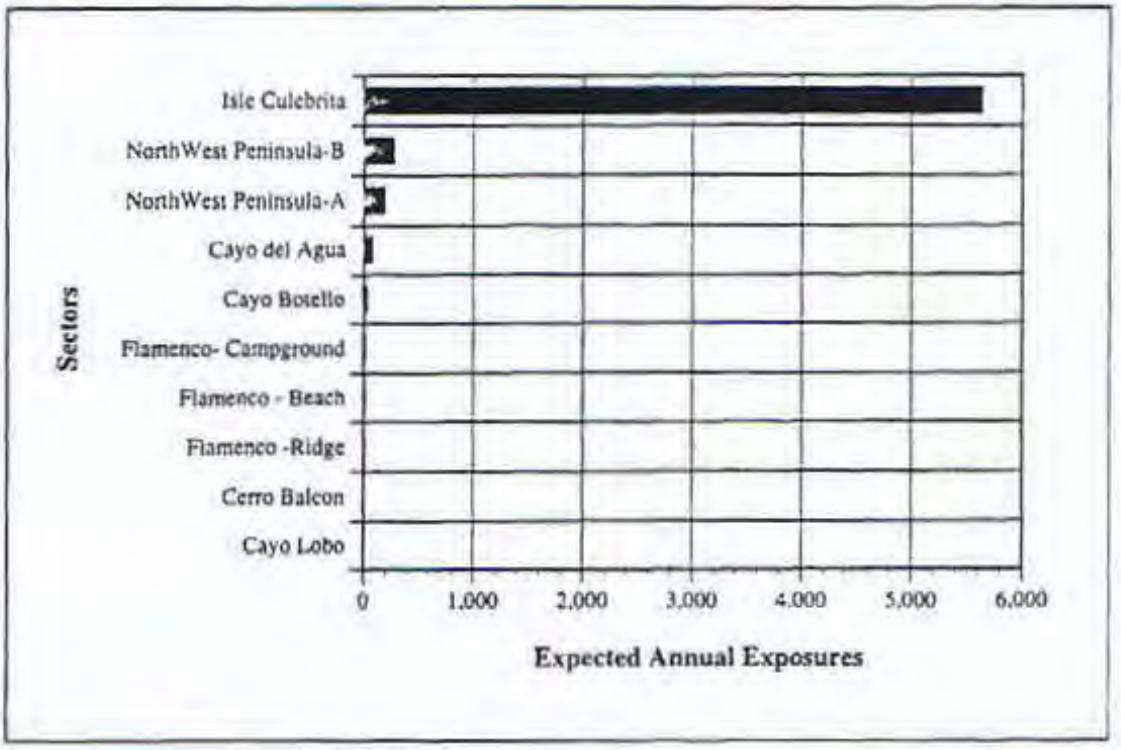

Figure 2.2-5. Low Density Expected Annual Exposures for Population: 10 Foot Removal

Figure 2.2-6 shows the expected annual exposures for the "No Action" removal option for each sector at Culebra Island National Wildlife Refuge given the "high" density estimates. The No Action option represents the current level of exposure at Culebra Island.

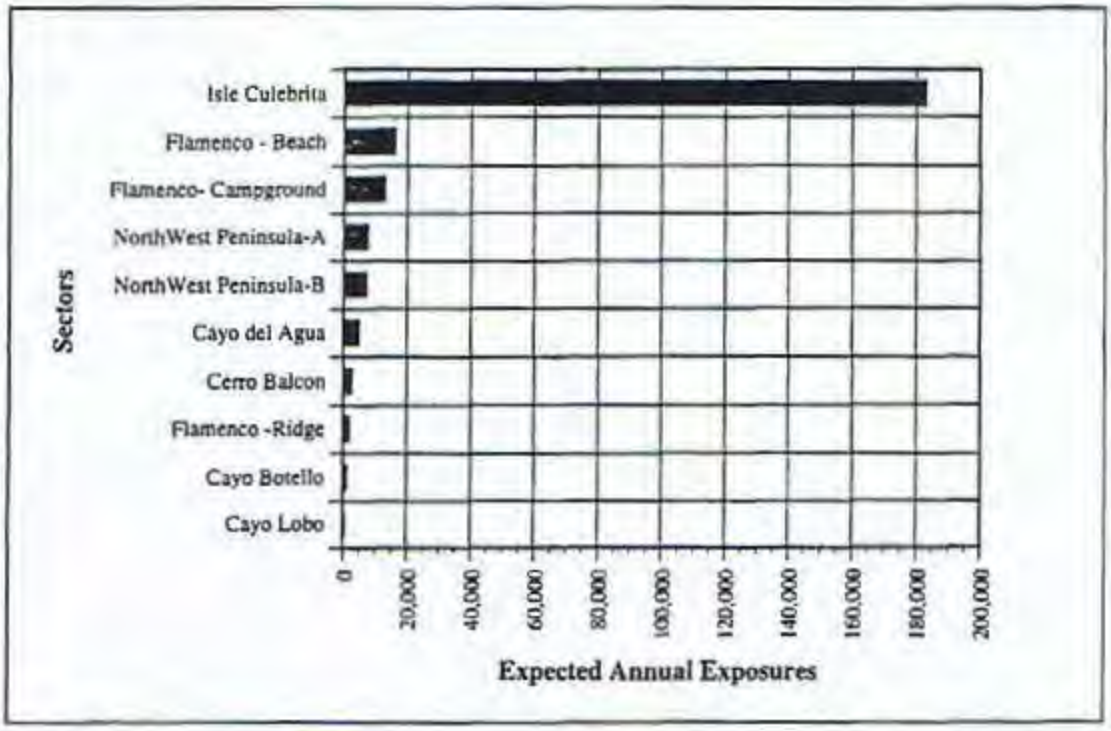

Figure 2.2-6. High Density Expected Annual Exposures for Population: No Action

Figure 2.2-7 shows the expected annual exposures for surface removal of OE from each sector at Culebra Island National Wildlife Refuge for "high" density estimates. The values associated with surface removal represent the expected annual exposures remaining after surface clearance of OE for each sector.

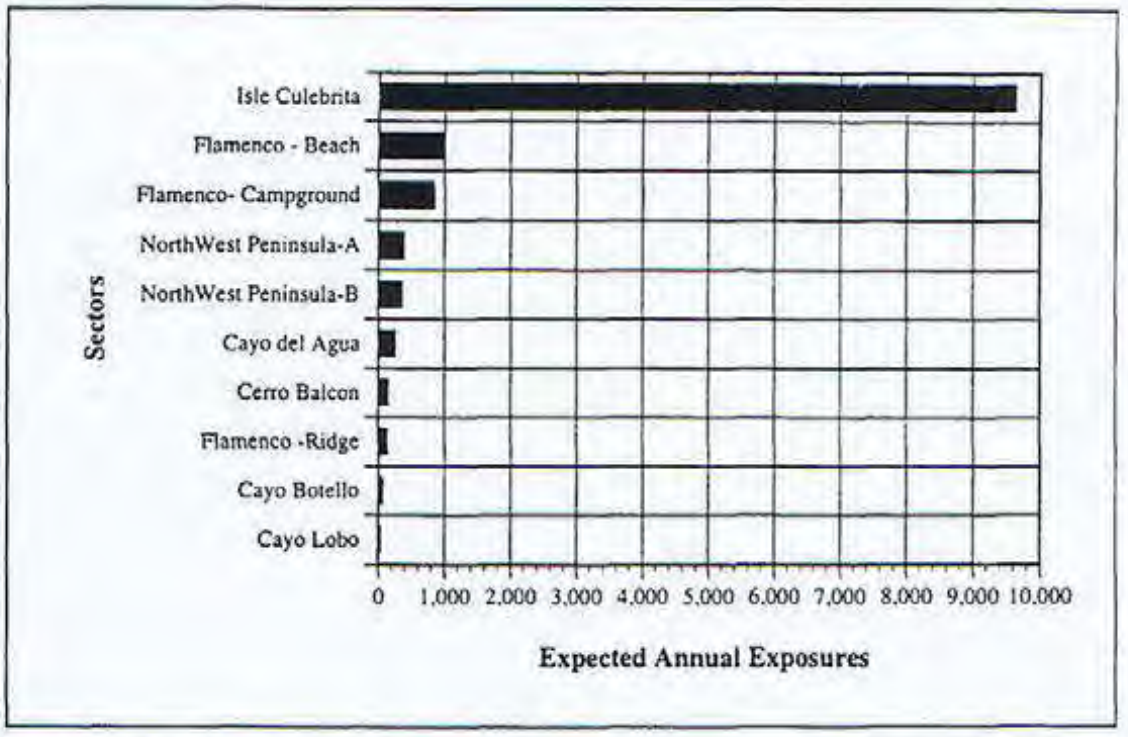

Figure 2.2-7. High Density Expected Annual Exposures for Population: Surface Removal

Figure 2.2-8 reflects the expected annual exposures for 1 foot removal of OE for each sector given "high" density estimates. The values associated with the 1 foot removal option represent the expected annual exposures remaining after 1 foot removal of OE for each sector identified.

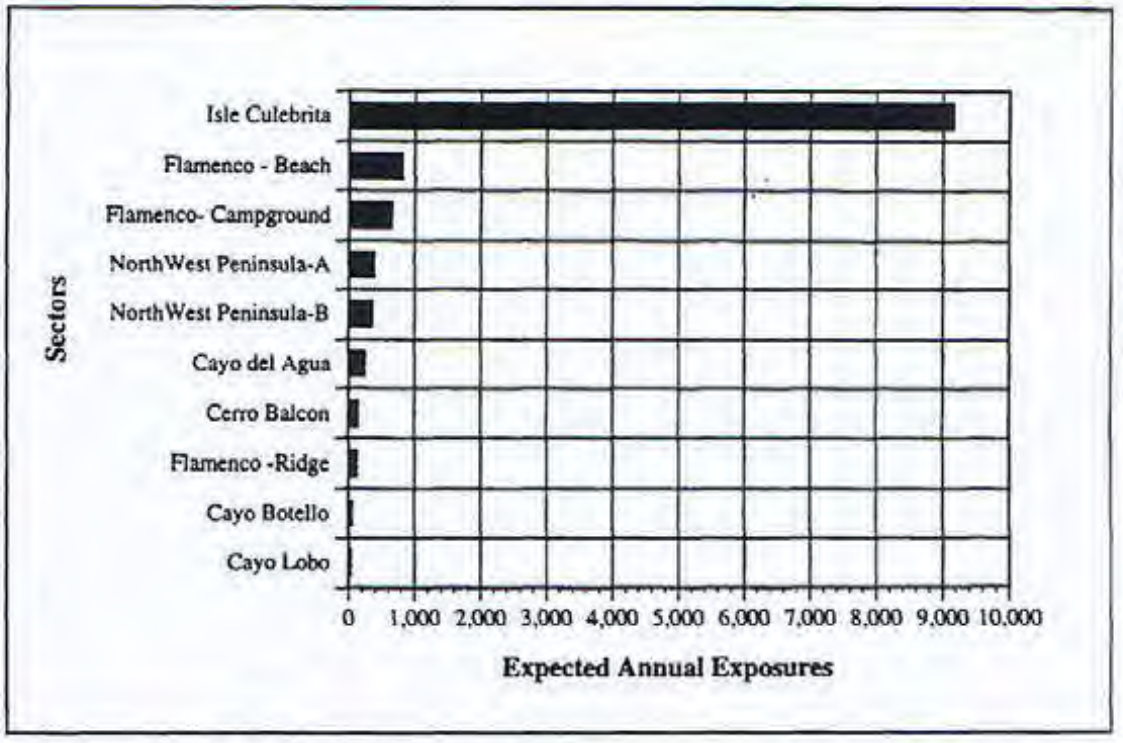

Figure 2.2-8. High Density Expected Annual Exposures for Population: 1 Foot Removal

Figure 2.2-9 shows the expected annual exposures for 4 foot removal of OE for each sector given "high" density estimates. Figure 2.2-10 shows the expected annual exposures for 10 foot removal of OE for each sector given the "high" density estimate. The values associated with the 4 foot removal and 10 foot removal option represent the expected annual exposures remaining after 4 foot and 10 foot removal of OE respectively.

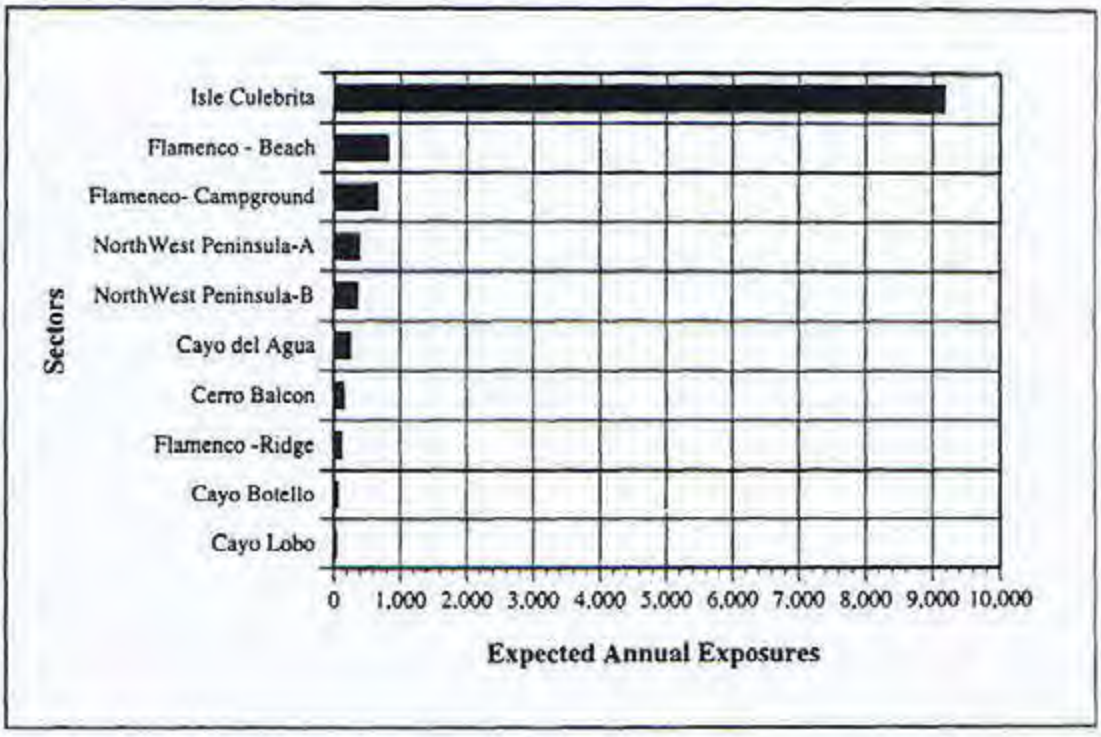

Figure 2.2-9. High Density Expected Annual Exposures for Population: 4 Foot Removal

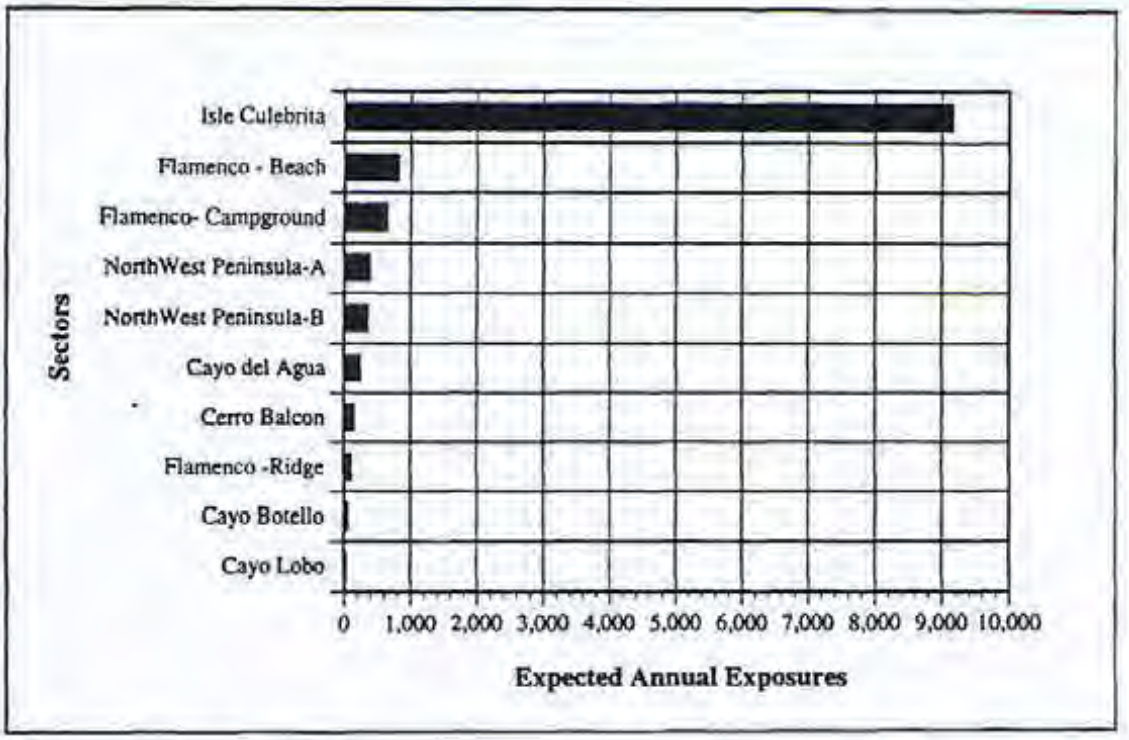

Figure 2.2-10. High Density Expected Annual Exposures for Population: 1 Foot Removal

2.3 INTERPRETATION OF ANALYSIS RESULTS

Figure 2.2-1 presents the current level of risk at Culebra Island National Wildlife Refuge for each of the ten sectors identified for analysis for "low" density estimates. As can be observed from the figure, Isle Culebrita has the highest number of expected exposures because of its density (59 items per acre), the location of the ordnance on the surface of the ground (59%), and the number of people who are estimated to visit the cay annually (20,800).

Figure 2.2-1 also reveals that Northwest Peninsula-B has the second highest number of expected annual exposures for the "low" density estimate due to its density (11.1 items per acre), its ordnance surface density (33%), and the large number of participants in the identified activities. Although public entry to the area is restricted and participation in the sector is limited to bird watching, hiking is an activity planned for the sector in the future. Therefore, the OE*Cert* analysis recognized hiking as an activity in the

sector and included the same number of hikers in Northwest Peninsula-B as in Northwest Peninsula-A. Although several other sectors have higher density estimates, the number of entrants to the other areas (such as the cays) is less, thus producing fewer expected exposures. Northwest Peninsula-A ranked third in current expected annual exposures for "low" density estimates. Although this sector has a high number of participants in all activities, the estimated ordnance density, 3.26 items per acre with 50% surface, is lower than Northwest Peninsula-B or Isle Culebrita.

Figure 2.2-2 reveals residual expected annual exposures after surface removal of ordnance at Culebra Island National Wildlife Refuge. The 94.5% reduction in expected exposures on Isle Culebrita, 95.0% reduction in Northwest Peninsula-B, and 95.0% reduction in Northwest Peninsula-A are the result of sweep efficiency and surface activities.

As can be seen in Figures 2.2-3 through 2.2-5, any additional reduction in expected exposures occurs only in the sectors where ground intrusive activities exist. In any case where the expected annual exposures do not change from one removal option to the next, this indicates that the intrusive depth associated with the activities occurring within the sector are all less than the removal depth associated with the removal option. Even if more ordnance is removed to a depth of four or ten feet, these items were not expected to be responsible for the expected exposures resulting from activities in each sector. Only the Flamenco Area - Ridge Sector continues to show a decrease in expected exposures with removal of ordnance to four and to ten feet as shown in Figures 2.2-4 and 2.2-5. This is due to the anticipated construction (a ten-foot ground-intrusive occupational activity) in this sector.

Figure 2.2-6 presents the current level of risk at Culebra Island National Wildlife Refuge for the "high" density estimates for each of the ten sectors. The highest number of expected exposures are once again seen on Isle Culebrita for the same reasons as those noted for "low" density estimates. The sector with the second highest number of expected annual exposures, as seen in Figure 2.2-6, is Flamenco Area-Beach due to the location of ordnance on the surface (30.77% for "high" density estimates), the estimated ordnance density (3.7 items per acre), and the high number of participants in the activities identified in the sector. The Campground Sector of Flamenco Area is third in the ranking for expected annual exposures for the population due to the location of ordnance on the surface

(30.77%), the estimated ordnance density (3.9 items per acre), and the number of participants in the activities identified in the sector.

Figure 2.2-7 shows the residual risk remaining after surface removal of ordnance at Culebra Island National Wildlife Refuge. Once again, it can be observed that approximately 95.0% of risk is removed with surface removal of ordnance in all sectors at Culebra Island. Additional risk is removed by one foot removal of ordnance at Isle Culebrita and in Flamenco Area -Beach, Campground, and Ridge Sectors because three subsurface activities, ground intrusive to one foot, child-play, camping, and picnicking, are identified in these sectors. Therefore, removal of ordnance to a depth of one foot would further reduce the expected risk.

Only Flamenco Area - Ridge continues to reveal reduction in risk with the four and ten foot removal options as can be seen in Figures 2.2-9 and 2.2-10. As stated previously, construction is ground-intrusive to ten feet thus producing expected exposures to a depth of ten feet (or the maximum ordnance penetration depth, whichever is greatest.) With removal of ordnance to ten feet (or maximum depth), expected exposures would be reduced for construction thus resulting in the reduction of expected exposures in the sector. Additional information and further explanation concerning the risk to the population and the risk to the individual (probability of individual exposure) resulting from the OE*Cert* analysis for Culebra Island National Wildlife Refuge can be found in Appendix E, Risk Estimates for Culebra Island National Wildlife Refuge.

APPENDIX A

OE*Cert* RISK ESTIMATING DESCRIPTION

APPENDIX A

OE*Cert* RISK ESTIMATING DESCRIPTION

Public exposure to both surface and subsurface OE items is characterized by a Poisson process. The Poisson distribution is the appropriate distribution because it is believed that sectors can be delineated, via appropriate sampling techniques, that exhibit homogeneously distributed OE. This homogeneous distribution of OE allows the passage of participants through the site to be characterized as a Poisson process.

The public exposures result from individuals performing specific activities (both recreational and occupational) within OE-contaminated areas. The expected number of surface OE exposures per participant in a sector is dependent on OE density, the proportion of OE on the surface of the ground, and the activity participant's exposure area (the area traversed by an individual while performing an activity). The expected number of subsurface OE exposures per participant in an area is dependent on the OE density, the proportion of OE beneath the surface of the ground, the density distribution of the subsurface OE, and the area associated with an activity performed in the area.

The calculation of the total expected number of exposures to OE at a site follows a step-by-step process. First, for each sector, the expected number of exposures for a single individual participating in a specific activity is calculated. Second, the number of individuals that are expected to participate annually in that activity on the site is determined based on the demographics surrounding the site and activity participation data. The two values are combined as shown in the following relationship to give the total annual number of exposures expected to occur for participants in the activity that was identified.

$$E[\text{Activity Exposures}] = E[\text{exposures for single participant}] \cdot E[\text{annual participants}].$$

These calculations are then performed for each activity that has been determined to be participated in at the FUDS. The values for the expected number of exposures resulting from participation in each activity are summed to yield the overall risk value for the site.

$$E[\text{Total Exposures}] = \sum_{\text{all activities}} E[\text{Activity Exposures}].$$

APPENDIX B

DATA COLLECTED FOR CULEBRA ISLAND NATIONAL WILDLIFE REFUGE OE*Cert* ANALYSIS

APPENDIX B

DATA COLLECTED FOR CULEBRA ISLAND NATIONAL WILDLIFE REFUGE OE*Cert* ANALYSIS

The following table includes the data used as inputs to the analysis performed for Culebra Island National Wildlife Refuge using OE Cost-Effectiveness Tool (OE*Cert*). Each item is accompanied by its source.

Table B-1. Culebra Island National Wildlife Refuge Data

Fact	Source
Area of Culebra Island National Wildlife Refuge FUDS is approximately 2660 acres	Culebra Island National Wildlife Refuge Archive Search Report, Prepared by U.S. Army Corps of Engineers, Rock Island District, February 1995
Vegetation of Northwest Peninsula A Sector = Brushy / Trees	Culebra Island Site Visit and ESE Archive Assessment Sheets
Vegetation of Northwest Peninsula B Sector = Grassy / Brushy	Culebra Island Site Visit and ESE Archive Assessment Sheets
Vegetation of Flamenco Area Beach Sector = Clear	Culebra Island Site Visit and ESE Archive Assessment Sheets
Vegetation of Flamenco Area Campground Sector = Grassy / Brushy	Culebra Island Site Visit and ESE Archive Assessment Sheets
Vegetation of Flamenco Area Ridge Sector = Brushy Trees	Culebra Island Site Visit and ESE Archive Assessment Sheets
Vegetation of Cerro Balcon Sector = Grassy / Brushy	Culebra Island Site Visit and ESE Archive Assessment Sheets
Vegetation of Isle Culebrita Sector = Grassy / Brushy	Culebra Island Site Visit and ESE Archive Assessment Sheets
Vegetation of Cayo Botella Sector = Grassy / Brushy	Culebra Island Site Visit and ESE Archive Assessment Sheets
Vegetation of Cayo del Agua Sector = Grassy / Brushy	Culebra Island Site Visit and ESE Archive Assessment Sheets
Vegetation of Cayo Lobo Sector = Grassy / Brushy	Culebra Island Site Visit and ESE Archive Assessment Sheets
Slope of Northwest Peninsula A Sector = (11° - 30°)	Culebra Island Site Visit and ESE Archive Assessment Sheets

Table B-1. Culebra Island National Wildlife Refuge Data (Continued)

Slope of Northwest Peninsula B Sector = (11° - 30°)	Culebra Island Site Visit and ESE Archive Assessment Sheets
Slope of Flamenco Area Beach Sector = (0° - 10°)	Culebra Island Site Visit and ESE Archive Assessment Sheets
Slope of Flamenco Area Campground Sector = (0° - 10°)	Culebra Island Site Visit and ESE Archive Assessment Sheets
Slope of Flamenco Area Ridge Sector = Over 30°	Culebra Island Site Visit and ESE Archive Assessment Sheets
Slope of Cerro Balcon Sector = (11° - 30°)	Culebra Island Site Visit and ESE Archive Assessment Sheets
Slope of Isle Culebrita Sector = (11° - 30°)	Culebra Island Site Visit and ESE Archive Assessment Sheets
Slope of Cayo Botella Sector = (11° - 30°)	Culebra Island Site Visit and ESE Archive Assessment Sheets
Slope of Cayo del Agua Sector = (11° - 30°)	Culebra Island Site Visit and ESE Archive Assessment Sheets
Slope of Cayo Lobo Sector = (11° - 30°)	Culebra Island Site Visit and ESE Archive Assessment Sheets
Soil Type of Northwest Peninsula A Sector is Clay	Culebra Island Archive Search Report and ESE Archive Assessment Sheets
Soil Type of Northwest Peninsula B Sector is Clay	Culebra Island Archive Search Report and ESE Archive Assessment Sheets
Soil Type of Flamenco Area Beach Sector is Sand	Culebra Island Archive Search Report and ESE Archive Assessment Sheets
Soil Type of Flamenco Area Campground Sector is Sand	Culebra Island Archive Search Report and ESE Archive Assessment Sheets

Table B-1. Culebra Island National Wildlife Refuge Data (Concluded)

Soil Type of Flamenco Area Ridge Sector is Clay	Culebra Island Archive Search Report and ESE Archive Assessment Sheets
Soil Type of Cerro Balcon Sector is Clay	Culebra Island Archive Search Report and ESE Archive Assessment Sheets
Soil Type of Isle Culebrita Sector is Clay	Culebra Island Archive Search Report and ESE Archive Assessment Sheets
Soil Type of Cayo Botella Sector is Clay	Culebra Island Archive Search Report and ESE Archive Assessment Sheets
Soil Type of Cayo del Agua Sector is Clay	Culebra Island Archive Search Report and ESE Archive Assessment Sheets
Soil Type of Cayo Lobo Sector is Clay	Culebra Island Archive Search Report and ESE Archive Assessment Sheets

APPENDIX C

ASSUMPTIONS FOR CULEBRA ISLAND NATIONAL WILDLIFE REFUGE OE*Cert* ANALYSIS

APPENDIX C

ASSUMPTIONS FOR CULEBRA ISLAND NATIONAL WILDLIFE REFUGE *OECert* ANALYSIS

The following table includes the assumptions used as inputs to the analysis performed for Culebra Island National Wildlife Refuge using the OE Cost-Effectiveness Tool (*OECert*). Each assumption is accompanied by its source/rationale.

Table C-1. Culebra Island National Wildlife Refuge

Assumption	Source/Rationale
Fishing, Hiking, and Bird Watching take place in Northwest Peninsula A Sector	Site Observation and ESE Archive Assessment Sheets
Bird Watching and Hiking (future) take place in Northwest Peninsula B Sector	Site Observation and ESE Archive Assessment Sheets
Swimming, Child Play, and Fishing take place in Flamenco Area Beach Sector	Site Observation and ESE Archive Assessment Sheets
Camping, Child Play, Picnicking, and Hiking take place in Flamenco Area Campground Sector	Site Observation and ESE Archive Assessment Sheets
Hiking, Bird Watching, Construction (future), and Surveying (future) take place in Flamenco Area Ridge Sector	Site Observation and ESE Archive Assessment Sheets
Ranching takes place in Cerro Balcon Sector	Site Observation and ESE Archive Assessment Sheets
Child Play, Fishing, Swimming, and Hiking take place in Isle Culebrita Sector	Site Observation and ESE Archive Assessment Sheets
Hiking takes place in Cayo Botella Sector (Short Distance Only)	Site Observation and ESE Archive Assessment Sheets
Hiking and Bird Watching take place in Cayo del Agua Sector (Short Distance Only)	Site Observation and ESE Archive Assessment Sheets
Hiking takes place in Cayo Lobo Sector (Short Distance Only)	Site Observation and ESE Archive Assessment Sheets
Total number of entrants per year to Northwest Peninsula A Sector = 50,000	ESE Archive Assessment Sheets
Total number of entrants per year to Northwest Peninsula B Sector = 100	ESE Archive Assessment Sheets
Total number of entrants per year to Flamenco Area Sectors = 50,000	ESE Archive Assessment Sheets
Total number of entrants per year to Isle Culebrita Sector = 20,800	ESE Archive Assessment Sheets
Total number of entrants per year to Cayo Botella Sector = 200	ESE Archive Assessment Sheets
Total number of entrants per year to Cayo del Agua Sector = 250	ESE Archive Assessment Sheets
Total number of entrants per year to Cayo Lobo Sector = 200	ESE Archive Assessment Sheets
Effective Area for Hiking on Cayo Botella = 0.0403 acre	Entrants to cay are illegal (except USF&WS employees), effective area allows hike to center of cay and return.

Table E-13. Expected Annual Exposures for Flamenco Area - Ridge Sector

	No Action		Surface Removal		1 Foot Removal		4 Foot Removal		10 Foot Removal	
	Density		Density		Density		Density		Density	
Activity	High	Low	High	Low	High	Low	High	Low	High	Low
Hiking	1788	0	90	0	90	0	90	0	90	0
Bird Watching	117	0	6	0	6	0	6	0	6	0
Surveying	12	0	1	0	1	0	1	0	1	0
Construction	39	19	28	19	24	16	11	7	5	3
TOTAL	1956	19	125	19	121	16	108	7	102	3

Table E-14. Expected Annual Exposures for Cerro Balcon

	No Action		Surface Removal		1 Foot Removal		4 Foot Removal		10 Foot Removal	
	Density		Density		Density		Density		Density	
Activity	High	Low	High	Low	High	Low	High	Low	High	Low
Ranching	2528	0	139	0	139	0	139	0	139	0
TOTAL	2528	0	139	0	139	0	139	0	139	0

Table E-15. Probability of Individual Exposure for Isle Culebrita

	No Action		Surface Removal		1 Foot Removal		4 Foot Removal		10 Foot Removal	
	Density		Density		Density		Density		Density	
Activity	High	Low	High	Low	High	Low	High	Low	High	Low
Child Play	1/1	1/1	1/1	1/2	1/1	1/2	1/1	1/2	1/1	1/2
Swimming	1/1	1/1	1/7	1/12	1/7	1/12	1/7	1/12	1/7	1/12
Fishing	1/1	1/1	1/7	1/12	1/7	1/12	1/7	1/12	1/7	1/12
Hiking	1/1	1/1	1/1	1/2	1/1	1/2	1/1	1/2	1/1	1/2

Table E-16. Probability of Individual Exposure for Cayo Botella

	No Action		Surface Removal		1 Foot Removal		4 Foot Removal		10 Foot Removal	
	Density		Density		Density		Density		Density	
Activity	High	Low	High	Low	High	Low	High	Low	High	Low
Hiking	1/1	1/1	1/4	1/9	1/4	1/9	1/4	1/9	1/4	1/9

Table E-17. Probability of Individual Exposure for Cayo del Aqua

	No Action		Surface Removal		1 Foot Removal		4 Foot Removal		10 Foot Removal	
	Density		Density		Density		Density		Density	
Activity	High	Low	High	Low	High	Low	High	Low	High	Low
Hiking	1/1	1/2	1/6	1/19	1/6	1/19	1/6	1/19	1/6	1/19
Bird Watching	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

Table E-18. Probability of Individual Exposure for Cayo Lobo

	No Action		Surface Removal		1 Foot Removal		4 Foot Removal		10 Foot Removal	
	Density		Density		Density		Density		Density	
Activity	High	Low	High	Low	High	Low	High	Low	High	Low
Hiking	1/1	0	1/8	0	1/8	0	1/8	0	1/8	0

Table E-19. Probability of Individual Exposure for Northwest Peninsula A

	No Action		Surface Removal		1 Foot Removal		4 Foot Removal		10 Foot Removal	
	Density		Density		Density		Density		Density	
Activity	High	Low	High	Low	High	Low	High	Low	High	Low
Hiking	1/1	1/2	1/14	1/29	1/14	1/29	1/14	1/29	1/14	1/29
Bird Watching	1/1	1/1	1/7	1/13	1/7	1/13	1/7	1/13	1/7	1/13
Fishing	1/5	1/10	1/91	1/ 186	1/91	1/ 186	1/91	1/ 186	1/91	1/ 186

Table E-20. Probability of Individual Exposure for Northwest Peninsula B

	No Action		Surface Removal		1 Foot Removal		4 Foot Removal		10 Foot Removal	
	Density		Density		Density		Density		Density	
Activity	High	Low	High	Low	High	Low	High	Low	High	Low
Hiking	1/1	1/1	1/5	1/7	1/5	1/7	1/5	1/7	1/5	1/7
Bird Watching	1/1	1/1	1/11	1/14	1/11	1/14	1/11	1/14	1/11	1/14

Table E-21. Probability of Individual Exposure for Flamenco Area - Beach

	No Action		Surface Removal		1 Foot Removal		4 Foot Removal		10 Foot Removal	
	Density		Density		Density		Density		Density	
Activity	High	Low	High	Low	High	Low	High	Low	High	Low
Fishing	1/70	0	1/ 1387	0	1/ 1387	0	1/ 1387	0	1/ 1387	0
Child Play	1/3	1/51	1/8	1/51	1/10	1/ 658	1/10	1/ 658	1/10	1/ 658
Swimming	1/70	0	1/ 1387	0	1/ 1387	0	1/ 1387	0	1/ 1387	0

Table E-22. Probability of Individual Exposure for Flamenco Area - Campground

	No Action		Surface Removal		1 Foot Removal		4 Foot Removal		10 Foot Removal	
	Density		Density		Density		Density		Density	
Activity	High	Low	High	Low	High	Low	High	Low	High	Low
Hiking	1/2	0	1/24	0	1/24	0	1/24	0	1/24	0
Child Play	1/1	1/51	1/11	1/51	1/11	1/ 658	1/11	1/ 658	1/11	1/ 658
Picnic	1/92	1/ 95,466	1/ 1,779	1/ 95,466	1/ 1825	1/ 9,345,794	1/ 1825	1/ 9,345,794	1/ 1825	1/ 9,345,794
Camping	1/14	1/ 97,088	1/ 234	1/ 97,088	1/ 234	1/ 1,261,036	1/ 234	1/ 1,261,036	1/ 234	1/ 1,261,036

Table E-23. Probability of Individual Exposure for Flamenco Area - Ridge

	No Action		Surface Removal		1 Foot Removal		4 Foot Removal		10 Foot Removal	
	Density		Density		Density		Density		Density	
Activity	High	Low	High	Low	High	Low	High	Low	High	Low
Hiking	1/3	0	1/39	0	1/39	0	1/39	0	1/39	0
Bird Watching	1/2	0	1/18	0	1/18	0	1/18	0	1/18	0
Surveying	1/1	0	1/2	0	1/2	0	1/2	0	1/2	0
Construction	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

Table E-24. Probability of Individual Exposure for Cerro Balcon

	No Action		Surface Removal		1 Foot Removal		4 Foot Removal		10 Foot Removal	
	Density		Density		Density		Density		Density	
Activity	High	Low	High	Low	High	Low	High	Low	High	Low
Ranching	1/1	0	1/3	0	1/3	0	1/3	0	1/3	0

APPENDIX L

COST TABLES

COST ESTIMATE SUMMARY
EE/CA for Culebra Naval Facility

ORDNANCE OPERABLE UNIT	ALTERNATIVE 2 INSTITUTIONAL CONTROLS (INCLUDING FENCING)	ALTERNATIVE 3 SURFACE CLEARANCE	ALTERNATIVE 4 CLEARANCE FOR USE	ALTERNATIVE 5 COMPLETE CLEARANCE
OOU-1 Flamenco Beach Area	$330,599	$921,440	$1,536,000	$2,488,000
OOU-2 Northwest Peninsula	$111,864	$1,127,040	$2,944,880	$6,995,920
OOU-3 Cerro Balcon *	$12,080	$199,360	$297,740	$397,600
OOU-4 Culebrita Island	$377,891	$678,400	$2,060,440	$2,119,680
OOU-5 Other Surrounding Cays	$85,920	$315,160	$574,050	$872,720

Notes:

* Fencing not included in the Institutional Controls alternative for OOU-3

Shading denotes the recommended alternative for each OOU

Ordnance Contamination Assumptions
EE/CA for Culebra Naval Facility

OOU	Area of Contamination (acres) *	QuantiTech Avg. UXO Density (UXO/acre)	Assumed Average UXO Density (UXO/acre) **	Expected Total UXO ***	Assumed UXO per Anomaly **	Expected Total Anomalies	QuantiTech Avg. Surface Percent Estimate	Assumed Surface Percent Estimate **	Expected Surface UXO
1	300	2.9	4	1,200	2%	60,000	15%	32%	384
2	313	6.5	20	6,260	2%	313,000	40%	40%	2,504
3	30	0.4	4	120	2%	6,000	15%	10%	12
4	82	78	80	6,560	10%	65,600	59%	60%	3,936
5	30	109	80	2,360	10%	23,600	49%	50%	1,180
Total	755			16,500		468,200			8,016

* Note 1 Area in OOU 3 includes only the suspected target area within the range fan west of Cerro Balcon
Area in OOU 4 Includes only the area of the strafing range.

** Note 2 Average values differ from those derived from sampling results. The EE/CA sampling was limited and the results not necessarily indicative of the densities that would be expected across the entire OOU. The average values given here reflect consultants best estimate of quantities.

*** Note 3 Includes surface (to 0.5 feet) and subsurface UXO

Source: ESE. 1990; QuantiTech, 1990

COST ESTIMATE
EE/CA for Culebra Naval Facility

Project: 319-5803G-0600-3100
Site: OOU-1 Flamenco Beach Area
Alternative 2 - INSTITUTIONAL CONTROLS
Estimated by: FR
Checked by: RW
Reviewed by:

ITEM NO.	DESCRIPTION	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL COST
1	Sign fabrication & posting (located along roads & trails)	17	ea	$100.00	$1,700
2	Perimeter fencing, chainlink, 6' high plus 3 strands of barbed wire 9 ga. Warning signs posted every 300 feet.	13000	feet	$15.00	$195,000
3	UXO support (for fencing and sign installation)	10	day	$500.00	$4,924
4	Mobilize/demobilize	1	ls	$5,000.00	$5,000

Total Capital Cost	$206,624
Contingency (25%)	$51,656
Consulting (15%)	$30,994
Overhead & profit (20%)	$41,325
Total Estimated Cost	$330,599

Notes:
1. Number of signs is based upon total length of roads and trails in the OOU.

COST ESTIMATE
EE/CA for Culebra Naval Facility

Project: 319-5803G-0600-3100
Site: OOU-1 Flamenco Beach Area
Alternative 3 - SURFACE CLEARANCE
Estimated by: FR
Checked by: RW
Reviewed by:

ITEM NO.	DESCRIPTION	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL COST
1	Site Preparation and clearing	300	acres	$750.00	$225,000
2	Survey/QC	300	acres	$100.00	$30,000
3	Visual inspection, limited geophysical investigation	300	acres	$750.00	$225,000
*4	Disposal/detonation of OE (surface)	384	UXO	$50.00	$19,200
5	Sign fabrication & posting (located along roads & trails)	17	ea	$100.00	$1,700
6	Mobilize/demobilize	1	ls	$75,000.00	$75,000

Total Capital Cost	$575,900
Contingency (25%)	$143,975
Consulting (15%)	$86,385
Overhead & profit (20%)	$115,180
Total Estimated Cost	$921,440

Notes:
1. Site preparation is based upon current land use and extent of investigation required.
2. Number of signs is based upon total length of roads and trails in the OOU.

COST ESTIMATE
EE/CA for Culebra Naval Facility

Project: 319-5803G-0600-3100
Site: OOU-1 Flamenco Beach Area
Alternative 4 - CLEARANCE FOR USE
Estimated by: FR
Checked by: RW
Reviewed by:

ITEM NO.	DESCRIPTION	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL COST
1	Site Preparation and clearing	300	acres	$750.00	$225,000
2	Survey /QC	300	acres	$100.00	$30,000
3	Geophysical investigation				
3a	High Usage Areas (25% of OOU - Complete Clearance)	75	acres	$1,800.00	$135,000
3b	Low Usage Areas (75% of OOU - Surface Clearance, limited investigation)	225	acres	$750.00	$168,750
*4	Excavation of anomalies				
4a	High Usage Areas (25% of OOU - 100% recovery)	15,000	anomalies	$10.00	$150,000
4b	Low Usage Areas (75%) (75% of OOU - 25% recovery)	11,250	anomalies	$10.00	$112,500
*5	Disposal/detonation of OE	741	UXO	$50.00	$37,050
6	Sign fabrication & posting (located along roads & trails)	17	ea	$100.00	$1,700
7	Mobilize/demobilize	1	ls	$100,000.00	$100,000

Total Capital Cost	$960,000
Contingency (25%)	$240,000
Consulting (15%)	$144,000
Overhead & profit (20%)	$192,000
Total Estimated Cost	$1,536,000

Notes:
1. Site preparation is based upon current land use and extent of investigation required.
2. Number of signs is based upon total length of roads and trails in the OOU.

COST ESTIMATE
EE/CA for Culebra Naval Facility

Project: 319-5803G-0600-3100
Site: OOU-1 Flamenco Beach Area
Alternative 5 - COMPLETE CLEARANCE
Estimated by: FR
Checked by: RW
Reviewed by:

ITEM NO.	DESCRIPTION	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL COST
1	Site Preparation and clearing	300	acres	$750.00	$225,000
2	Survey /QC	300	acres	$100.00	$30,000
3	Geophysical investigation	300	acres	$1,800.00	$540,000
*4	Excavation of anomalies	60,000	anomalies	$10.00	$600,000
*5	Disposal/detonation of OE	1,200	UXO	$50.00	$60,000
6	Mobilize/demobilize	1	ls	$100,000.00	$100,000

Total Capital Cost	$1,555,000
Contingency (25%)	$388,750
Consulting (15%)	$233,250
Overhead & profit (20%)	$311,000
Total Estimated Cost	$2,488,000

Notes:
1. Site preparation is based upon current land use and extent of investigation required.

COST ESTIMATE
EE/CA for Culebra Naval Facility

Project: 319-5803G-0600-3100
Site: OOU-2 Northwest Peninsula
Alternative 2 - INSTITUTIONAL CONTROLS
Estimated by: FR
Checked by: RW
Reviewed by:

ITEM NO.	DESCRIPTION	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL COST
1	Sign fabrication & posting (located along roads & trails)	34	ea	$100.00	$3,400
2	Fence along south boundary and beach access points, chainlink, 6' high plus 3 strands of barbed wire 9 ga. Warning signs posted every 300 feet.	4000	feet	$15.00	$60,000
3	UXO support (for fencing and sign installation)	3	day	$500.00	$1,515
4	Mobilize/demobilize	1	ls	$5,000.00	$5,000

Total Capital Cost	$69,915
Contingency (25%)	$17,479
Consulting (15%)	$10,487
Overhead & profit (20%)	$13,983
Total Estimated Cost	$111,864

Notes:
1. Number of signs is based upon total length of roads and trails in the OOU

COST ESTIMATE
EE/CA for Culebra Naval Facility

Project:	**319-5803G-0600-3100**
Site:	**OOU-2 Northwest Peninsula**
Alternative 3-	**SURFACE CLEARANCE**
Estimated by:	**FR**
Checked by:	**RW**
Reviewed by:	

ITEM NO.	DESCRIPTION	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL COST
1	Site Preparation and clearing	313	acres	$750.00	$234,750
2	Survey/QC	313	acres	$100.00	$31,300
3	Visual inspection, limited geophysical investigation	313	acres	$750.00	$234,750
*4	Disposal/detonation of OE (surface)	2,504	UXO	$50.00	$125,200
5	Mobilize/demobilize	1	ls	$75,000.00	$75,000
6	Sign fabrication & posting (located along roads and trails)	34	ea	$100.00	$3,400

Total Capital Cost	$704,400
Contingency (25%)	$176,100
Consulting (15%)	$105,660
Overhead & profit (20%)	$140,880
Total Estimated Co	$1,127,040

Notes:

1. Site preparation is based upon current land use and extent of investigation required.
2. Number of signs is based upon total length of roads and trails in the OOU.

COST ESTIMATE
EE/CA for Culebra Naval Facility

Project: 319-5803G-0600-3100
Site: OOU-2 Northwest Peninsula
Alternative 4 - CLEARANCE FOR USE
Estimated by: FR
Checked by: RW
Reviewed by:

ITEM NO.	DESCRIPTION	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL COST
1	Site Preparation and clearing	313	acres	$750.00	$234,750
2	Survey /QC	313	acres	$100.00	$31,300
3	Geophysical Investigation				
3a	High Usage Areas (10% of OOU - Complete Clearance)	31	acres	$1,800.00	$56,340
3b	Low Usage Areas (90% of OOU - Surface Clearance, limited investigation)	282	acres	$750.00	$211,275
*4	Excavation of anomalies				
4a	High Usage Areas (10% of OOU - 100% recovery)	31,300	anomalies	$10.00	$313,000
4b	Low Usage Areas (75%) (90% of OOU - 25% recovery)	70,425	anomalies	$10.00	$704,250
*5	Disposal/detonation of OE	3,725	UXO	$50.00	$186,235
6	Sign fabrication & posting (located along roads & trails)	34	ea	$100.00	$3,400
7	Mobilize/demobilize	1	ls	$100,000.00	$100,000

Total Capital Cost	$1,840,550
Contingency (25%)	$460,138
Consulting (15%)	$276,083
Overhead & profit (20%)	$368,110
Total Estimated Cost	$2,944,880

Notes:
1. Site preparation is based upon current land use and extent of investigation required.
2. Number of signs is based upon total length of roads and trails in the OOU

COST ESTIMATE
EE/CA for Culebra Naval Facility

Project:	319-5803G-0600-3100
Site:	OOU-2 Northwest Peninsula
Alternative 5 -	COMPLETE CLEARANCE
Estimated by:	FR
Checked by:	RW
Reviewed by:	

ITEM NO.	DESCRIPTION	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL COST
1	Site Preparation and clearing	313	acres	$750.00	$234,750
2	Survey /QC	313	acres	$100.00	$31,300
3	Geophysical investigation	313	acres	$1,800.00	$563,400
*4	Excavation of anomalies	313,000	anomalies	$10.00	$3,130,000
*5	Disposal/detonation of OE	6,260	UXO	$50.00	$313,000
6	Mobilize/demobilize	1	ls	$100,000.00	$100,000

Total Capital Cost	$4,372,450
Contingency (25%)	$1,093,113
Consulting (15%)	$655,868
Overhead & profit (20%)	$874,490
Total Estimated Cost	$6,995,920

Notes:
1. Site preparation is based upon current land use and extent of investigation required.

COST ESTIMATE
EE/CA for Culebra Naval Facility

Project: 319-5803G-0600-3100
Site: OOU-3 Cerro Balcon
Alternative 2 - INSTITUTIONAL CONTROLS (EXCLUDING FENCING)
Estimated by: FR
Checked by: RW
Reviewed by:

ITEM NO.	DESCRIPTION	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL COST
1	Sign fabrication & posting (located along roads & trails)	17	ea	$100.00	$1,700
2	UXO support (for sign installation)	2	day	$500.00	$850
3	Mobilize/demobilize	1	ls	$5,000.00	$5,000

Total Capital Cost	$7,550
Contingency (25%)	$1,888
Consulting (15%)	$1,133
Overhead & profit (20%)	$1,510
Total Estimated Cost	$12,080

Notes:
1. Number of signs is based upon total length of roads and trails in the OOU.

COST ESTIMATE
EE/CA for Culebra Naval Facility

Project: 319-5803G-0600-3100
Site: OOU-3 Cerro Balcon
Alternative 3 - SURFACE CLEARANCE
Estimated by: FR
Checked by: RW
Reviewed by:

ITEM NO.	DESCRIPTION	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL COST
1	Site Preparation and clearing	30	acres	$750.00	$22,500
2	Survey/QC	30	acres	$100.00	$3,000
3	Visual inspection, limited geophysical investigation	30	acres	$750.00	$22,500
*4	Disposal/detonation of OE (surface)	12	UXO	$50.00	$600
5	Mobilize/demobilize	1	ls	$75,000.00	$75,000
6	Sign fabrication & posting (located along roads and trails)	10	ea	$100.00	$1,000

Total Capital Cost	$124,600
Contingency (25%)	$31,150
Consulting (15%)	$18,690
Overhead & profit (20%)	$24,920
Total Estimated Cost	$199,360

Notes:
1. Site preparation is based upon current land use.
2. Number of signs is based upon total length of roads and trails in the OOU.

COST ESTIMATE
EE/CA for Culebra Naval Facility

Project: 319-5803G-0600-3100
Site: OOU-3 Cerro Balcon
Alternative 4 - CLEARANCE FOR USE
Estimated by: FR
Checked by: RW
Reviewed by:

ITEM NO.	DESCRIPTION	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL COST
1	Site Preparation and clearing	30	acres	$750.00	$22,500
2	Survey /QC	30	acres	$100.00	$3,000
3	Geophysical investigation				
3a	High Usage Areas (25% of OOU - Complete Clearance)	8	acres	$1,800.00	$13,500
3b	Low Usage Areas (75% of OOU - Surface Clearance, limited investigation)	23	acres	$750.00	$16,875
*4	Excavation of anomalies				
4a	High Usage Areas (25% of OOU - 100% recovery)	1,500	anomalies	$10.00	$15,000
4b	Low Usage Areas (75%) (75% of OOU - 25% recovery)	1,125	anomalies	$10.00	$11,250
*5	Disposal/detonation of OE	59	UXO	$50.00	$2,963
6	Sign fabrication & posting (located along roads & trails)	10	ea	$100.00	$1,000
6	Mobilize/demobilize	1	ls	$100,000.00	$100,000

Total Capital Cost	$186,088
Contingency (25%)	$46,522
Consulting (15%)	$27,913
Overhead & profit (20%)	$37,218
Total Estimated Cost	$297,740

Notes:
1. Site preparation is based upon current land use and extent of investigation required.
2. Number of signs is based upon total length of roads and trails in the OOU.

COST ESTIMATE
EE/CA for Culebra Naval Facility

Project: 319-5803G-0600-3100
Site: OOU-3 Cerro Balcon
Alternative 5 - COMPLETE CLEARANCE
Estimated by: FR
Checked by: RW
Reviewed by:

ITEM NO.	DESCRIPTION	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL COST
1	Site Preparation and clearing	30	acres	$750.00	$22,500
2	Survey /QC	30	acres	$100.00	$3,000
3	Geophysical investigation	30	acres	$1,800.00	$54,000
*4	Excavation of anomalies	6,000	anomalies	$10.00	$60,000
*5	Disposal/detonation of OE	120	UXO	$50.00	$6,000
6	Sign fabrication & posting	30	ea	$100.00	$3,000
7	Mobilize/demobilize	1	ls	$100,000.00	$100,000

Total Capital Cost	$248,500
Contingency (25%)	$62,125
Consulting (15%)	$37,275
Overhead & profit (20%)	$49,700
Total Estimated Cost	$397,600

Notes:
1. Site preparation is based upon current land use.

COST ESTIMATE
EE/CA for Culebra Naval Facility

Project: 319-5803G-0600-3100
Site: OOU-4 Culebrita Island
Alternative 2 - INSTITUTIONAL CONTROLS
Estimated by: FR
Checked by: RW
Reviewed by:

ITEM NO.	DESCRIPTION	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL COST
1	Sign fabrication & posting (located along roads & trails)	5	ea	$100.00	$500
2	Perimeter fencing, chainlink, 6' high plus 3 strands of barbed wire 9 ga. Warning signs posted every 300 feet.	15000	feet	$15.00	$225,000
3	UXO support (for fencing and sign installation)	11	day	$500.00	$5,682
4	Mobilize/demobilize	1	ls	$5,000.00	$5,000

Total Capital Cost	$236,182
Contingency (25%)	$59,045
Consulting (15%)	$35,427
Overhead & profit (20%)	$47,236
Total Estimated Cost	$377,891

Notes:
1. Number of signs is based upon total length of roads and trails in the OOU.

COST ESTIMATE
EE/CA for Culebra Naval Facility

Project: 319-5803G-0600-3100
Site: OOU-4 Culebrita Island
Alternative 3 - SURFACE CLEARANCE
Estimated by: FR
Checked by: RW
Reviewed by:

ITEM NO.	DESCRIPTION	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL COST
1	Site Preparation and clearing	82	acres	$1,000.00	$82,000
2	Survey/QC	82	acres	$100.00	$8,200
3	Visual inspection, limited geophysical investigation	82	acres	$750.00	$61,500
*4	Disposal/detonation of OE (surface)	3,936	UXO	$50.00	$196,800
5	Mobilize/demobilize	1	ls	$75,000.00	$75,000
6	Sign fabrication & posting (located along roads and trails)	5	ea	$100.00	$500
			Total Capital Cost		$424,000
			Contingency (25%)		$106,000
			Consulting (15%)		$63,600
			Overhead & profit (20%)		$84,800
			Total Estimated Cost		$678,400

Notes:
1. Site preparation is based upon current land use and extent of investigation required.
2. Number of signs is based upon total length of roads and trails in the OOU.

COST ESTIMATE
EE/CA for Culebra Naval Facility

Project: 319-5803G-0600-3100
Site: OOU-4 Culebrita Island
Alternative 4 - CLEARANCE FOR USE
Estimated by: FR
Checked by: RW
Reviewed by:

ITEM NO.	DESCRIPTION	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL COST
1	Site Preparation and clearing	82	acres	$1,000.00	$82,000
2	Survey /QC	82	acres	$100.00	$8,200
3	Geophysical investigation				
3a	High Usage Areas (95% of OOU - Complete Clearance)	78	acres	$1,800.00	$140,220
3b	Low Usage Areas (5% of OOU - Surface Clearance, limited investigation)	4	acres	$750.00	$3,075
*4	Excavation of anomalies				
4a	High Usage Areas (95% of OOU - 100% recovery)	62,320	anomalies	$10.00	$623,200
4b	Low Usage Areas (5% of OOU - 25% recovery)	750	anomalies	$10.00	$7,500
*5	Disposal/detonation of OE	6,462	UXO	$50.00	$323,080
6	Sign fabrication & posting (located along roads & trails)	5	ea	$100.00	$500
7	Mobilize/demobilize	1	ls	$100,000.00	$100,000

Total Capital Cost	$1,287,775
Contingency (25%)	$321,944
Consulting (15%)	$193,166
Overhead & profit (20%)	$257,555
Total Estimated Cost	$2,060,440

Notes:
1. Site preparation is based upon current land use and extent of investigation required.
2. Number of signs is based upon total length of roads and trails in the OOU.

COST ESTIMATE
EE/CA for Culebra Naval Facility

Project:	**319-5803G-0600-3100**
Site:	**OOU-4 Culebrita Island**
Alternative 5 -	**COMPLETE CLEARANCE**
Estimated by:	**FR**
Checked by:	**RW**
Reviewed by:	

ITEM NO.	DESCRIPTION	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL COST
1	Site Preparation and clearing	82	acres	$1,000.00	$82,000
2	Survey /QC	82	acres	$100.00	$8,200
3	Geophysical investigation	82	acres	$1,800.00	$147,600
*4	Excavation of anomalies	65,600	anomalies	$10.00	$656,000
*5	Disposal/detonation of OE	6,560	UXO	$50.00	$328,000
6	Sign fabrication & posting	30	ea	$100.00	$3,000
7	Mobilize/demobilize	1	ls	$100,000.00	$100,000

Total Capital Cost	$1,324,800
Contingency (25%)	$331,200
Consulting (15%)	$198,720
Overhead & profit (20%)	$264,960
Total Estimated Cost	$2,119,680

Notes:

1. Site preparation is based upon current land use and extent of investigation required.
2. Number of signs is based upon total length of roads and trails in the OOU.

COST ESTIMATE
EE/CA for Culebra Naval Facility

Project: 319-5803G-0600-3100
Site: OOU-5 Other Surrounding Cays
Alternative 2 - INSTITUTIONAL CONTROLS
Estimated by: FR
Checked by: RW
Reviewed by:

ITEM NO.	DESCRIPTION	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL COST
1	Sign fabrication & posting (located every 300 ft. along perimeter)	37	ea	$100.00	$3,700
2	Perimeter fencing, chainlink, 6' high plus 3 strands of barbed wire 9 ga. Warning signs posted every 300 feet.	0	feet	$15.00	$0
3	UXO support (for fencing and sign installation)	0	day	$500.00	$0
4	Mobilize/demobilize	1	ls	$50,000.00	$50,000

Total Capital Cost	$53,700
Contingency (25%)	$13,425
Consulting (15%)	$8,055
Overhead & profit (20%)	$10,740
Total Estimated Cost	$85,920

Notes:
1. Number of signs is based upon total length of roads and trails in the OOU.

COST ESTIMATE
EE/CA for Culebra Naval Facility

Project: 319-5803G-0600-3100
Site: OOU-5 Other Surrounding Cays
Alternative 3 - SURFACE CLEARANCE
Estimated by: FR
Checked by: RW
Reviewed by:

ITEM NO.	DESCRIPTION	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL COST
1	Site Preparation and clearing	30	acres	$1,200.00	$35,400
2	Survey/QC	30	acres	$100.00	$2,950
3	Visual inspection, limited geophysical investigation	30	acres	$750.00	$22,125
*4	Disposal/detonation of OE (surface)	1,180	UXO	$50.00	$59,000
5	Mobilize/demobilize	1	ls	$75,000.00	$75,000
6	Sign fabrication & posting (located along roads and trails)	25	ea	$100.00	$2,500
			Total Capital Cost		$196,975
			Contingency (25%)		$49,244
			Consulting (15%)		$29,546
			Overhead & profit (20%)		$39,395
			Total Estimated Cost		$315,160

Notes:
1. Site preparation is based upon current land use and extent of investigation required.
2. Number of signs is based upon total length of roads and trails in the OOU.

COST ESTIMATE
EE/CA for Culebra Naval Facility

Project: 319-5803G-0600-3100
Site: OOU-5 Other Surrounding Cays
Alternative 4 - CLEARANCE FOR USE
Estimated by: FR
Checked by: RW
Reviewed by:

ITEM NO.	DESCRIPTION	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL COST
1	Site Preparation and clearing	30	acres	$1,200.00	$35,400
2	Survey /QC	30	acres	$100.00	$2,950
3	Geophysical investigation				
3a	High Usage Areas (25% of OOU - Complete Clearance)	7	acres	$1,800.00	$13,275
3b	Low Usage Areas (75% of OOU - Surface Clearance, limited investigation)	22	acres	$750.00	$16,594
*4	Excavation of anomalies				
4a	High Usage Areas (25% of OOU - 100% recovery)	5,900	anomalies	$10.00	$59,000
4b	Low Usage Areas (75%) (75% of OOU - 25% recovery)	4,425	anomalies	$10.00	$44,250
*5	Disposal/detonation of OE	1,696	UXO	$50.00	$84,813
6	Sign fabrication & posting (located along roads & trails)	25	ea	$100.00	$2,500
7	Mobilize/demobilize	1	ls	$100,000.00	$100,000

Total Capital Cost	$358,781
Contingency (25%)	$89,695
Consulting (15%)	$53,817
Overhead & profit (20%)	$71,756
Total Estimated Cost	$574,050

Notes:

1. Site preparation is based upon current land use and extent of investigation required.
2. Number of signs is based upon total length of roads and trails in the OOU.

COST ESTIMATE
EE/CA for Culebra Naval Facility

Project: 319-5803G-0600-3100
Site: OOU-5 Other Surrounding Cays
Alternative 5 - COMPLETE CLEARANCE
Estimated by: FR
Checked by: RW
Reviewed by:

ITEM NO.	DESCRIPTION	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL COST
1	Site Preparation and clearing	30	acres	$1,200.00	$35,400
2	Survey /QC	30	acres	$100.00	$2,950
3	Geophysical investigation	30	acres	$1,800.00	$53,100
*4	Excavation of anomalies	23,600	anomalies	$10.00	$236,000
*5	Disposal/detonation of OE	2,360	UXO	$50.00	$118,000
6	Mobilize/demobilize	1	ls	$100,000.00	$100,000

Total Capital Cost	$545,450
Contingency (25%)	$136,363
Consulting (15%)	$81,818
Overhead & profit (20%)	$109,090
Total Estimated Cost	$872,720

Notes:

1. Site preparation is based upon current land use.
2. Number of signs is based upon total length of roads and trails in the OOU.

CULEBRA ISLAND COST ESTIMATE

The costs provided in this EE/CA are estimated based on the consultant's best engineering judgement and experience. Attached are the estimated costs to implement each of the alternatives at each of the five OOUs. The costs are based on specific assumptions for all sites including:

1. The cost of site preparation for all OE clearance activities is based on current land use and extent of investigation required.
2. The costs provided in the attached tables for each alternative at each OOU do not include the costs for an Education/Information program. As discussed in Section 7 of the Culebra Island EE/CA report, the cost to develop the program will be $25,000 to $50,000. The annual cost to maintain and administer the program will be $2,500 to $5,000.
3. The cost estimate includes a contingency of 25% to cover the cost of unforseen conditions (such as anomalous concentrations of UXO, dense underbrush, hazardous site conditions, etc.).
4. The cost estimate includes a consulting fee of 15% of the implementation cost. The consulting services include: planning, consulting, design, plans and specifications, permitting, health and safety plans, work plans, and other field support services.

Clearance for use Calculations

The cost to provide the " Clearance for Use" alternative has been estimated based on the assumption that the areas will be differentially cleared based on present and future usage. The actual cost of implementing clearance for use would lie between the cost of surface clearance and the cost of complete clearance. For the purpose of estimating the cost of clearance for use, the OOU is subdivided into "High" and "Low" access areas. The area divisions are estimated to a percent of the total area of expected high and low access.

ESE assumes that "High Access" areas include areas where there is high public access and therefore a high exposure potential. These areas will require more extensive clearance than areas where public access and exposure is limited. "High Access" areas will be costed for complete clearance.

"Low Access" areas include areas where there is low public access and therefore a low exposure potential. These areas will require less extensive clearance than areas where public access and exposure is limited. "Low Access" areas will be costed for a surface clearance and limited excavation (estimated to be 25% of the anomalies).
The calculations for number of UXO are based on the following assumptions:

1. The total expected UXOs in each OOU is estimated based upon the assumed ordnance density at that OOU, multiplied by the acreage of the OOU.

2. The total anomalies for each OOU is estimated on the assumption that a predicted % of anomalies for that OOU will be UXO.

3. The total expected surface UXO is calculated based upon the assumption that a percentage of the total UXO within the OOU will be found on the land surface.

4. The total UXO expected to be recovered during implementation of Alternative 4 includes all of the expected surface UXO plus a portion of the expected subsurface UXOs.

5. In the "High Access" areas, it is assumed that 100% of the anomalies will be excavated and 100% of the UXOs will be recovered. In the low access areas it is assumed that 25% of the anomalies and 25% of the total subsurface UXO will be recovered due to the excavation.

APPENDIX M
RESPONSIVENESS SUMMARY

Appendix M
Former Culebra Island Naval Facility
Culebra, Puerto Rico
Responsiveness Summary

1.0 Overview

The U.S. Army Engineering and Support Center, Huntsville (USAESCH) recommended the preferred risk reduction alternatives for the former Culebra Island Naval Facility, culebra, Puerto Rico. The recommended preferred alternatives address the reduction of risk associated with the potential for exposure to ordnance remaining from activities at the formerly used defense-site. The preferred alternatives have been revised as the result of USAESCH response to public comments. The preferred alternatives are presented in Section 3.0 of this responsiveness summary.

Based on the comments received during the public comment period, it has been concluded that the most significant concerns have now been addressed by the recommended risk reduction alternatives. All public comments were carefully considered. Recommendations for two of the five OOUs were modified in response to public comments received.

2.0 Background on Community Involvement

The Jacksonville Corps of Engineers (CESAJ), Mr. Robert Bridgers, is the life-cycle manger for investigation activities on Culebra Island. Lt. Col. Fowler of the local Antilles area office (United States Army Corps of Engineers) provided onsite assistance and personnel. The USAESCH, is the technical center for explosive safety and removal, was given the primary task of technical management of the Culebra project. Mr. Roland Belew was the USAESCH technical manager.

The following coordination protocol was followed:

- All ESE communications and contacts with the public were coordinated under the direction of the CESAJ public affairs officer and the USAESCH technical manager.

- Information/contacts made by ESE during the project were documented and forwarded to the CESAJ public affairs officer and the USAESCH technical manager, and

- Public Meetings were conducted based on instructions received from the USAESCH technical manager in conjunction with CESAJ.

Coordination for the project was performed by Mr. Robert Bridgers of the CESAJ and from the Antilles area office of the USACE. Personnel from the Antilles office assisted with public coordination. Public statements were prepared by the Antilles personnel and distributed to local and regional news media. Mr. Alfonso Oneil, of the Antilles office remained onsite during most of the field activities to assist with coordination of the investigation and to provide information to local residents.

2.1 Public Meetings

Three (3) public meetings were held at the Culebra Island Municipal Building, Culebra Island, Puerto Rico to discuss the EE/CA activities with the public.

The first public meeting was held concurrently with a site visit on Thursday, May 4, 1995. The attendees were MTA, ESE, USAESCH, and local residents. Topics of discussion during the meeting included MTA TCRA activities at Flamenco Beach and the impending

EE/CA Sampling Activities.

The second public meeting was held on November 29, 1995. The attendees were ESE, USAESCH, USFWS, PRDNR USACE, residents of San Juan, and local residents. The purpose of the meeting was to discuss the activities of the EE/CA investigation with local residents in response to a local television report which erroneously reported that an underwater investigation was being performed to remove ordnance in the reefs surrounding the cays. The public was told that underwater operations would not be conducted during the current investigation.

Also discussed were the field activities and how they were to be conducted. Several local residents requested that Culebrita and Flamenco Beach be investigated first in order to not interfere with the main attractions to Culebra during the busy holiday season. ESE agreed to this request and performed the investigations on Culebrita and Flamenco Beach concurrently at the beginning of the project.

The 30 day review public review period of the Draft Final EE/CA was initiated on July 30, 1996 with a public meeting on Culebra Island, Puerto Rico. The results of the meeting and the public comments are presented in this Responsiveness Summary.

3.0 Summary of Public Comments and USAESCH Responses

The preparation of the report "Engineering Evaluation /Cost Analysis (EE/CA)Former Culebra Island Naval Facility, Culebra, Puerto Rico" was completed in three stages (the draft EE/CA, the Draft Final EE/CA and the Final EE/CA) to facilitate two different levels of review. The Draft and Draft Final EE/CA reports were based on information collected from the site investigation, the local agencies and the USAESCH during the EE/CA investigation. The final report includes additional data and responses to comments received during the public review period.

The draft EE/CA Report was delivered on June 7, 1996. The purpose of the draft report was to provide a review document for the U.S. Army Engineering Support Center, Huntsville (USAESCH), USACE Jacksonville District, and other reviewing agencies. The comments generated by USAESCH personnel were addressed and incorporated into the Draft Final EE/CA Report.

The Draft Final EE/CA report was delivered on July 19th, 1996. The draft final EE/CA report is a document of record which was delivered to the public for review. A public meeting to discuss the conclusions of the Draft Final EE/CA report was conducted on Culebra, Puerto Rico on July 30, 1996. A record of the discussions during the meeting is included in Attachment A. The meeting initiated the public review period in which the public was requested to express their concerns in regard to the recommendations of the EE/CA report.

Hurricane Hortense delayed the receipt of the final responses from the public until September 6, 1996. The comments were overwhelmingly in favor of complete clearance of Flamenco Beach, the Northwest Peninsula, and the surrounding Cays. Additional information was also received, including a plan to provide windmill power to Culebra Island (See Puerto Rico Power Authority Letter dated August 21, 1996) and indication from the United States Fish and Wildlife Service (USF&WS) that there is a plan to increase the public use of their lands. A copy of the public comments is provided in Attachment B of this report.

USAESCH RESPONSE

The USAESCH has researched the ownership of the property given to the USF&WS and to

the Puerto Rico Department of Natural Resources to determine if any limitation was placed to restrict access to the contaminated areas within the Culebra Archipelago. The research indicated that no restrictions were placed on the property; therefore, access and activities of the property owner are not restricted or encumbered by deed restrictions. However, if in the future the land ownership is passed from the United States or the commonwealth of Puerto Rico to the public, a restriction from excavations without prior ordnance investigation by qualified EOD personnel should be included on the deed.

Due to the overwhelming public response, and the present desires of the local agencies, changes were incorporated in the final EE/CA . Attachment D includes a copy of the letter requesting the changes. Also, The chosen alternative "Clearance for Use" at Cerro Balcon was changed to Surface Clearance as there are no present plans for construction in the investigation area. The investigation area is zoned for agriculture which allows only one house per forty acres.

In response to public comments the following revisions have been made to the EE/CA document:

LOCATION	PREVIOUS ALTERNATIVE	FINAL ALTERNATIVE
OOU-1 Flamenco Beach	Alternative 4"Clearance for Use"	Alternative 4"Clearance for Use"
OOU-2 Northwest Peninsula	Alternative 2 "Institutional Controls "	Alternative 4"Clearance for Use"
OOU-3 Cerro Balcon	Alternative 4"Clearance for Use"	Alternative 3"Surface Clearance"
OOU-4 Isla Culebrita	Alternative 3"Surface Clearance"	Alternative 3"Surface Clearance"
OOU-5 Other Surrounding Cays	Alternative 2 "Institutional Controls "	Alternative 3"Surface Clearance"

These changes are fully executed in the final EE/CA document for Culebra Island.

4.0 Remaining Concerns

There were additional public comments concerning the underwater safety of the surrounding cays. The surrounding cays are used for recreational boating, fishing, and diving. The public concerns were that an anchor from one of the recreational boats may cause the detonation of a unexploded ordnance (UXO). As a result of this concern, the USAESCH is actively researching the installation of mooring stations in key areas. Although public comments addressed underwater concerns, underwater concerns were not part of this EE/CA investigation scope of work.

ATTACHMENT A

MEETING MINUTES
JULY 30, 1996

ENVIRONMENTAL SCIENCE & ENGINEERING, INC.
MEMORANDUM
GAINESVILLE, FL

TO: Culebra Project File

FROM: Denise Feiber
DATE: August 7, 1996
SUBJECT: Notes from the July 30, 1996 Public Meeting in Culebra

Project Name:
Public Meeting to Present the
Draft Final Engineering Evaluation/Cost Analysis (EE/CA)
Former Culebra Island Naval Facility

Time and Date of Meeting:
7:00 - 10 PM
July 30, 1996

Location of Meeting:
Culebra Municipal Building

Government Attendees:
-Col. Fowler, Commander, Antilles Office of the Corps of Engineers, Jacksonville District
-Elsa Jiminez, Public Affairs Officer, Antilles Office of the Corps of Engineers, Jacksonville District
-Alfonso O'Neil, Project Engineer, Antilles Office of the Corps of Engineers, Jacksonville District
-Roland Belew, U.S. Army Engineering and Support Center, Huntsville (USAESCH)
-Karl Blankenship, USAESCH
-Sam Sung, USAESCH

Contractors:
-Mark Bagel, ESE
-Jeff Bleke, Ellis Engineering
-Bill Brindle, EOD
-Denise Feiber, ESE
-Dottie Fuller, Quantitech

Notetaker:
Denise Feiber, ESE
These notes are the recollections of the notetaker. They are not meant to serve as a formal record of the meeting.

Meeting Summary:

1900 hours

Public arriving, signing in and reviewing displays of fact sheets, maps and videotape of field effort.

1930 hours

Introduction by Elsa Jiminez in spanish and english. She explains that the meeting will be bilingual and asks for patience because it may take a little longer. She also informs public that they will have 30 days to respond to the EE/CA report and the presentation conducted tonight.

She says that this will be an informal meeting and asks people to feel free to interrupt with questions and clarifications.

1945 hours

Greeting and introduction by the Mayor of Culebra in spanish. He states that the efforts to clean up Culebra are progressing and appreciates the involvement of the citizens and their attendance at the meeting.

1955 hours

Introduction by Col. Fowler, Commander of the Antilles Office of the Corps of Engineers. He introduces his staff (Elsa and Alfonso O'Neil) and explains that Alfonso will serve as an interpreter during the technical discussion. After a brief introduction in english, Col. Fowler reads a statement to the public in spanish. After this, in english he gives a brief status of the project and turns the meeting over to Roland Belew.

2010 hours

Roland Belew introduces himself and gives an overview (using overheads) of the structure of the Huntsville Division of the Corps of Engineers.

He then holds up the EE/CA report and explains the high level of effort that has gone into the field investigation and report preparation. He reminds the public that they have 30 days to review the report and to review and comment on the report.

Mr. Belew discusses the Archive Search Report and how it was used as the basis for identifying where field investigations were conducted. In addition, he discusses how information gathered from the previous Public Meeting held in the Fall of 1995 and other sources also contributed to the field investigation effort.

Mr. Belew then discusses the project schedule and explains how things are dependent upon funding.

Alfonso O'Neil translates in spanish the discussion about the schedule and reminds the public of the importance of their review and comment of the EE/CA report within 30 days.

2030 hours

Roland Belew introduces Mark Bagel of ESE. Mark thanks the residents of Culebra for their support during the field work. He introduces his team members. Mark starts the discussion of the field effort identifying the areas that were investigated. He started with the Northwest Peninsula and explained how it was divided in to two sectors, A (Flamenco Beach) and B.

A local resident asked a question about future land use, particularly in the Northwest Peninsula area. She made reference to a cafeteria that supposedly was being discussed near the beach.

The former discussion led to a lengthy discussion with U.S. Fish & Wildlife and DNER personnel about their understanding of why the investigation was being performed. The agencies understanding seemed to be that

the EE/CA would give a picture of the level of contamination of the Northwest Peninsula, so they could then decide what to do with the property in the future--perhaps clearing some area for use, if possible, to provide a safe environment for tourists and wildlife. The government and contractor's understanding seemed to be that the agencies did not want the area accessible to the public because of the fragile nature of the wildlife in the area. It was resolved that this issue needs to be presented in the form of a formal comment to the EE/CA report.

Roland suggested that a Town Meeting be held between DNER, U.S. Fish & Wildlife Service and the public to decide what the town wants related to future uses. Then the Corps should be informed of their decision.

Another discussion arose from a question from the public about why cost is an issue. The person said that it wasn't an issue when the bombs were dropped. They asked if it was too much to ask for the island to be cleaned up and returned to its original state, so it can be developed and made profitable for benefit to the local economy.

Roland gave an explanation of the FUDS Program in response to a question of how the media will respond to the information contained in the EE/CA. He said that the media were already aware of other FUDS sites around the country and that it shouldn't be a problem. He said it may even help, if the public is made aware through the media that the area is being cleaned up.

Mark's presentation continued and covered additional areas of investigation and what the findings were. He explained that to facilitate evaluation of risk-reduction alternatives, the former Culebra Island Naval Facility was subdivided into five Ordnance Operable Units (OOUs): OOU-1 Flamenco Beach; OOU-2 Northwest Peninsula; OOU-3 Cerro Balcon; OOU-4 Isla Culebrita; and OOU-5 other surrounding cays.

Roland described the plans to tour the water areas to begin an investigation of whether the water should be studied. The U.S. Navy will be included in the discussion. He said that they are finishing the land phase of the project and beginning evaluation of whether to study the water. He said a decision will be made by September regarding the investigation of the water.

2145 hours

Col. Fowler addressed the audience asking if their were any other questions. He summarized the meeting stating that we are here to help, so please comment in writing. He thanked everyone for attending and ended the meeting.

ATTACHMENT B

PUBLIC COMMENTS

DEPARTAMENTO DE RECURSOS NATURALES Y AMBIENTALES

Chester Fowler
Deputy District Engineer
for the Antilles
USACE
400 Ave. Fernández Juncos
San Juan, P.R. 00901

March 21, 1996

Dear Mr. Fowler:

In May of 1995, the USACE commenced search and removal operations for unexploded ordnance in the Flamingo sector of the island municipality of Culebra.

In view of the fact that the Puerto Rico Department of Natural and Environmental Resources has authorization for the installation of a series of mooring buoys in the coastal zones of this island, within National Permit No. 10, there is an urgent need to extend the search to include the coastal sea bottom, and that the viability of removal of any explosives encountered be evaluated.

For any additional information that might be required, you may communicate with me at 722-1429 or 724-8774 ext. 258.

We hope to count on your cooperation and support.

Sincerely,

Ramón Martínez
Director,
Bureau of Fisheries and Wildlife

cc. Ron Belen
USACE
P.O. Box 35807-4301
Huntsville, Alabama

Ave. Muñoz Rivera, Pda. 3 1/2, San Juan, P.R. / Apdo. 5887, Puerta de Tierra, P.R. 00906 / Tel. (809) 724-8774

DEPARTAMENTO DE RECURSOS NATURALES Y AMBIENTALES

August 6, 1996

COL. CHESTER FOWLER
DEPUTY DISTRIC ENGINEER
FOR THE ANTILLES
USACE
400 AVE. FERNANDEZ JUNCOS
SAN JUAN, P.R. 00901

Dear Col. Fowler

We thank you for your efforts in the evaluation and removal operations of unexploded ordnance on the island of Culebra. In reference to this subject, we sent you a letter on March 21 (see enclosure) of the present year, requesting extension of the search to the sea bottom and the possibility of removal of any underwater ordnance encountered.

During the public hearings celebrated in Culebra last July 30 you met Mr. Carlos M. Rodríguez, Project Leader, Mooring Buoy Project. Your conversation with him established the necessity to inspect the sea bottom around the proposed mooring sites which already have a National Permit No. 10. In preliminary inspections of those areas by your team, it was established that Mr. Rodríguez would send you the exact mooring buoy sites to be inspected (at least a perimeter of 20 feet around the proposed locations or any appropriate area that can be determined by the contractors or the navy experts). We are including with this letter a copy of those permits with their exact locations. Our mooring buoy project personnel offers to help you in this matter by making available a 26 foot boat and the R/V EOS, A 50' boat, that can help your team in their underwater work.

If you require additional information, please contact Mr. Rodríguez at 725-8619 or 724-8774 ext. 447 or fax 723-2805.

Cordially,

Ramón Martínez
Director
Bureau of Fisheries and Wildlife

Ave. Muñoz Rivera, Pda. 31/2 San Juan, P.R. / Apdo. 1827 Puerta de Tierra P.R. 00906 / TD (809) 724-8774

Ave. Muñoz Rivera, Plz. 31/2, San Juan, P.R. / Apdo. 5387, Puerta de Tierra, P.R. 00906 / Tél. (809) 724-8774

(OESTE)

1. 18 16. 820' N
   065 17. 195' W
ANCLA MR- IM 3.5'

2. 18 16. 750' N
   065 17. 240' W
ANCLA MR- 1M 3.5'

ENSENADA DAKITY

1. 18 17. 467' N

1. 18 20. 855' N
   065 14. 310' W
   HALAS PIN

CAYO TIBURON

1. 18 20. 665' N
   065 14. 310' W
   HALAS PIN

1. 18 17. 467' N
   065 16. 842' W
ANCLA MR - SRM 8'

2. 18 17. 447'N
   065 16. 833' W
ANCLA MR- SRM 8'

3. 18 17. 425' N
   065 16. 827' W
ANCLA MR- SRM 8'

CULEBRITA

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ANCLA MR- SRM 8'

2. 18 19. 148' N
   065 13 . 656'W
ANCLA MR- SRM 8'

3. 18 19. 128' N
   065 13. 673' W
ANCLA MR- SRM 8'

CAYO LUIS PENA

(OESTE)

1. 18 18. 350' N
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HALAS PIN

(SUR OESTE)

2. 18 17. 936' N
   065 19. 944' W
MR-1 3.5'

(SUR)

3. 18 17. 776' N
   065 19. 746' W
HALAS PIN

CULEBRA

(OESTE)

1. 18 19. 893' N
   065 19. 993' W
HALAS PIN

2. 18 19. 814' N
   065 19. 946' W
HALAS PIN

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CAYO YERBA

(NORESTE)

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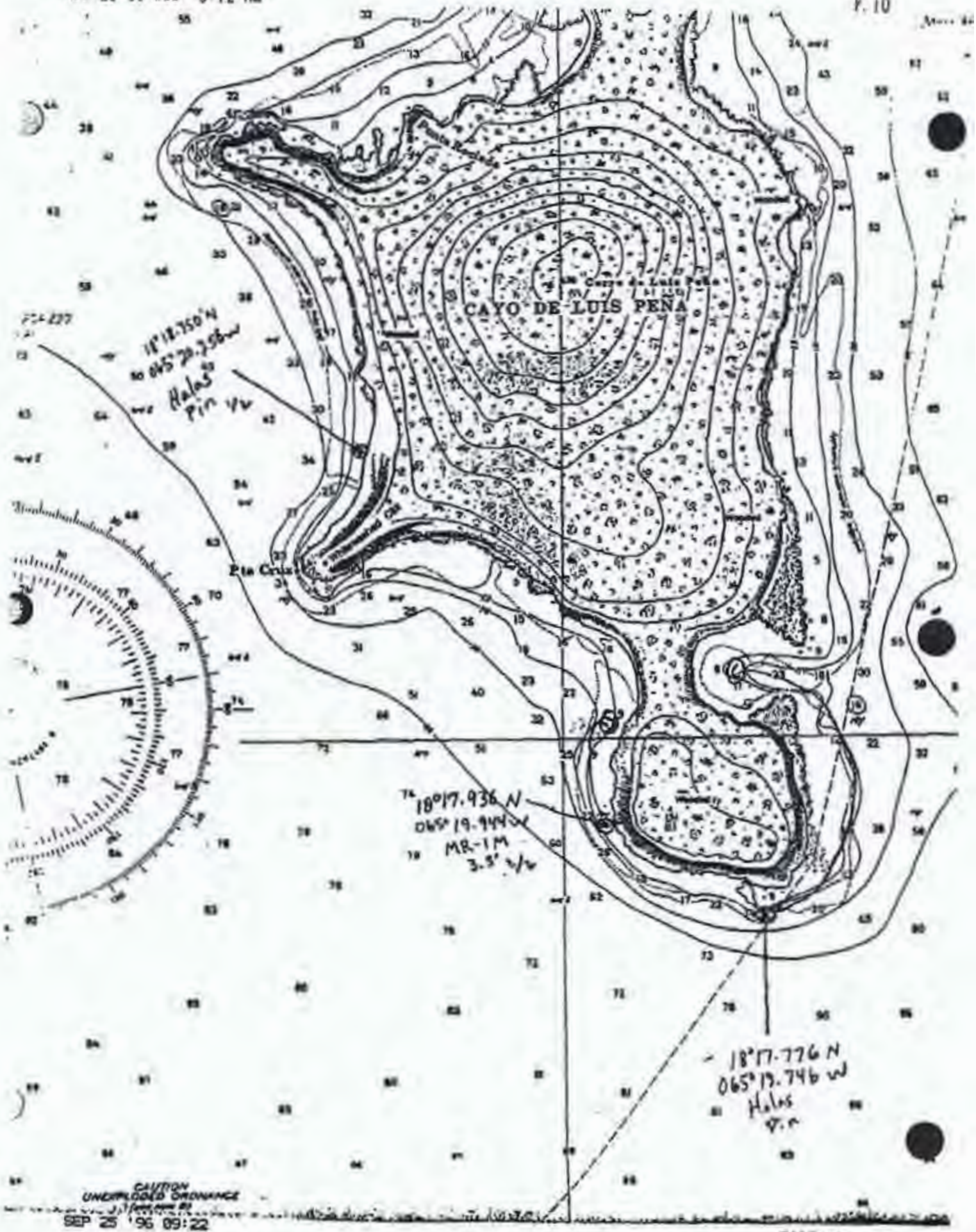
HALAS PIN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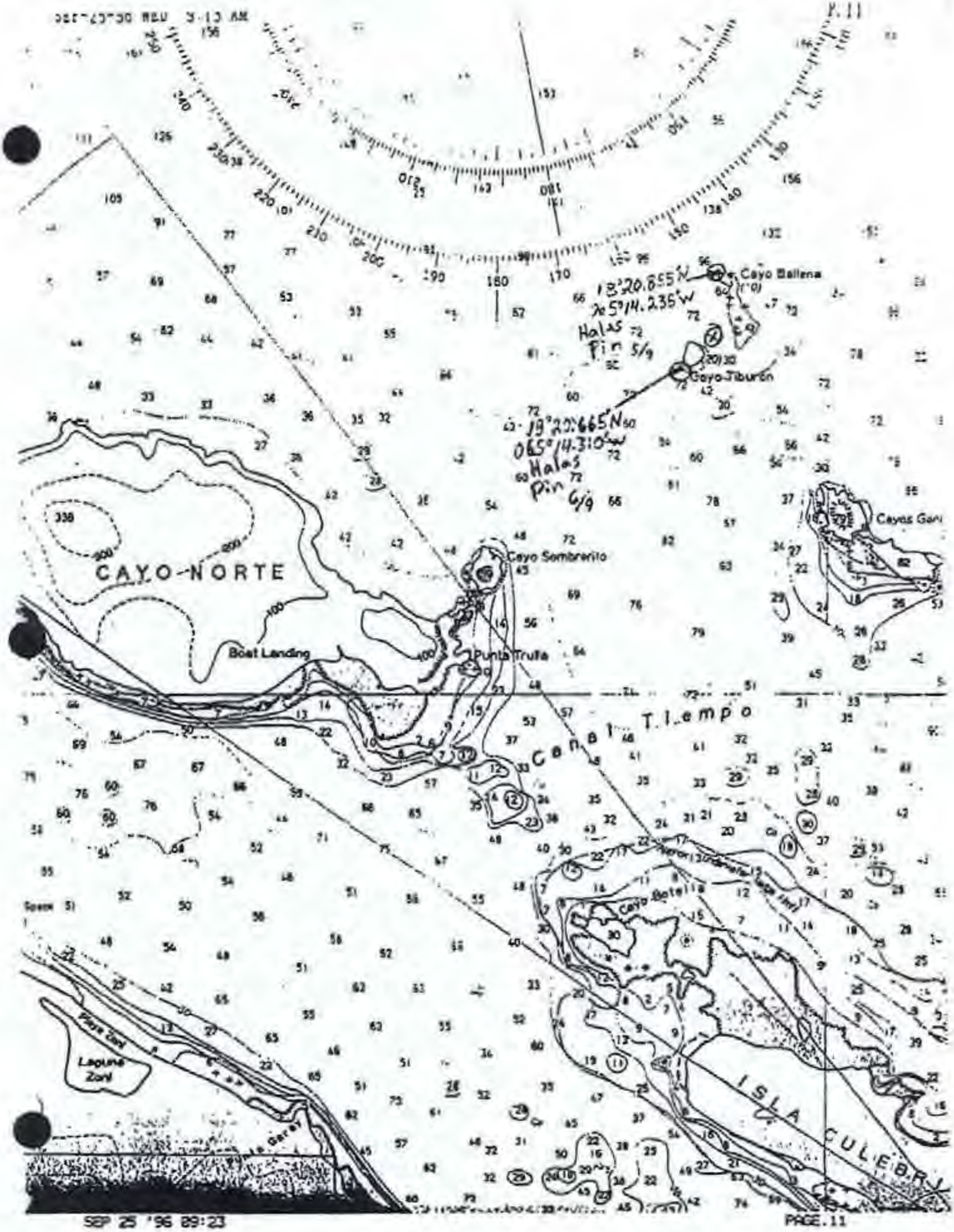
Halos
4.5'
CAUTION
UNEXPLODED ORDNANCE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Cayo Tiburon
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Halas
Pin 6/9
Cayos Gari
CAYO NORTE
Cayo Sombrerito
Boat Landing
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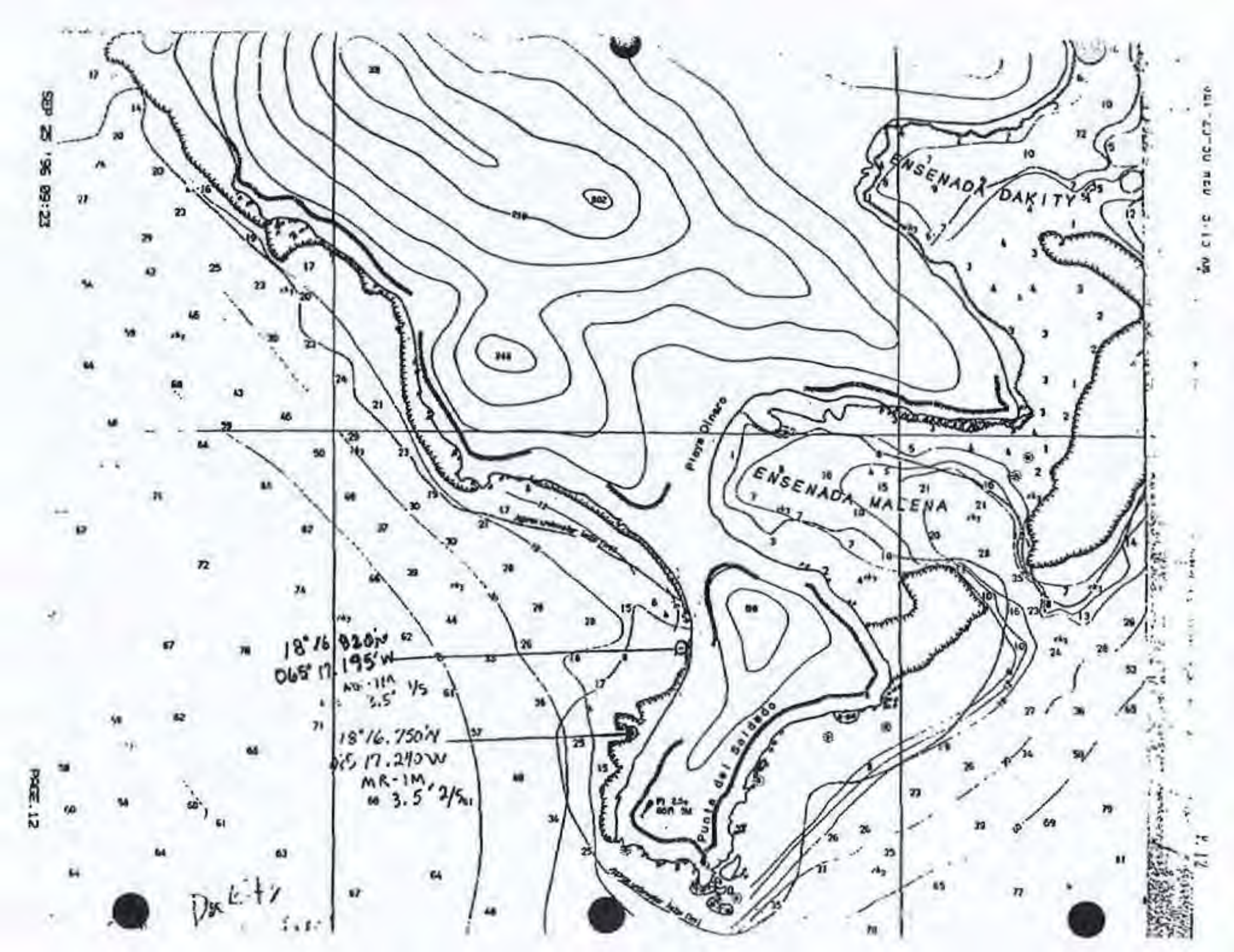
Cayo Botella
Laguna Zoni
Playa Zoni
ISLA CULEBRA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ENSENADA MALENA
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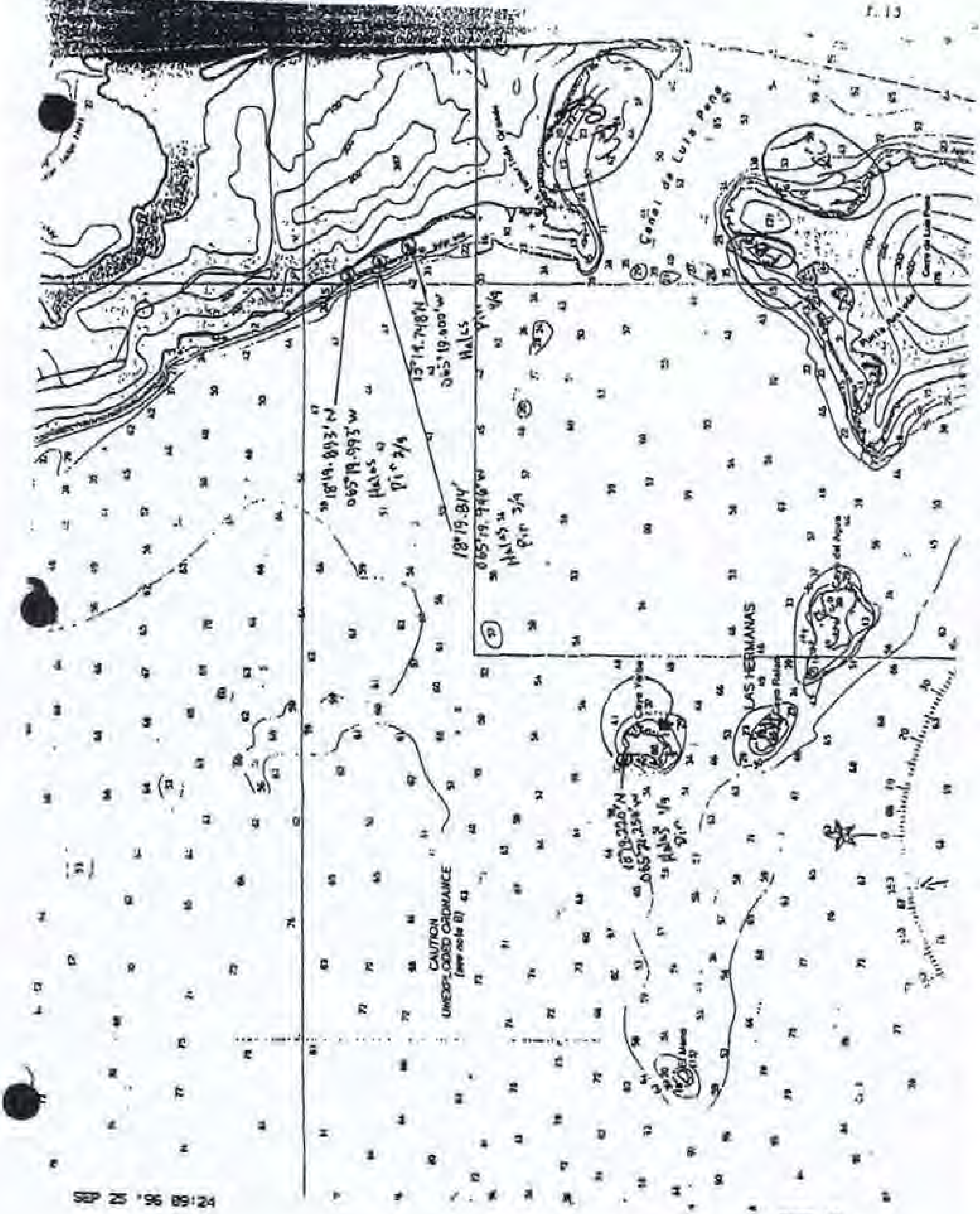
Canal de Luis Peña
LAS HERMANAS
CAUTION
UNEXPLODED ORDNANCE
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Pic 3/4
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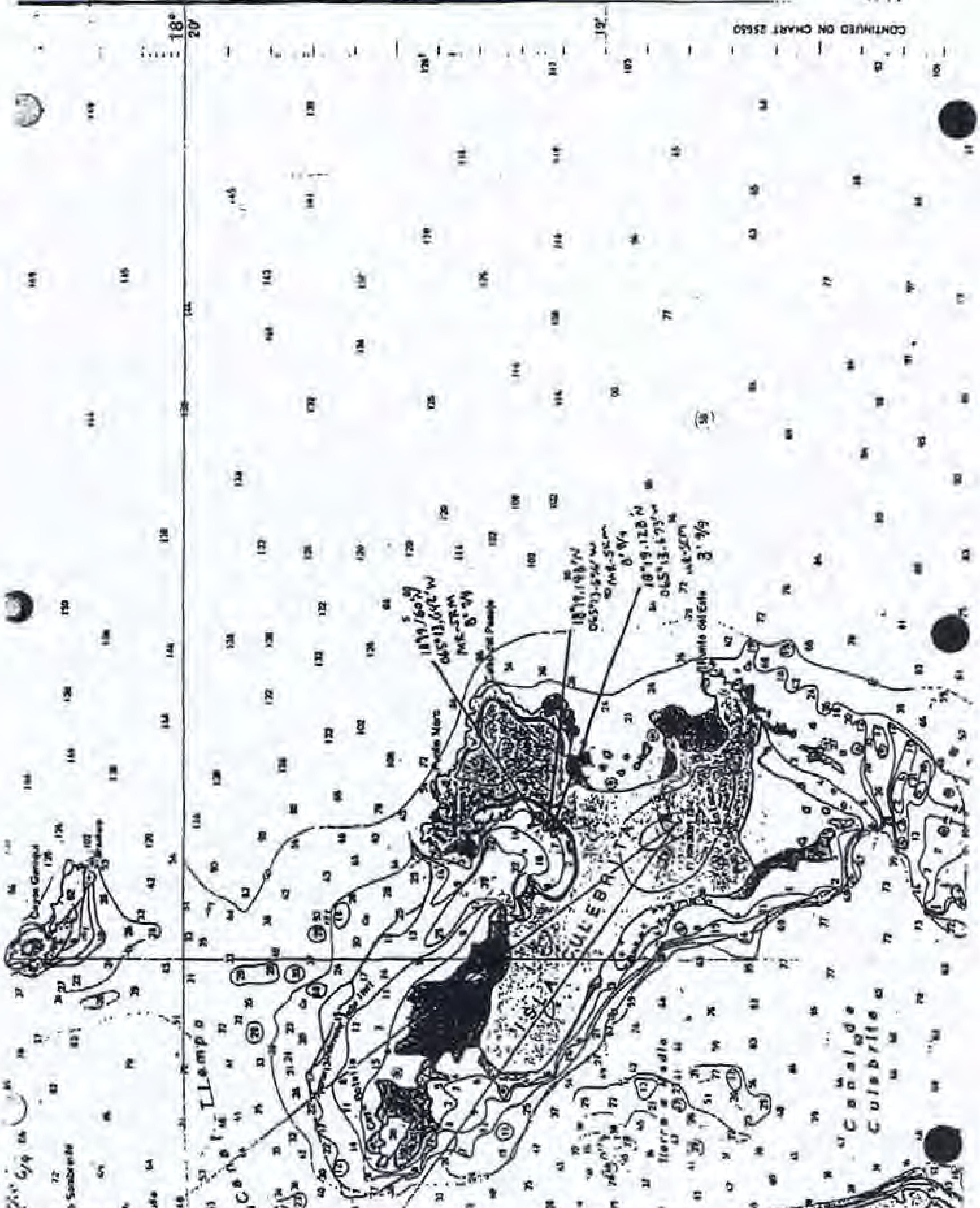

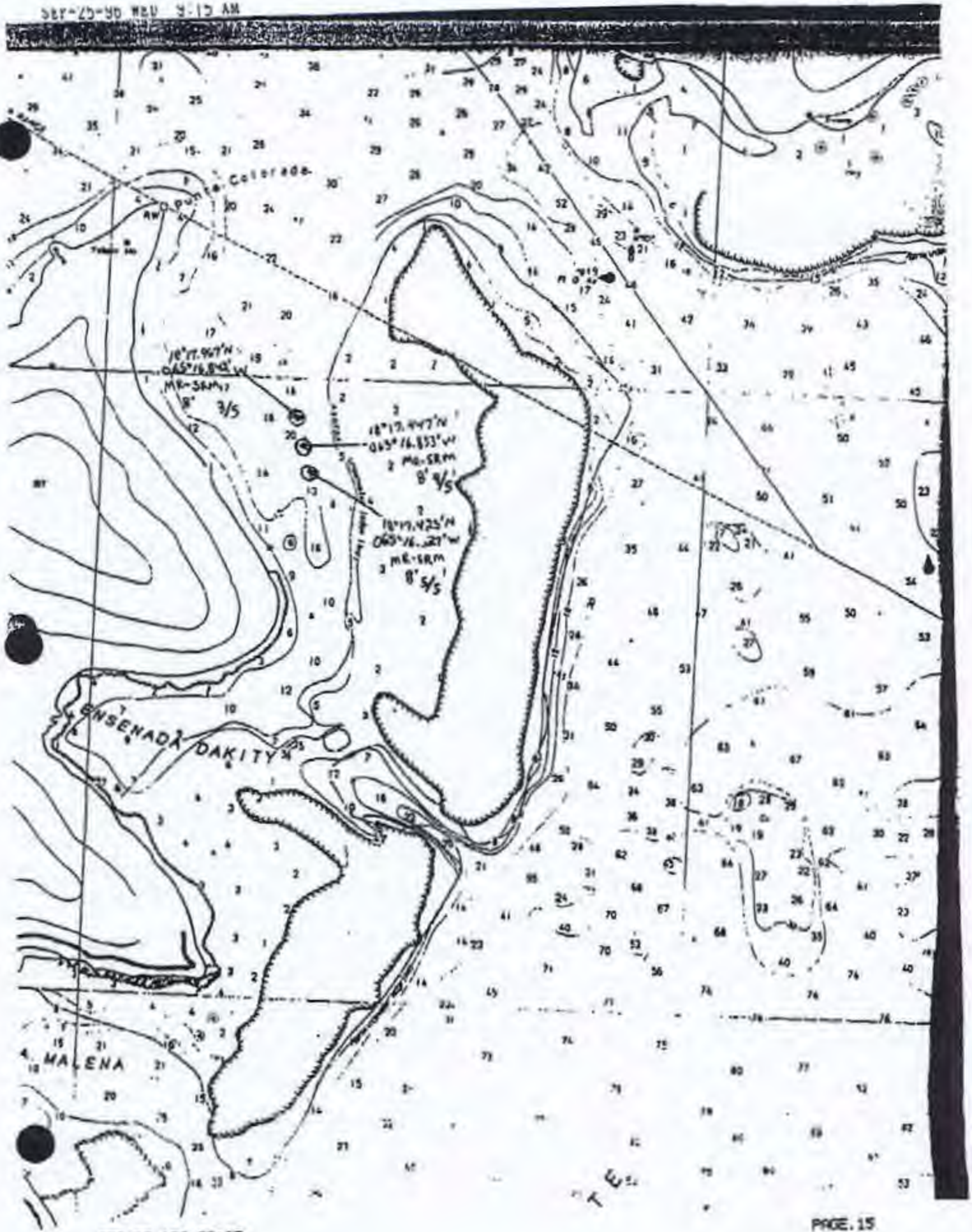
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MR-58RM
8' 3/5
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18°17.925'N
065°16.821'W
MR-58RM
8' 5/5
ENSENADA
DAKITY
MALENA

Juan J. Romero
P. O. Box 184
Culebra, P. R. 00775-0184

August 19, 1996

Lt. Col. Chester D. Fowler
Deputy District Engineer for the Antilles
US Army Corps of Engineers
400 Fernandez Juncos
San Juan, P. R. 00901-3299

Dear Mr. Fowler:

In reference to the Engineering Evaluation and Cost Analysis on the possible removal and/or risk attenuation of the unexploded ordnance left behind by the U. S. Navy in Culebra, discussed on July 30, 1996, I would like to add the following comments.

In my opinion, the people of Culebra is expecting a complete removal of all unexploded ordnance and any other material considered to be hazardous to the public. This is based on the contention that the problem was created by the Navy and not by us, and that we should not be left holding the bag. Of course, the reasoning is also based in not knowing the facts and details of what would entail a complete cleanup.

Your report provides five alternatives that applied to different contaminated areas based on a specific rationale. This is very well and good if the alternatives are applied on a short term basis. But what happens on a long term basis? For example, if Alternative 2 is applied to the Northwest Peninsula, how long will be fenced-off to the public? Will it ever be cleared of any hazards?

Ever since the Navy left Culebra we have been banned from our land by the Fish and Wildlife Service and the Department of Natural Resources on the basis that they are trying to protect the environment and the endangered species. You are now giving them another excuse to keep the public out of those lands.

We do not think that the land use rationale or the cost should be a determining factor on weather the unexploded ordnance should be removed or not, without the people of Culebra getting something in return. Right now the Fish and Wildlife Service is hampering the Municipality's effort in getting jurisdiction over the former Navy Observation Post. Right now, the Fish and Wildlife Service is hampering our efforts to bring a water pipeline from the main island, that would bring life to a thirsty population.

The fact is that the people of Culebra is being held hostage by

the Fish and Wildlife Service and the Department of Natural Resources. Any additional restrictions will definitely hamper the growth and development of the tourism industry, the only industry that we foresee that can provide jobs and security for our people.

There have been enough accidents in Culebra related to naval operations, for us to be in any way reluctant to accept restrictions in order to save lives and even the endangered flora and fauna. We also like to conserve and preserve our land and our habitats. But we also came to the brink of extinction when the Navy tried to get us off this island. Right now, we only depend on our natural resources which we treasure very much.

If the recommendations in this report are finally applied, I believe that considerations should be taken in manner that a complete clean-up can be foreseen for the future. In twenty-two years nobody has been killed or maimed because of the present situation. If a complete clean-up is not in anybody's plans or the money is not available, then we ought to keep playing the "Russian roulette", until someone does get killed or maimed.

I am enclosing an article published in the Culebra Calendar, a local bilingual monthly "newsletter", which will probably give you a better insight of what has been the situation.

Cordially yours,

Juan J. Romero

The "OP"
By: Juan Romero

The Flamingo Peninsula extends from the beautiful Flamingo Beach to Molinos Point. It had been bombarded and shelled by ships and airplanes from the thirties up and until 1975 when the U. S. Navy left Culebra.

The shelling and bombing runs were controlled from the Observation Post on top of Flamingo Point and it could be seen when the shells and bombs exploded on the targets, on the groves that would be set on fire when they were dry; on the beaches, on the sand, and on the sea. Many a times a strayed bomb or shell would fall on other areas and sprayed fragments in places where miraculously no one ever died or got hurt.

It was not that way in April 1948 when an airplane from the aircraft carrier Tarawa dropped two bombs by mistake on the Observation Post blowing it up to pieces and killing nine officers. Luckily none of the culebrans that used to work or frequently visited the Observation Post got hurt in such tragic accident.

The "Observation Post", the "OP" as it became known to the culebrans, became a common name as Flamenco, Verdun or Tampico. It also became a paternalistic symbol. A symbol of authority to whom permission had to asked for everything. Everything that was done in Culebra revolved around the OP and around "Lower Camp" where other naval facilities existed and where the Navy Yardmen that looked after the navy properties used to live.

To go to the beach at Flamingo people had to wait until the maneuvers had stopped, ask permission to go to the beach or do it behind the Navy's back. To go fishing, the fishermen had to be aware of the "shooting days" and the notices to the people that were posted in strategic places on the Island. Even the arrivals and departures of ships and aircraft was controlled by the OP. In all, the life of the culebrans was controlled from the OP. There was very little that could be done about it. The Navy was in charge in Culebra.

A big party was thrown on Flamingo Beach on October 15, 1975 to celebrate the Navy's departure from Culebra. No one was looking from the OP. At last the OP was not controlling the life of the culebrans. The Navy dismantled the power generators, the antennas, the radios and all of the equipment that could be used in some other place. The OP was abandoned.

Little by little the vandals began stealing and destroying what was left. The toilets and wash basins were torn from the walls just to be smashed against the floor. The electrical wiring and other metals were taken out to be sold, and whatever was left that did not have any value was plainly destroyed. Even though this acts of vandalism were vicious and stupid, maybe there was

no other reason than to get even with the Navy. Maybe no one realized the value that this property might have had for Culebra and the culebrans.

To try to make good what had been made wrong for forty years, an agreement was made between the Government of Puerto Rico and the Department of Interior to divide and turn over the land that belong to the Navy in such a way and in a manner that would be protected from uncontrolled and excessive development. Conservation and preservation was the only thing thought of at the moment. Nothing was ever given to the culebrans nor compensation given for having been forgotten and abandoned since the beginning of the century.

From a total of 1,712 acres of land the Federal Government retained 776 acres for the Fish and Wildlife Service. To the Government of Puerto Rico were transferred 936 acres for passive recreational and conservation purposes. Much of the land under the Department of Natural Resources Department have been taken over by squatters and as to the rest of the land nobody seems to know what to do about it. The land that has been utilized for housing development in Culebra had to bought back by the Government of Puerto at market value, from the same Federal Government that had expropriated or acquired the land at bargain prices.

The Navy retained 87 acres of land at Flamingo Point where the former Observation Post was located, for the purpose of setting up a radio relay station, a project that has never materialized.

On the proposal for the disposition and administration of the excess lands declared by the Navy in Culebra it was never contemplated that Flamingo Point would be turned over to the Fish and Wildlife Service. However, sometime in 1984 the Navy extended a five year lease on the property to the Service, which has been renovated for the same period of time ever since. Apparently the Service is expecting that the Navy will eventually transfer the property to them in its entirety. It should be pointed out that apart of the 776 acres that the Service was given, it kept whatever it had before including the 282 acres in the Island of Culebrita.

Despite the fact that the Navy has on many occasions expressed the intention of permitting the use of the OP facilities by the Municipality of Culebra, that has yet also to materialize. Since the Service is holding a lease for five years on the property, the only thing that the Service can do is to "sub-lease" the property to the Municipality for the same period of time, which does not provide sufficient time for any type of development and in effect maintains the property in a "status quo".

The Fish and Wildlife Service has expressed on many occasions that it does not have the intention or the money the repair or maintain the structures that comprise the OP facilities. Based on

the above, they decided to lease from the Government of Puerto Rico through the Culebra Conservation and Development Authority four acres of land for fifty years at the Lower Camp site and on which the new Service's facilities have been constructed. At no time has the Service mentioned the OP nor has suggested any type of arrangement with the Municipality in return for the contract they got in November of 1981 from the Government of Puerto Rico.

The Municipality of Culebra has approached the Service on the disposition of the OP, without getting a clear response from the Service on the subject. Based on information given by the Service, they have apparently made a petition to the Navy to separate the OP structures from the rest of the land so that the Navy could in turn lease the facilities to the Municipality for a longer period of time. Apparently the Navy has denied that petition.

In the meantime, the Municipality of Culebra cannot make use of the Observation Post and the facilities keep deteriorating and falling apart. On the one side the Fish and Wildlife Service is not apparently satisfied with what it previously had, the 288 acres in Culebrita, and the 778 acres that were transferred to them. It also wants the 87 acres at Flamingo Point. On the other side, apparently the U. S. Navy would prefer that the Observation Post be destroyed and lost rather than see it utilized by the culebrans.

The Government of Puerto Rico ought to say something about it!

08/27/11 10:46

PUERTO RICO ELECTRIC POWER AUTHORITY

San Juan, Puerto Rico

FAX (787) 289-4890

PLANNING & RESEARCH DIVISION

August 21, 1996

Mr. Roger Fitzpatrick
U.S. Army Engineering Division
CEHND-PM-CT
P.O. Box 1600
Huntsville, AL 35807-4301

Dear Mr. Fitzpatrick:

The Puerto Rico Electric Power Authority (PREPA) has been interested in the activity (EE/CA) supervised by the USACE towards evaluation of the potential cleaning from the presence of military unexploded ordnance and explosives, on the Culebra archipelago located on the eastern portion of Puerto Rico.

As part of the available information on this cleanup activity, we make reference to the "Draft Final Engineering Evaluation/Cost Analysis Former Culebra Island Naval Facility Culebra Island, Puerto Rico", prepared by "Environmental Science & Engineering, Inc." of Gainesville, Florida, July 1996. Of the whole area, we are more interested in the Flamenco Peninsula, the northeastern portion of Culebra Island, which seems to be the most heavily pounded portion of the Culebra military training area.

On the other hand, we foresee the Flamenco Peninsula as a very attractive site for wind energy development in complete harmony with the present wildlife reserve use of said parcel. If we obtain the rights to use those lands for a wind generation farm, the only portion of land required would be the upper ridge that runs from the South (Playa Flamenco) to the North (Punta Molinos). These have an approximate length of 8,800 ft. A narrow service road (could be a dirt road) is required along which the wind turbines would be deployed. The wind project would consist of 22-30 units, depending on the final spacing between units, as determined by the standard wind assessment studies required for all wind projects.

The unexploded explosives issue will be most related to the 4-5 ft. deep trench to be excavated for the underground MV electrical connection between the units. It is also related to the

SENT BY: 8-30-96 ; 12:19 ;

foundations required for each wind turbine. If lattice towers are used, the foundations will require four reinforced concrete caissons, poured in place, and with a length of 7.6 M on a 7.4 M square. In the case of tubular towers placed in soil of less than good mechanical properties, each turbine foundation would require eight piles placed some 12 M below the surface. It is evident that an explosives free strip of land is required before the construction of said foundations.

At present, the EE/CA evaluation referenced above does not give us any clue on the feasibility and associated costs of an explosives detection and cleaning program, as required for a wind generation project with the characteristics already described. It would be very helpful for PREPA to obtain some comments to this end in the final version of the above referenced report.

Thank you very much for your attention to this matter.

Truly yours,

Carlos R. Díaz R., Engr.
Technical Advisor on
Generating System Projects

c. Eng. Luis E. Cruz Bermúdez, P&R PREPA
Mr. Casárao Nieves, ER-NAVSTAT
Mr. Robert Bridgers, USACE-JAX
✓Ms. Elsa Jiménez-Del Pilar, USACE-SJ

OPEN LETTRR
P. O. Box 189
Culebra, P. R. 00775-0189

August 24, 1998

Lt. Col. Chester O. Fowler
Deputy District Engineer for the Antilles
US Army Corps of Engineers
400 Fernandez Juncos
San Juan, P. R. 00901-3299

Dear Mr. Fowler:

Reference is made to the Engineering Evaluation and Cost Analysis studies made on the possible removal and/or risk attenuation of the unexploded ordnance left behind by the U. S. Navy in Culebra, as discussed on July 30, 1998.

We, the people of Culebra, expect a complete removal of all unexploded ordnance and any other material considered to be hazardous to the public. This is based on the contention that the problem was created by the Federal Government and not by us. In other words, if the Federal Government (U. S. Navy) created the problem, it is the Federal Government's responsibility to clean up the mess.

We the undersigned, citizens and residents of Culebra, demand that serious consideration be given to a complete removal of all unexploded or hazardous material from the island of Culebra. Should this not be possible on a short term basis, then the people of Culebra should be guaranteed and assured that a complete removal will be made in the near future.

Signed,

PRESIDENT CULEBRA FOUNDATION

PRESIDENT CITY COUNCIL

PRESIDENT OF ASEC

BORN IN NORTHWEST PENINSULA

EX-MAYOR OF CULEBRA

BORN IN NORTHWEST PENINSULA

BORN IN NORTHWEST PENINSULA

FACSIMILE TRANSMITTAL HEADER SHEET

COMMAND/ OFFICE	NAME/ OFFICE SYMBOL	OFFICE TELEPHONE NO. (AUTOVON/Comm.)	FAX NO. (AUTOVON/Comm.)
FROM: Alfonso O'Neill	CESAS-DS-CO-E	809-729-6880/6833	809-729-6281
TO: Mr. Sam Sang			

CLASSIFICATION	PRECEDENCE	NO. PAGES (Including this Header)	DATE-TIME	MONTH	YEAR	RELEASER'S SIGNATURE
Unclass		2	11:15 30	08	96	

REMARKS

Space Below For Communications Center Use Only

DA FORM 3918-R, JUL 90 DA FORM 3918-R, AUG 72 IS OBSOLETE USAPA V2.0

Sam: THIS LETTER WAS ACCOMPANIED with around 200 SIGNATURES FROM RESIDENTS. I'LL NOT FAXING THOSE SIGNATURE SHEETS.

Alfonso

SEP- 3-96 TUE 4:44 PM

August 26, 1996

U.S. Army Corps of Engineers
Antilles Area Office
Attn: E. Colón
400 Fernande Juncos Ave.
San Juan, Puerto Rico 00901-3299

Dear Sir:

I appreciate this opportunity to make comments on the Engineering Evaluation and Cost Analysis prepared by your Department in regard to munitions and explosives that remain on the island of Culebra. In July of 1972 the U.S. Navy declared excess its land (Excess Notices 2-N-PR-472 and 2N-PR- 472-A) to the General Service Administration. The Municipal Government and the people of Culebra have since asked that these lands be cleared of explosives for the enjoyment of all.

A Resolution by the Senate Committee on Interior and Insular Affairs of June 16, 1971 resulted in a study entitled "Culebra: A Plan for Conservation and Development" commonly referred to as the "Joint Report"; which was completed in October of 1973 and a document titled "Final Environmental Impact Statement" prepared in 1981, set agreements on best land use. The agreement transferred 776 acres to Fish and Wildlife Service, deeded 262 acres on Culebrita to the Government of Puerto Rico (with restrictions) and deeded 936 acres of excess Navy land to the People of Puerto Rico to be used for public recreation.

The community has waited almost 100 years in vain with the hope that their rightful heritage be returned. When the Spanish Government colonized the island in 1887 they set aside these land as green areas where no trees were to be cut, this was necessary so as to attract rainfall; wildlife could prosper and left open public land for everyone (see Archivo General de P.R., Fondo: Obras Públicas; Leg. B, Exp. 37. Año 1879).

Culebra turned-out to be of significant stratelgical importance in the defense of the Panama Canal it was the most easterly property in the U.S. until 1917 when the U.S. Virgin Island where acquired. Ships could intervene against the thereat of the Germans an Japanese as early as 1906, that's when lands were transferred to the Department of Defense. In the 1930's deep port bases were setup on the other islands and Culebra was only used for gunnery practice until 1975.

These excess lands are the "ecological wonder" of the island. Where exceptionally beautiful landscape, fish, birds, plants and humans all lived together and each was an integral part of each other. Today the recommendations made by your Department is that these lands are highly contaminated with explosives that institutional controls, that means fenced-off, be imposed on most of the lands. Only a small portion of Flamenco Beach, OOU-1, which in its most part has already been cleared, was recommended for clearance for use. The only other area to be cleared is Cerro Balcón, OOU-3, which is private property and where no UXOs were found. Of the 2,227 acres declared excess only less than 200 remain open to Culebrans, of which 155 were bought by the Municipality, 19 are the airport and a few on Flamenco Beach.

The report prepared by the Corps of Engineers is visibly influenced by another federal agency. It disrespectfully taints Culebrans as egg-poachers and destroyers of nature. In the F.E.I.S. agreement signed by the Department of the Interior and the government of P.R., specifically on page 12, clearly states that lands under FWS were to remain closed until the ordnaces were removed. Today the Corps will only try to have the assignment of monies (3.3 millions) allotted to fence-off these lands even more from Culebrans and the world.

The only petition by the Municipal Government, which is included in the report, request that all ordnances both on land and sea be removed as soon as possible. This request by the Mayor Speaks for me, my family and all Culebrans that share a common purpose and have lived on the island for more than just a few years. We sincerely hope the Corps will do every thing in its power to undo a wrong, that money will soon be found and our lands decontaminated.

Cordially yours,

Carmen Georgina González
Box 615
Culebra, P.R.

SEP- 3-96 TUE 4:45 PM

ESTADO LIBRE ASOCIADO DE PUERTO RICO
GOBIERNO MUNICIPAL DE CULEBRA
OFICINA DE Eco-Turismo
APARTADO 189
CULEBRA, PUERTO RICO 00775
TEL. 742-3521

27 de agosto de 1996

Hon. Teniente Coronel Chester Fawler
Cuerpo de Ingenieros del Ejército
de los Estados Unidos de America
400 Fernándes Juncos
San Juan, Puerto Rico

Estimado Teniente Coronel Fowler:

Para responder al Informe donde solicitan Recomendaciones sobre el Proyecto de Limpieza de municiones y explosivos a realizar por el Cuerpo de Ingenieros en Culebra, señalo lo siguiente:

Número Uno: No cabe otra recomendación sobre la descontaminación de municiones y explosivos en Punta Molino y toda la Isla de Culebra que no sea la alternativa número cinco, incluyendo la limpieza y remoción total de Municiones y cualquier artefacto explosivo realizando todas las actividades necesarias para localizar excavar y remover la totalidad de explosivos detectados.

Número Dos: La Junta de Residentes de Culebra y el Gobierno Municipal, estamos trabajando para convertirnos en un Municipio Autónomo. Nuestro interés y propósito es que esta región se convierta en el futuro en una área provista de mecanísmos para proteger el ambiente.

SEP- 3-96 TUE 4:46 PM

Cuerpo de Ingenieros
Ramón Feliciano

Integrar el territorio y sus Recursos Ecológicos como parte de nuestro potencial de Desarrollo Recreativo Turístico.

Número Tres: Que se se devuelva la tierra despojada por la Marina de los Estados Unidos de America, a los antiguos y legítimos dueños que fueron desalojados en el 1934, estos tuvieron que abandonar el área perdiendo sus viviendas y su agricultura, ya que se vieron obligados todos los residentes a la perdida de sus títulos de propiedad obtenidos desde hacia más de treinta (30) años.

Entiendo que en nuestro Sistema Democratico como versa en la Constitución, no se puede discriminar contra ningún ciudadano por distintas razones. en Culebra se discrimina continuamente contra nuestros ciudadanos por las Fuerzas Armadas de los Estados Unidos y otras Agencias Federales, las cuales anteponen el medio ambiente a la salud, desarrollo y progreso de los ciudadanos norteamericanos que residimos en el territorio de Culebra.

Sugiero que se le dé pensamiento a mi recomendación y si es necesario información adicional estoy en su mejor disposición o en la Oficina del Alcalde, Honorable Anastacio Soto Ayala.

Cordialmente,

Ramón Feliciano Encarnación
Ex.Alcalde y Presidente de
Comisión de Eco-turísmo
Municipio de Culebra

August 27, 1996

Para responder al Informe donde solicitan Recomendaciones sobre el Proyect de Limpieza de municiones y explosivos a realizar por el Cuerpo de Ingenieros en Culebra, senalo lo siguiente:

Numero Uno: No cabe otra recomendacion sobre la descontaminacion de municiones y explosivos en Punta Molino y toda la Isla de Culebra que no sea la alternativa numero cinco, incluyendo la limpieza y remocion total de Municiones y cualquier altefacto explosive realizando todas las actividades necesarias para localizar excavar y remover la totalidad de explosivos detectados.

Numero Dos: La Junta de Residentes de Culebra y el Gobierno Municipal, estamos trabajando para convertirnos en un Municipio Autonomo. Nuestro interes y proposito es qee esta region se convierta en el futuro en una area provista de mecanisimos para proteger el ambiente. Integrar el territoria y sus Recursos Ecologicos como parte de nuestro potencial de Desarrollo Recreativo Turistico.

Numero Tres: Que se se devuelva la tierra despojada por la Marina de los Estados Unidos de America, a los antiguos y legitimos duenos que fueron desalojados en el 1934, estos tuieron que abandonar el area perdiendo sus viviendas y agricultura, ya que se vieron obligados todos los residentes a la perdida de sus titulos de propoedad obtenidos desde hacia mas de treinta (30) anos.

Entiendo que en uestro Sistema Democratico como versa en la Constitucion, no se puede discriminar contra nunbun ciudadano por distintas razones. en Culebra se discrimina continuamente conta nuestros ciudadanos por las Fuerzas Armadas de los Estados Unidos

In response to report containing recommendations for the Cleanup Project of munitions and explosives to be carried out by the Corps of Engineers in Culebra, I note the following:

Number One: There is no better recomendation for the decontamination of munitions and explosives in Punta Molino and all of the island of Culebra besides number five. This alternative includes the cleanup and total removal of munitions and other explosive artifacts, considering all of the activities necessary to locate, excavate and remove all of the explosives detected.

Number Two: The Residents Association of Culebra and the Municipal Government are working together to convert to an Autonomous Municipality. Our main interest and purpose is that this region eventually be converted into a designated area for the protect of the environment and to integrate the territory and its ecological resources as part of our potential for turistic and recreational development.

Number Three: We ask that any land conficated by the U.S. Navy, be retured to the original and legitimate owners who were evicted in 1934. These residents had to abandon the area, losing their homes and farms, as a result of being formed to give up their titles of ownership, which they had held for over thirty (30) years.

I understand that in our democratic system, as is noted in the constitution, there should be no discrimination against any citizen for any reason. In Culebra there is continual discrimination against our citizens by the Armed Forces of the United States and other

y otras Agencias Federales, las cuales anteponen el medio ambiente a la salud, desarrollo y progreso de los ciudadanos norteamericanos que residimos en el territorio de Culebra.

Sugiero que se le de pensamiento a mi recomendacion y si es necesario informacion adicional estory en su mejor disposicion o en la Oficina del Alcalde, Honorable Anadtacio Soto Ayala.

Federal Agencies. These agencies prefer the environment to the health, development and progress of the northamerican citizens that reside in the territory of Culebra.

I ask that you consider my recomendation and if you need additional information I am at your disposal in the Office of the Mayor, the Honorable Anasticio Soto Ayala.

ESTADO LIBRE ASOCIADO DE PUERTO RICO
GOBIERNO MUNICIPAL DE CULEBRA
OFICINA DEL ALCALDE
CULEBRA, PUERTO RICO 00775

28 de agosto de 1996

Hon. Teniente Coronel Chester Fowler
Cuerpo de Ingenieros del Ejército
de los Estados Unidos de América
400 Fernández Juncos Ave.
San Juan, Puerto Rico

Estimado Teniente Coronel Fowler:

Hemos estudiado y analizado cuidadosamente el contenido sobre el Informe de Evaluación Final referido por el Cuerpo de Ingenieros de los Estados Unidos de América, en el cual se nos recomiendan cinco (5) alternativas relacionadas con las municiones y explosivos encontrados en el Territorio de Culebra, para que hagamos nuestros comentarios.

En el informe sometido a nuestra consideración y análisis se exponen cinco (5) alternativas para que escojamos una o aquellas que entendamos podían ser de beneficio para ambas partes.

Hemos escogido la número (5) por entender que es la única que le hace justicia a nuestra gente luego de setenta y un año (71) de la marina estar usando a Culebra como targeta de tiro al blanco.

Reconocemos la importancia que el Gobierno Federal le ha dado a este asunto, específicamente en todos y cada uno de los lugares que han sido identificados en dicho informe.

Hon. Tnte. Coronel Chester Fowler
Alcalde de Culebra

Las prioridades de remoción total de estos artefactos para los residentes de Culebra, son las mismas en todos y cada uno de los lugares que se identifican en el informe donde acuden cientos de personas en busca de paz y esparcimiento.

Habremos de aceptar la número cinco (5) como única alternativa, por entender que la Constitución del Congreso de los Estados Unidos de América, le garantiza a todos sus ciudadanos el derecho de disfrutar de su vida y su bienestar social, los residentes de Culebra tenemos ese derecho como ciudadanos de esa gran nación.

Sabemos que la eliminación de todo artefacto explosivo es un proyecto costoso, pero no hay peor gestión que la que no se hace.

Les agradezco su interés así como de todo y cada uno de su personal que de una forma u otra se han interesado en este asunto en beneficio de ambas partes.

Con gracias anticipadas por la atención que pueda ofrecernos en este aspecto tan necesario para nuestro pueblo, quedo.

Cordialmente,

Anastacio Soto Ayala
Alcalde

August 28, 1996

Hemos estudiado y analizado cuidadosamente el contenido sobre el Informe de Evaluacion Final feferido por el Cuerpo de Ingenieros de los Estados Unidos de America, en el cual se nos recomiendan cinco (5) alternativas relacionadas con las municiones y explosivos encontrados en el Territorio de Culebra, para hagamos nuestros comentarios.

We have carefully studied and analyzed the contents concerning the Information of Final Evaluation referred by the U.S. (Army) Corps of Engineers, in which they recommend to us five (5) alternatives concerned with the munitions and explosives encountered in the Territory of Culebra, about which we are commenting.

En el informe sometido a nuestra consideracion y analisis se exponen cinco (5) alternativas para que escojamos una o aquellas que entendamos podian ser de beneficio para ambas partes.

In the report sumbitted for our consideration and analysis we are given five (5) alternatives in order to chose at least one that could be of benifit to everyone.

Hemos escogido la numero (5) por entender que es la unica que le hace justicia a nuestra gente luego de setenta y un ano (71) de la marina estar usando a Culebra como targeta de tiro al blanco.

We have chosen number five (5) because we understand what is the only one which does justice to our people, after seventy one (71) years of the navy using Culebra for target practice.

Reconocemos la importancia que el Gobierno Gederal le ha dado a este asunto, sespecificamente en todos y cada uno de los lugares que an side identificados en dicho inorme.

We recocognize the importance that the Federal Government has placed on this subject, specifically in each and every of the locations that have been identified in this report.

Las prioridades de remocion total de estos artefactos para los residented de Culebra, son las mismas en todos y Cada uno de los lugares que se identifican en el informe dende acuden cientos de persones en busca de paz y esparcimiento.

The priorities set for the total removal of these artifacts for the residents of Culebra, have been the same in each and every one of the loactions that have been identified in the report. These locations are frequented by hundreds of people who come to in search of peace and relaxation.

Habremos de aceptar la numero cinco (5) como unica alternativa, per entender que la Constitucion del Congreso de los Estados Unidos de America, le garantiza a totos sus ciudadanos el derecho de disfrutar de su vida y su bienestar social, los residentes de Culebra tenemos ese detecho como ciudadanos de esa gran nacion.

We shall accept number five (5) as the only alternative. It is understood in the Constitution of the Congress of the United States of America, which guarantees to all of its citizens the right to happines of their life and social well being, that the residents of Culebra have this right as citizens of this great nation.

Sabemos que la eliminacion de todo artefacto explosivo es un proyecto costoso, pero no hay peor gestion que la que no se hace.

Les agradezco su interes asi como de todo y cada uno de su personal que de una forma u otra se han interesado en este asunto en beneficio de ambas partes.

Con gracias anticipadas por la atencion que pueda ofrecernos en ests adpecto tan necesario para nuestro pueble, quedo.

We know that the elimination of all explosive artifacts is an expensive project, but there is no worse measure than to do nothing.

We appreciate your interest as well as each and every one of your staff that in one form or another have been involved in this matter of benefit to everyone.

We thank you in anticipated for the considration given us in this aspect that is so important for our people.

8/29/96 10 Nov 96

Teniente Coronel Chester Fowler: Please excuse the informality but you asked that this be received by 8/30 & Hurricane Edouard, Hurricane Fran & probably Tropical Storm Gustav are keeping us pretty much confined to our boat & I haven't been able to seek out a typewriter. As soon as these "situations" have been resolved, we will resend a more formal letter with appropriate copies.

Here is what Capt. Ken Brighton requested me to send:

1) The potential danger of the unexploded ordinance is a dark cloud over an otherwise beautiful island - it is too severe to ignore.

2) Culebra: resident population is increasing rapidly; it is also becoming a more active tourist attraction especially for campers, hikers & aquatic activities. The potential for a tragic explosion increases proportionately on both the main island as well as neighboring Culebrita.

3) The island has accommodated the military in past years & the least the military can do is leave the islands in a safe condition after their departure - anything less is not in the American tradition.

Sincerely,

Marsha Brighton
for Ken Brighton
P.O. Box 415
Culebra, PR 00775

Culebra Island Small Inns Association
Asociacion de Pequeñas Hospederias

29 de agosto de 1996

Teniente Coronel Chester Fowler
Cuerpo de Ingenieros del Ejército
400 Fernández Juncos
San Juan, P.R. 00901

Estimado señor Fowler:

Como usted sabe nuestra isla ha sido utilizada por la Marina de los E.U. desde el 1902 periódicamente como un juego de guerra y también se utilizó para ejercicios de tiro al blanco desde el 1936.

Hemos tolerado estos ejercicios por elinterés de la Defensa Nacional, ya que como ciudadanos americanos entendemos y compartimos las mismas obligaciones que tienen otros ciudadanos en sus respectivas comunidades para el entrenamiento de nuestras fuerzas militares.

En la isla de Culebra nos sentimos muy orgullosos de haber participado activamente en beneficio de la seguridad nacional de todos los ciudadanos americanos, no importando su origen o lugar de residencia.

Hoy dieciocho años después de nosotros haber cumplido nuestra misión como comunidad nos encontramos que parte del acuerdo tomado en 1978 no ha sido completado, ya que para verguenza de todos los ciudadanos americanos todavía no se han decontaminado las costas de nuestra isla bonita que sirvieron como blancos de tiro a la Marina de E.U.

1978 Senador Henry Jackson
Washington State
Pres. Com. Fuerzas Armadas
Senado de los E.U.

> "We celebrate the fact that the Federal Government has delivered upon on its solom commitment to the people of Culebra as a Naval firing range has come to an end. The sacrifice of the people of Culebra have made for so many years in the interest of the National Security is overe.

Los residentes de la isla de Culebra merecen, al igua que los residentes de otras comunidades, aspirar lo que nuestro Presidente Bill Clinton llama el "American Dream" que no es otra cosa que el derecho constitucional a una mejor calidad de vida.

1978 Senador Henry Jackson
Senate Residential

"Culebra is now a symbol of a new day in the future, national decisions which affects the commonwealth, will not be made until the views of the Puertorican people have first been heard. This new resolution of the problem of Culebra makes the first step towards a new relationship between the Federal government and the commonwealth.

This new relationship will recognize the needs and desires of the Puertorican people to have a greater control over their destiny. Our goal must be that every able body person shall have an opportunity to do a day's work at a good job and a decent wage and live in a good neighborhood and enjoy a good environment."

En estos momentos Culebra atraviesa por unos de sus años más difíciles ante los efectos causados, no solo por los huracanes, sino también por decisiones tomadas por distintas agencias federales y estatales que tronchan nuestro derecho a desarrollarnos como pueblo y crear los empleos necesarios. Tenemos ante nosotros cinco alternativas que serán presentadas al pueblo de los E.U. a través del Congreso de los E.U.

Si verdaderamente quisiéramos hacerle justicia a este pueblo después del sacrificio por lo cual fue sometido, existiría una sexta (6) alternativa, la número 6 que recogería la número cinco (5) más crearía una afirmación al compromiso del gobierno Federal del 1978 al derecho del pueblo de Culebra a una mejor oportunidad a un buen trabajo y disfrutar de un mejor ambiente, mediante elincentivo y ayuda a un desarrollo planificado como todos aspiramos para nuestra juventud. Derecho que se nos ha tronchado en beneficio de la Seguridad Nacional.

Espero que esta iniciativa sea el comienzo de una nueva actitud por parte de todas las agencias Federale y Estatales para el beneficio de nuestra juventud y una mejor calidad de vida que todos los ciudadanos americanos merecemos.

Nuestra asociación ha aceptado responsablemente el reto que se nos ha brindado de proveer los empleos necesarios que nuestra juventud reclama, pero para poder lograrlo necesitamos acciones positivas que nos permitan hacerlo a través del ecoturismo

Atentamente,

Gabriel Cánovas

P.O. Box 183. Culebra Island. P.R. 00775 (809) 742-3525

August 29, 1996

Como usted sabe nuestra isla ha sido utilizada por la Marina de los E.U., desde el 1902 periodicamente como un juego de guerra y tambien se utilizo para ejercicios de tiro al blanco desde el 1936.

As you know, our island has been utilized periodically by the U.S. Navy since 1902 for war games and also has been utilized for target practice exercises since 1936.

Hemos tolerado estos ejercicios por elinteres de la Defensa Nacional ya que como como cuidadanos americanos entendemos y compartimos las mismas obligaciones que tienen otros ciudadanos en sus respectivas comunidades para el entrenamiento de nuestras fuerzas militares.

We have tolerated these exercises in the interest of national defense. As northamerican citizens we understand that we share the same obligations that other citizens have in their respective communities for the training of our military forces.

en la isla de Culebras nos sentimos muy orgullosos de haber participado activamente en beneficio de la seguridad nacional de todos los ciudadanos americanos, no importandos su origin o lugar de residencia.

On the island of Culebra we feel very proud to have actively participated for the benefit of national security of all the american citizens, reguardless of their orgin or place of residence.

Hoy dieciocho anos despues de nosotros haber cumplido nuestra mision como comunidad nos eoncontramos que parte del acuerdo tomado en 1978 no ha sido completado. ya que para verguenza de todos los ciudadanos americanos todavia no se han decontaminado lad costas de nuestra isla bonita que sirvieron como blancos de tiro a la Marina de E.U.

Today, eighteen years after our mission has been completed, we find that part of our agreement made in 1978 has not been fulfilled. To the emparresment of all American citizens, the coasts of our beautiful island, which have served as target practice for the U.S. Navy, have still not been decontaminated.

... quote in english from Senator Henry Jackson ...

.... quote in english from Senator Henry Jackson ...

Los residentes de la isla de Culebra merecen, al?gua que los residentes de otras comunidates, aspriar lo que nuestro Presidente Bill Clinton llama el "American Dream" que no es otra cosa que el derecho constitucional a una mejor calidad de vida.

The residents of the island of Culebra deserve the same as the residents of other communities. To aspire to what president Bill Clinton calls the "American Dream" which is nothing else than our consitutional right for a better quality of life.

... quote in english from Senator Henry Jackson ...

.... quote in english from Senator Henry Jackson ...

En estos momentos Culebra atravieza por unos de sus anos mas dificiles ante los efectos causados, no colo por los huracanes, sino tambien por decisiones tomadas por distintas agencias federales y estatales que tronchan nuestro derecho a desarrollamos como pueble presentadeas al pueble de los E.U. a traves del Congreso de los E.U.

Currently Culebra is going through its most difficult years as a result of all the effects caused, not only by hurricanes, but also the decisions made by distant state and federal agencies denying us our rights to develop as a community and to create necessary employment. We have before us five alternatives that will be presented to the citizens of the United Stated through the U.S. Congress.

Si verdaderamente quisieramos hacerle justicia a este pueblo despues del sacrificia por cual fue sometido, existiria una sexta (6) alternativa, la numero 6 que recogeria la numero cinco (5) mas crearia una afirmacion al compromiso del gobierno Federal del 1978 al derecho del pueble de Culbra a una mejor oportunidad a un buen trabajo y disfrutar de un aspiramos para nuestra juventud. Derecho que se nos ha tronchado en beneficio de la Seguridad Nacional.

If we truly wish to make justice to our citizens after the sacrifice they were submitted to, there would exist a sixth alternative. Number 6 would follow in the steps of number five (5) amd it would confirm the commitment made by the Federal government in 1978 to the right of the citizens of Culebra to a better opportunity for a good job and to enjoy a clean environment. Through the incentive and help of a planned development like we all aspire for our youth. This right of ours has been trampled for the benefit of national security.

Espero que esta iniciativa sea el comienzo de una nueva actitud por parte de todas las agencias Federales y Estatales para el beneficio de nuestra juventud y una mejor calidad de vida que todos loes ciudadanos americans merecemos.

I hope that this initiative may be the begining of a new attitude on the part of all the Federal and state agencies for the benefit of our youth and a better quality of life that all american citizens deserve.

Nuestra asociacion ha aceptado responsablemente el reto que se nos ha brindado de proveer los empleos necesarios que nuestra juventud reclama, pero para poder lograrlo necesitamos acciones positivas que nos permitan hacerlo a traves del ecoturismo.

Our association has responsibly accepted the challenge that has been offered us to provide the necessary employment that our youth demand. But in order to be able to achieve this we need positive action that will permit us to make it happen through ecotourism.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Caribbean Field Office
P.O. Box 491
Boqueron, Puerto Rico 00622

September 6, 1996

FAX TRANSMITTAL	# pages 2
To Lt. Colonel Fowler	From Jorge Saliva
Dept./Agency CoE	Phone # 851-7297
Fax # 721-6879	Fax # 851-7440

Mr. Roland G. Belew, Project Manager
U.S. Army Corps of Engineers
Explosive Ordnance Engineering
Huntsville Division
MCX and Design Center
P.O. Box 1600
Huntsville, Alabama 35807-4301

Re: DERP-FUDS 102PR006802, Culebra Island

Dear Mr. Belew:

We have the following comments in response to the Draft Final Engineering Evaluation for the removal of unexploded ordnance at the former Culebra Island Naval Facility in the Municipality of Culebra, Puerto Rico.

We recommend Alternative 4 for sectors OOU-1 to OOU-5 because it is compatible with the management and future recreational and public use of the areas, while at the same time ordnance and explosives (OE) would be removed to a depth that takes into account the expected land use and overall health and safety of the community of Culebra.

OOU-2, OOU-4 & OOU-5 form part of the Culebra Islands National Wildlife Refuge. The selection of Alternative 2 for parts of the Refuge will severely limit not only public use of the area but access by Service and research personnel, and restrict the Service's ability to manage the habitat for wildlife. Routine patrols and seabird studies are carried out on a regular basis, thus making vehicular access (including anchoring offshore) necessary. Since listed species and migratory birds do occur in many of the selected sectors, it is necessary for Service personnel to access such areas to manage the recovery and well-being of such species. Alternative 2 would prevent that.

Land management practices that involve the use of fires to control vegetation, and prepare the area for nesting seabirds, have been curtailed by the presence of OE in the area. Construction of public access facilities to some areas in the form of trails, observation decks, and other recreational uses are currently planned. At least, a "safety corridor" (where OE have been removed) should be established for vehicular and pedestrian access to some locations. An educational program can then be incorporated to inform the public about the areas that are safe to access, and the danger of using areas not posted as safe for pedestrian traffic.

Although remote, some of the cays off Culebra (OOU-5) are easily accessible by boat and get quite a bit of public use. Some of these cays like Cayo Agua, Yerba, and Lobo have become favorite SCUBA diving spots for the island's developing tourism industry. Dive boats from Puerto Rico and Culebra visit these cays and anchor around them. Efforts to install permanent mooring buoys in the more heavily used cays have been hampered by the presence of underwater UXO, yet dive boats as well as Service boats continue to anchor around these same cays. Both the Commonwealth DNER and NGO groups such as Coralations and Reefkeeper have an interest in installing mooring buoys in these areas. Some form of protocol or guidelines should be developed for the installation of permanent moorings for these cays.

We believe that a comprehensive OE removal plan addressing all concerns regarding the future land use of these areas, as well as the natural resources found in the selected sites, can be prepared with the input from the general public, government agencies, and private groups.

Thank you for the opportunity to comment on this action, and please do not hesitate to contact Dr. Jorge E. Saliva or Mr. Félix López from our staff at (787) 851-7297, if you have any questions.

Sincerely,

Susan Silander

Susan Silander
Acting Field Supervisor

jes
cc: Teresa Tallevast, FWS, Culebra
Lt. Fowler, COE, San Juan
EQB, San Juan
José L. Chabert, DNER, San Juan

United States Department of the Interior
FISH AND WILDLIFE SERVICE

6 September 1996

U.S. Army Corps of Engineers
400 Fernandez Juncos
San Juan, P.R. 00901
ATTN: Lieutenant Colonel Chester Fowler

RE: DERP-FUDS I02PR06802, Culebra Island

Dear Lieutenant Colonel Fowler,

Thank you for the opportunity to review the Draft Final Engineering Evaluation/Cost Analysis (EE/CA) for Culebra Island. Please refer to the attached map for further explanation of our comments. All comments are based on your recommendations and Table 2-6 OECert Predicted Exposures which indicate that, in some of the cases, Alternative 4 is equal to Alternative 5 in risk reduction effectiveness.

We concur with your recommendation of Alternative 4 for sectors OOU-1 and OOU 3. OOU-3 has undergone mechanical clearing in the past and may experience more clearing in the future if building of homes or agricultural practices occur.

The following comments refer to sectors OOU-2 Northwest Peninsula Sector B, OOU-4 Isla Culebrita, and OOU-5 Other Surrounding Cays, all of which are contained within the Culebra National Wildlife Refuge (Culebra NWR).

We consider Alternative 2 to be insufficient due to current use and future possibilities for increased levels of public use, as well as habitat management considerations. Ideally, Alternative 5 is preferred for all sites (or Alternative 4 if risk reduction is equal) to eliminate possible exposure to the public. Although current access to the areas might be relatively low when compared to Flamenco Beach, the implementation of institutional controls to limit access (Alternative 2) has been proven to be ineffective in the past. The public currently accesses all sites where signs are posted and/or with knowledge of the presence of unexploded ordnance. Hiking along the shoreline of Peninsula Flamenco also occurs.

Service personnel, researchers, volunteers, and the public access all areas. Increased public use of Isla Culebrita and the Northwest Peninsula Sector B is being considered as part of a Public Use Management Plan for Culebra NWR. Also, desirable resource management practices, including controlled burns to control vegetation and reduce fire threats, as well as fire fighting, have been impossible to conduct on Northwest Peninsula and the offshore cays due to the presence of unexploded ordnance. To adequately manage flora and fauna of the area, the explosives must be removed.

Fencing of Culebrita and other offshore cays is not appropriate, as we prefer to maintain the integrity of the natural appearance of the areas, and fencing could also jeopardize seabirds which utilize the sites. Fencing currently in place on Peninsula Flamenco Sector B is utilized to prevent livestock from passing onto refuge property and we do not foresee the need to expand its use, other than possibly at the Sooty Tern nesting area on Punta Molinos to prevent passage of feral dogs and cats into the nesting colony.

Degrees of vegetation clearance during ordnance removal, as well as manipulation of wetlands, seabird roosting and nesting habitat, and sea turtle nesting beaches will be priority issues for special consideration in all sectors requiring review by USFWS and DNER. Impacts of total vegetation removal and habitat recovery rates will be evaluated.

The following addresses specific requests regarding designated sites:

DOU-2 Northwest Peninsula Sector B: Requested Action: Alternative 5 (or Alternative 4 if risk reduction results are equal). Minimal Action: Combination of Alternatives 3, 4, and 5 to include the following: total clearance of the access road out to the Punta Molinos helicopter pad with, at the minimum, 30 meter clearance on each side of the road; total clearance of road extensions as indicated on map; total clearance of the area south of the Punta Noroeste Sooty Tern nesting area as indicated on map; total clearance of beach accesses and beaches as indicated on map.

DOU-4 Isla Culebrita: Alternative 5 or Alternative 4 if equally effective.

DOU-5 Other Surrounding Cays: Alternative 5 or Alternative 4 if equally effective.

We concur with FWS Caribbean Field Office in the need to formulate a mooring plan in waters throughout the archipelago, and support a cooperative effort among agencies, private groups, and the general public to implement a comprehensive plan addressing all concerns.

We also recommend that a follow-up meeting be held among agencies and the public involved in the review of the draft report before a final report is issued by the Corps. Ordnance removal in the Culebra archipelago is an extremely sensitive and complex issue that should be given further consideration including open discussion of comments before a final determination of actions is issued.

If we can be of further assistance in this matter, please contact Mr. Shaw Davis at (787) 851-7258 or me at (787) 742-0115.

Sincerely,

Teresa Tallevast

Teresa Tallevast
Acting Project Leader, Caribbean Islands National Wildlife Refuge

ATTACHMENT C

USAESCH RESPONSE LETTER

DEPARTMENT OF THE ARMY
HUNTSVILLE DIVISION, CORPS OF ENGINEERS
P.O. BOX 1600
HUNTSVILLE, ALABAMA 35807-4301

REPLY TO
ATTENTION OF

October 29, 1996

Design Management
Group

SUBJECT: Incorporation of Public Comments into Final Engineering Evaluation and Cost Analysis (EECA) Report on Contract DACA87-92-D-0018, Delivery Order 27, for Culebra Puerto Rico

Mr. Mark Bagel
Environmental Science and Engineering
P.O. Box 1703
Gainsville, Florida 32602-1703

Dear Mr. Bagel:

Due to Hurricane Hortense the finalization of subject report has been delayed. We now have all comments from the public and local agencies. There will be changes in alternatives recommended per discussions with LTC Fowler and yourself. The following recommendations should be made to the final report with the Action Memorandum reflecting the same:

OOU1-Flamenco Beach:-	Clearance for Use,	$1,536,000
OOU2-Northwest Peninsula:-	Clearance for Use,	$2,944,880
OOU3-Cerro Balcon:-	Clearance for Use,	$ 297,740
OOU4-Isla Culebrita:-	Surface Clearance,	$ 678,400
OOU5-Other Surrounding Cays:-	Surface Clearance,	$ 315,160

Please provide one final copy of the report to this office for back check prior to reproduction of all final reports. Also provide the draft Action Memorandum per the above changes.

If you believe certain comments included herein constitute a change to your contract, do not proceed with performance. Instead, formally notify me of the basis of your position and await instructions. I may (1) confirm that it is a change, direct the mode of further performance, and plan for its funding; (2) countermand the alleged change; or (3) notify you that no

change is considered to have occurred. Proceeding with performance without first notifying me of your position will be at your own risk.

If you have any questions, please contact Mr. Roland Belew at commercial 205-895-1553.

Sincerely,

Lynda Bonds

Lynda Bonds
Contracting Officer

Copies Furnished:

Commander, U.S. Army Division, South Atlantic, ATTN: CESAD-PM-H (Ms. Sharon Ernst), 77 Forsyth St, Atlanta, GA 30335-6801
Commander, U.S. Army Engineer District, Jacksonville, ATTN: CESAJ-DP-I (Mr. Robert Bridgers), P.O. Box 4970, Jacksonville, FL 32232-0019
Commander, U.S. Army Corps of Engineer, Antilles Area Office ATTN: CESAJ-DE (LTC Chester Fowler), 400 Fernandez Junco Avenue, San Juan, Puerto Rico 00901-3299