



US Army Corps  
of Engineers  
San Juan District



Defense Environmental Restoration Program  
for  
Formerly Used Defense Sites  
Ordnance and Explosive Waste

# Archives Search Report

## FINDINGS

for

# Culebra Island National Wildlife Refuge

Culebra, Puerto Rico  
Project Number I02PR006802

February 1995



DEFENSE ENVIRONMENTAL RESTORATION PROGRAM  
for  
FORMERLY USED DEFENSE SITES

FINDINGS

ORDNANCE AND EXPLOSIVE WASTE  
ARCHIVES SEARCH REPORT  
FOR  
CULEBRA ISLAND NATIONAL WILDLIFE REFUGE  
CULEBRA, PUERTO RICO  
PROJECT NUMBER I02PR006802

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ORDNANCE AND EXPLOSIVE WASTE  
 ARCHIVES SEARCH REPORT  
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 CULEBRA, PUERTO RICO  
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1. INTRODUCTION

a. **Subject and Purpose**

(1) This report presents the findings of an historical records search and site inspection for ordnance and explosive waste (OEW) presence located at the Culebra Island National Wildlife Refuge, Culebra, Puerto Rico. See plate 1 for general location map. The investigation was performed under the authority of the Defense Environmental Restoration Program for Formerly Used Defense Sites (DERP FUDS).

(2) The purpose of this investigation was to characterize the site for potential OEW contamination, to include chemical warfare material (CWM). This was achieved by a thorough evaluation of historical records, interviews, and an on-site visual inspection.

b. **Scope**

(1) This ASR covers the entire land area of Culebra Island and the nearby keys, about 7,300 acres of land, and also includes 85,200 acres of the surrounding water. The only property not included is the 87.5 acres still owned by the Navy. The historical section covers the period from 1898 until gunnery exercises ended in 1975.

(2) This report presents the site history, site description, real estate ownership information, and confirmed ordnance presence, based on available records, interviews, and the site inspection. It further provides a complete evaluation of all information to assess potential ordnance contamination where actual ordnance presence has not been confirmed.

(3) For the purpose of this report, OEW is considered unwanted and abandoned ammunition or components thereof, which contains or contained energetic, toxic, or radiological materials, and was manufactured, purchased, stored, used, and/or disposed of by the War Department/Department of Defense.

## 2. PREVIOUS INVESTIGATIONS

### a. **Preliminary Assessment**

A Preliminary Assessment of the Culebra Island National Wildlife Refuge was conducted by the Jacksonville District (CESAJ) in 1991 (see document E-1). That report qualified 2660 acres as FUDS-eligible and recommended referral to CEHND for an evaluation of confirmed ordnance contamination. This assessment did not include the entire 92,500 acres addressed in this ASR. Table 2-1 represents an overview of the PA phase.

Project Number	DERP Category	Present Phase	Comments	Location
I02PR006802	OEW	SI	Ordnance or explosive contamination	See INPR (doc E-1)
	OEW	IRA	Interim removal	Flamenco Beach, 3 acres, see plate 6
I02PR006801	HTRW	SI	OSD Priority 2	Lower Camp see plate 8
	BD/DR	-	No projects recommended	

### b. **Other Investigations**

(1) In March 1993, Wayne Galloway of CEHND and Robert Bridgers of CESAJ visited Culebra in connection with proposed interim removal at the Flamenco Beach campground area. The contractor for the interim removal, MTA, developed a site specific work plan and some useful OEW information was obtained from this document (ref B-112).

(2) Although the team found that other government agencies had done archeological and environmental studies of Culebra (refs B-87 & B-111), none provided any significant information on OEW. Other relevant information has been extracted from these reports and is included in the appropriate sections.

### 3. SITE DESCRIPTION

#### a. Existing Land Usage

(1) Although this site has been named Culebra Island National Wildlife Refuge, the name is misleading. There is Culebra Island, and there are about 20 keys surrounding Culebra Island. Most of these keys are owned by the Fish & Wildlife Service (FWS). Total land area is about 7300 acres, and the FWS owns only about 1500 of these acres. The rest is owned by the Commonwealth of Puerto Rico (about 1200 acres), primarily the Department of Natural Resources (DNR), and private owners (about 4600 acres). DNR owns all water from the high tide mark out to 9 miles. See table 3-1 for a breakdown of areas and plate 9 for ownership of the entire site.

(2) The Findings and Determination of Eligibility (FDE) dated 24 Dec 1991 qualified 2660 acres as eligible for consideration under DERP-FUDS (see document E-1). However, upon completion of the site visit and review of historical material from National Archives, it was determined that all of Culebra Island, all of the keys, and all of the water within the boundary of the Naval Defensive Sea Area should be considered a FUDS site. Document L-12 shows the limits of the Naval Defensive Area, and the boundary is also shown on plate 1. This will be further explained in section 5.

**TABLE 3-1  
CURRENT LAND USAGE**

Area	Topo Name	Other Names	Documented Former Usage	Current Usage	Current Owner**	Approximate Size, Acres
A-1	Isla Culebrita	Culebrita	OP, torpedos, & strafing	Wildlife refuge	FWS	266
A-2	-	Culebrita North Bay	Strafing	Water & beach	FWS, DNR	100
A-3	Cayo Botella	Ladrone Key	Aerial bombing & rockets	Wildlife refuge	FWS	3
A-4	Cayos Geniqui	Palada Keys	Aerial bombing & rockets, torpedoes	Wildlife refuge	FWS	4
A-5	Cayo Tiburon	Shark Key	Aerial bombing & rockets	Wildlife refuge	FWS	1
A-6	Cayo Ballena	Whale Rock	-	Wildlife refuge	FWS	1
A-7	Cayo Sombrerito	Pajarito Key	-	Wildlife refuge	FWS	1
A-8	Cayo Norte (eastern)	Northeast Key	Possible run-in line to Cayo Botella	Undeveloped 1 part-time resident	Juan de la Cruz Padron	254
A-9	Culebra Island (eastern)	-	-	Undeveloped several residences	DNR, FWS, & private	598

\*\* DNR owns all water from the high tide mark out to 9 miles.

**TABLE 3-1 (continued)**  
**CURRENT LAND USAGE**

Area	Topo Name	Other Names	Documented Former Usage	Current Usage	Current Owner**	Approximate Size, Acres
B-1	Cayo de Luis Pena	Luis Pena Key	OP, radar site, run-in line	Wildlife refuge	FWS	342
B-2	-	North Bay, Luis Pena Key	-	Water and beach	FWS & DNR	80
B-3	Cayo del Agua	Water Key, Agua Cay	Aerial bombing & rockets	Wildlife refuge	FWS	2
B-4	Cayo Yerba	Yerba Key	-	Wildlife refuge	FWS	3
B-5	Cayo Raton	Mono Cay	-	Wildlife refuge	FWS	3
B-6	El Mono	Roco Negra, Black Rock	-	Wildlife refuge	FWS	1
B-7	Cayo Lobo	Cross Key	Aerial bombing & rockets	Wildlife refuge	FWS	20
B-8	Cayo Lobito	-	Flight line approach marker	Wildlife refuge	FWS	7
B-9	Alcarraza	Fungy Bowl	Aerial bombing & rockets	Wildlife refuge	FWS	7
B-10	Los Gemelos	Twin Rocks	Aerial bombing, rockets, and missile	Wildlife refuge	FWS	2
B-11	Cayo Botijuela	Roca Lavador	-	Wildlife refuge	FWS	1

\*\* DNR owns all water from the high tide mark out to 9 miles.

**TABLE 3-1 (continued)**  
**CURRENT LAND USAGE**

Area	Topo Name	Other Names	Documented Former Usage	Current Usage	Current Owner**	Approximate Size, Acres
C-1	Flamenco Peninsula	Northwest Peninsula	Naval gunfire, aerial bombing & rockets, strafing	Wildlife refuge, dump undeveloped	FWS, DNR, private	572
C-2	Flamenco Beach	Playa Flamenco	Naval gunfire	Beach, hotel campground	DNR & private	25
C-3		Peninsula Shoreline	Naval gunfire	Wildlife refuge	FWS & DNR	15
C-4	-	Carlos Rosario Beach	-	Water & beach	FWS & DNR	100
C-5	Piedra Stevens	Roca Pilots, Pilot Rock	-	Wildlife refuge	FWS	2
C-6		All other area C	-	Water, dump, & undeveloped	DNR & private	8327
D	-	Mortar Range	-	Grazing	Private	80
E	-	Airfield rifle range	-	Housing & undeveloped	City & private	22
F	-	Southern rifle range	-	Mostly undeveloped some houses	DNR	43
G	-	Lower Camp	Navy & Marine base	FWS & DNR offices, freshwater plant, open	DNR	60

\*\* DNR owns all water from the high tide mark out to 9 miles.

**TABLE 3-1 (continued)  
CURRENT LAND USAGE**

Area	Topo Name	Other Names	Documented Former Usage	Current Usage	Current Owner**	Approximate Size, Acres
H	-	Lower Camp dumps	-	FWS & DNR offices	DNR	1
I	Cayo Matojo	Matojo Cay	-	Wildlife refuge	FWS	1
J		Navy gun sites (7 each)	Possible coastal defense batteries	1 known residence & unknown	FWS, DNR, & private	13.83
K	-	Mining West	Aerial mining range	Open water	DNR	2,438
L	-	Marine water minefield	-	Open water	DNR	142
M	-	Confirmed water	-	Fishing	DNR	419
N	-	All other water	-	Fishing & swimming	DNR	57,284
O	-	All other land	Possible Marine training & gun sites, possible Army gun sites, coaling station & unknown	Mostly undeveloped some houses	DNR, FWS, & private	4,764
P	-	Flamenco Point OP	not eligible for DERP-FUDS		Navy	87.5

\*\* DNR owns all water from the high tide mark out to 9 miles.

## **b. Climatic Data**

(1) Culebra has a tropical marine climate with year-round warm temperatures. The average daily temperature is about 80° Fahrenheit (F), with the summer months (May through October) being slightly warmer than the other months. The average maximum is about 86°, while the average minimum is about 74°. The lowest ever recorded was 60° in February of 1973, while the highest was 95° in July of 1969. Average water temperature is about 80°, with a yearly low of 77° and a high of 83°.

(2) The average yearly rainfall is 36 inches, ranging from a low of 16 inches in 1967 to the 59 inches recorded in 1942. The heaviest average rainfall occurs in October, May, September, and November, with August through November being the rainy season. The driest months are usually January through April. The greatest amount of rainfall ever recorded was 27 inches in May of 1979, while the least amount was 1/4 inch in March of 1958. In the summer months (May through November), the rainfall occurs more often in the form of brief showers. In the winter months, most of the rainfall from one or two prolonged major weather systems followed by extensive dry periods.

(3) The average annual humidity is about 73%, with a daytime average of about 65% and a nighttime average of about 80%. The most humid months are August through January, though the other months are only slightly lower in humidity.

(4) The prevailing winds blow from the east-northeast November through January from the east all other months. Average speed is 8 knots. The hurricane season lasts from June through November, with most storms occurring July through September. These storms form well east of the Caribbean and frequently track near Puerto Rico as they move westward. Severe hurricanes occur every 10 to 20 years. The worst hurricane in recent memory was Hugo, which struck in September of 1989, causing extensive damage to Culebra and all of Puerto Rico. The Roosevelt Roads Naval Station recorded an all-time high wind gust of 104 knots from this storm (refs B-107 & B-108).

## **c. Topography**

(1) Culebra Island and the surrounding keys exhibit a variety of topographic features. Culebra Island has sandy beaches, irregular rugged coastline, lagoons, coastal wetlands, steep mountains, and narrow valleys. Ninety per cent of the island is mountainous, and the level areas are primarily in the vicinity of the airport and the town center. The highest point on the island is Monte Resaca, which is about 630 feet high.

Most undeveloped areas are covered with vegetation ranging from moderate to extremely dense. Each area will be described separately in section 6.

(2) The three largest keys are Culebrita, Cayo Norte, and Luis Pena. These resemble Culebra in that they all have sandy beaches, rugged coastline, and gentle to steep hills. Vegetation ranges from moderate to extremely dense. The smaller keys are primarily solid rock, with sparse or no vegetation. A few of the smaller keys have tiny beaches, while most are rugged rock all around. Each key will be described separately in section 6 (refs B-91 & B-106).

#### **d. Geology and Soils**

(1) Culebra and the adjacent keys are underlain by volcanic and intrusive rocks of probable Upper Cretaceous age. Andesite lava and Andesite tuff are clearly dominant. Toward the north-central part of Culebra and on the east Cayo Luis Pena, the tuff and lava contain diorite porphyry inclusions. These volcanic rocks no longer exhibit porosity, due to compaction and the filling of pores with quartz and calcite. See document E-2 for a geological map of Culebra (ref B-87).

(2) Culebra has a limited variety of soils types, owing to its volcanic origin, small size, rugged terrain, and moderately uniform climate. Its total acreages consist of about 75% soils of the Descalabrado series, formed in slopes of 20% to 40%. The Flamenco Peninsula is totally of the Descalabrado series, which is well-drained with rapid runoff and moderate permeability. Generally, the soils are between 12 and 24 inches thick, with hard volcanic rock underneath. See document E-3 for a soil map of Culebra (refs B-87 & B-106).

#### **e. Hydrology**

(1) Fresh water has always been a scarce resource, as there are no major, permanently flowing streams on Culebra. Creeks and streams are intermittent and seasonal. Normally they are dry and only collect and drain runoff water during rainstorms. There are about a dozen natural springs and seeps, but they are only charged after particularly wet seasons. There are some wells 10-20 feet deep in areas away from coastal seepage, but these wells are high in chloride concentrations and salinity. Most of Culebra gets their fresh water from the desalinization plant the Navy installed at the Lower Camp (ref B-87).

(2) Culebra is separated from Puerto Rico by about 17 miles of the Vieques Sound. The waters surrounding Culebra to

the south are the Caribbean Sea, while the northern waters are considered the Atlantic Ocean. These warm, clear waters provide a home for a wide variety of sea life and attract scuba divers from all over the US.

(3) National Oceanic and Atmospheric Administration (NOAA) chart #25653 shows water depths averaging about 70 to 90 feet in the areas surrounding Culebra and the keys (see document L-8). However, there are some areas over 130 feet west of the Flamenco Peninsula and east of Cayos Geniqui. This chart also shows "Caution Unexploded Ordnance" in the northern and western areas. A local diving instructor said the bottom is mostly sand, which shifts to cover or uncover underwater objects. The US Geological Survey has an underwater mapping project of the Culebra area tentatively scheduled for 1995.

(4) Tidal data for Culebrita Island shows that tides are chiefly diurnal. The difference in height between mean higher high water and mean lower low water is 1.1 feet. The mean tide level is .6 feet. Daily tidal information for 1994 can be found at document E-4 (ref B-104).

(5) Tidal currents for the Vieques Sound (southwest of Culebra) flow twice a day. The maximum ebb direction is 355 degrees true at .6 knots, while the maximum flood tide is 180 degrees at .4 knots. Daily current information for 1994 can be found at document E-5 (ref B-105).

#### **f. Natural Resources**

(1) Ms. Teresa Tallevast, manager of the National Wildlife Refuge, provided a listing of threatened and endangered species in and around Culebra. This information is provided at table 3-2 (ref B-95). It will be essential for site contractors to maintain close coordination with the Fish and Wildlife Service and DNR to avoid disturbing any of these species.

**TABLE 3-2  
NATURAL RESOURCES**

Classification	Common Name	Status
Mammals	Sperm Whale	Endangered
Birds	West Indies Brown Pelican	Endangered
	Peregrine Falcon	Endangered
	Roseate Tern	Threatened
Reptiles	Hawksbill Sea Turtle	Endangered
	Leatherback Sea Turtle	Endangered
	Green Sea Turtle	Threatened
	Loggerhead Sea Turtle	Threatened
	Virgin Islands Tree Boa	Endangered
Plants	Culebra Giant Anole	Endangered
	Wheeler's Peperomia	Endangered
	Cactus (Leptocerus grantianus)	Endangered

(2) While table 3-2 lists threatened and endangered species, there are numerous other sensitive resources that must also be protected. This includes mangroves and off-shore coral formations. In addition, Ms. Tallevast stated that burning would not be allowed on Culebrita and Cayo Luis Pena because the virgin vegetation is a sensitive habitat. The Fish & Wildlife Service is likely to allow burning on their area of the Flamenco Peninsula.

(3) There are additional natural resources that site contractors should consider. The poisonous manzanillo tree is present on Flamenco Peninsula and probably other areas. The mesquite acacia has long, sharp thorns which cause irritation. Mosquitos, while not a hazard, are an annoying distraction. In the water, fire coral and sea urchins can cause severe pain, as can sharks (nurse, sand, lemon, and hammerhead) and moray eels (ref I-10).

#### **g. Historical/Cultural Resources**

Mr. Miguel Bonini of the Puerto Rico Office of Historic Preservation provided sensitive information about the many archeological and historical sites on Culebra, some of which have been recently discovered and have not been publicly disseminated. He stated that very little is known about the archeology of Culebra and there may be additional sites. He added that the Fish & Wildlife Study (ref B-87) is the most thorough work on Culebra. When planning site remediation, the COE will need to maintain close contact with the SHPO to avoid disturbing the known sites as well as additional sites that may exist.

#### **4. HISTORICAL ORDNANCE PRESENCE**

##### **a. Chronological Site Summary**

(1) Spain transferred all of Puerto Rico to the US in December 1898 after signing the Treaty of Paris formally ending the Spanish-American War. In December, 1901, President Theodore Roosevelt signed General Order 75 placing all of Culebra's public lands under the jurisdiction of the Navy Department. This was amended by subsequent Executive Orders (ref B-42).

(2) Exactly when the military presence began is unknown, but in 1901 or 1902 the Navy set up a base (Lower Camp) where the Culebrans had established the town of San Idelfonso. The town was moved to the present location of Culebra City and was renamed Dewey after the famous Admiral. The Navy also set up a coaling station near Ensenada Fulladosa (refs B-43 & B-87).

(3) The US Naval Fleet was first sent to Culebra for maneuvers in October 1902, and used the area extensively in succeeding years. The US Marines made their first landing on Culebra in early 1903, and over the next 40 years used the area extensively to practice amphibious landings and ground maneuver training (ref B-98).

(4) In 1914, the Marines used Culebra Harbor to train new pilots on seaplanes. The Navy temporarily abandoned the Lower Camp between about 1920 and 1942, though they still held fleet maneuvers in the area. Sometime around 1920, the Navy built a small grass airstrip in the center of the island west of Lower Camp. Also in the 1930s, the Navy and Marines built temporary tent camps at several locations near the airstrip (refs B-100, B-103, B-113, & B-122).

(5) Navy records use 1936 as the year naval bombardment began on the Flamenco Peninsula. From then on, the Navy used Culebra and the keys for gunnery training until ordnance use was

terminated on September 30, 1975. Live ordnance operations reached their peak in 1969 as the fleet was training pilots for Viet Nam. The Navy constructed barracks, helicopter pads, range instrumentation facilities, three observation posts (OPs) spotting stations, targets, a desalinization plant, and other facilities which were transferred from government ownership after the range was closed. The only property still owned by the Navy is the 87 acres of the abandoned OP at Flamenco Point, which will eventually be turned over to GSA for disposal (refs B-1, B-80, & B-98). Table 4-1 provides a summary of site history.

**TABLE 4-1  
SUMMARY OF CHRONOLOGICAL HISTORY**

Date	Action
Dec 1998	Treaty of Paris signed, Puerto Rico ceded to US
Dec 1901	President Roosevelt places public lands under Navy jurisdiction
circa 1902	Lower Camp Navy base established
Oct 1902	US Fleet holds first naval maneuvers
1903-1941	Marines hold training exercises
circa 1920	Airfield constructed
circa 1935	First Naval gunnery at Flamenco Peninsula
circa 1964	Expansion of range to include eastern and western keys
1971	Ordnance use ends on eastern keys
Sep 30, 1975	All ordnance use ends
circa 1985	Flamenco Point OP closed
1975-1982	All property (except OP) transferred

(6) Government files and newspaper articles indicate there was a large amount of ill will between the Navy and the Culebrans in the late sixties/early seventies over the live-fire exercises and a proposed expansion of the range. This became a major political issue, with Congressional intervention and visits leading to a 1971 agreement signed by the Secretary of the Navy, the Governor of Puerto Rico, and the Mayor of Culebra (see documents F-3, H-1, & H-2).

## b. Ordnance Related Records Review

### (1) Introduction

Research efforts began with a thorough review of all reports, historical documents, and reference material gathered during the archival search. During this review, an effort was made to focus on areas of potential OEW contamination as described in the OEW project summary sheet as well as additional areas that were identified during the research.

### (2) Marine Corps Training - 1902 to 1941

(a) A 1902 sketch of the base at Lower Camp shows a "store shack" for storekeeper and ordnance property and numerous facilities for Marines (ref B-87). This sketch also shows a trail heading west to the "target range", possibly the airport rifle range shown on later maps. The first known Marine amphibious landing on Culebra took place in early 1903, and they brought a 5" gun which a platoon moved through rough terrain. This training included the use of guns and underwater mines to defend the island (refs B-97 & B-98).

(b) A major Marine exercise was held in January of 1914, with the First Advanced Base Brigade defending the island against an attacking force of 1200 men. One book said that "Bombardments of the shore fortifications were made, operations were conducted for the discovery of minefields, and attempts made to drag for the mines." and "...the portable railroad was constructed to the gun positions high on the hills, gun-pits dug, platforms built, guns mounted. Mine fields had been laid...gun and mine practices have been of great benefit..." (ref B-124). Another reference describes an artillery duel between the defenders and the attacking ships and "a barrage of blanks and a battery of searchlights..." (ref B-98). One book also mentions that Navy destroyers did mine sweeping trials at Culebra (Panama) in January and February 1914 (ref B-143; the author probably confused Culebra PR with an island of the same name on the Pacific side of the Canal Zone).

(c) Document L-10 is a map dated December 12, 1913. This map represents a plan for defending Culebra in the forthcoming exercises, a plan which closely matches the description of the mock battle described in paragraph 3 above. The map shows 3" and 5" guns on Culebra and Cayo de Luis Pena as well as defensive positions all over Culebra, Cayo de Luis Pena, and Isla Culebrita. It also shows six camp sites and two rifle ranges. In addition, there are landing areas shown on Culebra, Culebrita, Cayo Norte, and Cayo de Luis Pena. The map also shows

numerous contact mines and dormant controlled mines in the waters to the south and west of Culebra.

(d) A February 19, 1916 Navy map shows the Lower Camp with a Naval magazine and a smaller Marine magazine. A June 1953 map shows the Naval magazine as "Old magazine" (see documents L-1 & L-2). A 1992 FWS archeological survey dig found a spent cartridge case and numerous bottles in the area of the eastern garbage dump (ref B-87, see plate 8). This is the only known OEW-related item found in the Lower Camp.

(e) Fleet maneuvers held January through April of 1922 involved two companies landing field artillery up to and including 155mm guns on Culebra. Also during 1922 exercises, a submarine landed an observer on Playa Larga. A much larger Fleet Exercise was held December 1923 through February 1924, with 3,300 Marines participating. The defense force had 6 155mm guns, 12 75mm guns, and 18 machine guns, and included engineers, gas and signal troops plus aviation, balloon service, antiaircraft units, and a light tank platoon. The attackers were the 5th Marine Regiment including a gas platoon (NOTE: This is the only indication of possible CWM). The mock battle included "insufficient naval bombardment", lost boats, and boats landing on the wrong beach (refs B-89 & B-124). A March 1924 letter indicates that the Marines leased their own property for artillery and infantry positions (see document F-1).

(f) The Fleet Exercise in 1923/24 was well-documented by service photographers, as books show several photos of troops and equipment landing on the shores. One particular photo appears to have been taken on the Flamenco Peninsula (see photo K-2). Another photo shows a huge fleet at anchor off west of Culebra (see photo K-1).

(g) A September 28, 1934 memorandum from the CG, Fleet Marine Force, details the planning for the upcoming exercises. The memo addresses "...the use of certain surrounding hills for temporary gun emplacements for 155mm guns, 75mm pack howitzers, and .50 cal A.A machine guns..." and states "...a suitable area for use as a combat range for infantry weapons is also desired...". In a separate paragraph, the memo describes an area on Flamenco Peninsula "...requested for actual fire problems for infantry, light artillery, and aircraft weapons." The final paragraph reads "The decision as to where the experimental naval gun fire is to be conducted will be made by the Commander, Special Service Squadron. That Officer has tentatively selected Cross Cay." (Cayo Lobo) (see document F-2).

(h) The Fleet Landing Exercise (FLEX-1) which took place January through March 1935 involved new tactics, as the

Marines fired all their organic weapons "...rifles through machine guns and 81mm mortars to the new 75mm pack howitzers against beach targets..." presumably from the boats. The Navy practiced shore bombardment and aircraft engaged in bombing and strafing practice. A similar exercise, FLEX-2, was conducted in January and February of 1936 (refs B-98 & B-102).

(i) The Marines constructed a rifle range at the site of the airfield. This was identified in the 1913 map as an "old rifle range" (see document L-10). A 1938 aerial photo shows what appear to be firing butts, and a 1944 map of the airfield shows these as brick walls (see documents K-14 & L-3). A 1947 map of the airfield shows them as "ruins of brick walls" (see document L-4). The 1913 map also shows an "old rifle range" south of Culebra City near the coaling station (see document L-10).

(j) There were additional exercises that were not as well documented. A February 1938 aerial photo shows a large camp (Camp R.E. Rowell) with hundreds of tents set up on the harbor southeast of the airfield (see photo K-14). A March 1939 photo shows at least 40 large ships at anchor just west of Culebra (see photo K-15). Culebra's final known amphibious exercise was FLEX-7, which took place 4-16 February 1941. This included the 1st Marine Brigade and the Army's 1st Infantry division as well as Marine air support and naval gunfire (refs B-98 & B-102).

### (3) Coastal Defense Artillery

(a) Records indicate that the Army planned to establish coast artillery units on Culebra. A September 1942 letter from the War Department has a priority list for new 6" coastal defense batteries, with #312 (Culebra Island NW Point) and #313 (Culebra Island Dolphin Head) as numbers 48 and 49 out of 82 sites (see document F-7). An April 1943 letter includes the two Culebra batteries on a list concerning auxiliary power equipment. However, two current publications on coastal defenses both indicate the the two sites were never actually built (refs B-116, B-129, & B-130).

(b) The Navy was also involved in coastal defense. A 1950 property map shows what appear to be 7 gun sites (1 thru 7) in southern Culebra (see document L-5). A 1968 real estate map shows five gun sites (2,3,4,5, & 6) and indicates they were purchased in 1903 (see document L-6). A 1982 quitclaim deed refers to 6 pound, 4", and 5" gun mounts transferred to DNR (see document G-2). The sites of these Navy guns do not match the Marine sites in the 1913 map (see document L-10) or the locations of the Army sites described above.

#### (4) 1940 - 1959 Activity

(a) Records show that the Navy abandoned the Lower Camp in the 1920s but reactivated it in 1942 before again reducing it to caretaker status in September 1944. Aerial photos taken in 1943 show the camp in use (see photo K-16). An aerial photo taken January 1945 shows the impact area, including the lagoon, overlaid with target grids (see photo K-3). This photo shows a fence line or break between Navy and private property, as do photos K-9 and K-15. Documents L-6 and L-7 shows this break as the boundary of Navy property. It does not appear that the property southeast of this line was part of the impact area, though stray rounds likely fell there. Navy use continued after WWII, and an errant bomb killed 9 sailors at an OP in 1946 (see document H-2).

(b) A June 1949 report from NAS Roosevelt Roads states that units conducted 2 air strikes and 50 bombardment exercises on Culebra in fiscal year 1949. A similar report for July through December 1949 showed one air strike and 29 bombardment exercises. This report also listed the war reserve ordnance stocks of GP bombs, aerial depth charges, fragmentation bombs, aviation ammunition, small arms, and aircraft rockets (see document E-9). Other letters show that in May of 1950 the Navy considered closing the Culebra range, but later decided to keep it open, possibly due to the outbreak of the Korean Conflict (ref B-119).

(c) The Navy's use of Flamenco Peninsula continued in the 1950s. An October 1950 property map shows the border of the impact area extending northeast to southwest through the center of the lagoon, beyond the boundary of the Navy-owned land (see document L-5). Other maps show the large Navy-owned area east and south of Flamenco Point identified as an "operations area" with no information on its usage (see document L-6).

(d) A November 1959 letter authorized the CO of Submarine Squadron Two to fire 14 live torpedos at Cayos Geniqui from a range of 1000 yards. This letter included instructions to suspend firings while EOD teams searched for duds (see document F-8). Other Navy records indicate that submarines also fired torpedos at Marc Point on Culebrita but stopped prior to 1969 (see document E-7).

#### (5) Viet Nam Era Training

(a) Most of the remaining information in this section was extracted from a 1972 Navy study, portions of which are included as documents E-6, E-7, and L-12. The study contains

excellent information on 1969 activities and recent range operations, but it does not contain a great deal of specific pre-1969 data. It is likely there was additional ordnance used (and possibly other targets) not addressed in the study and the following paragraphs.

(b) Until the early sixties, Flamenco Peninsula, Los Gemelos, and Alcarazza had been the only aircraft targets in the complex. To support increased training needs for Viet Nam, the Navy acquired adjacent keys to the east and west and constructed facilities for aircraft ranges. The main observation post (OP)/range control center at Flamenco Point was supplemented by additional OPs on Culebrita and Cayo de Luis Pena. In addition, spotting stations were built on Cayo Lobo, Flamenco Peninsula, Culebrita, and on Duck Point on the eastern side of Culebra. All of the OPs and some of the spotting stations had helipads, and the three OPs also had living accommodations. A run-in line was constructed on Cayo de Luis Pena and a similar line was planned for Cayo Norte. The Navy installed electronic scoring equipment, searchlights, bullseye targets, and strafing targets on the keys. The OP at Cayo de Luis Pena received a Nike-Ajax radar for general range surveillance as well as tracking aircraft doing loft and over the shoulder bombing (refs B-10, & B-15, see documents E-7 and K-6 through K-12).

(c) Navy records show that the Flamenco Peninsula was the only target area for naval gunfire support (NGFS) training. Targets were four old Sherman tanks as well as trucks and panels. Ships normally fired from a range of 2,000 to 12,000 yards, usually sailing parallel to the coastline heading northwest. In 1969, US ships fired live 40mm, 3" 50 caliber (3"/50), 5"/38, 5"/54, 6"/47, and 8"/55 rounds. In some instances, this firing was directed at 81mm white phosphorous (WP) spotting rounds fired from near the Flamenco Point OP. It is likely that 81mm illuminating rounds were also used. The range was also used by ships from the Coast Guard as well as from the following foreign countries: Great Britain, Canada, Germany, The Netherlands, France, Brazil, Colombia, and Venezuela. These foreign ships fired live rounds varying from 3" to 5". Aircraft bombing and strafing of the Flamenco Peninsula ended around 1970 and the use of live rounds for NGFS ended in 1971. Naval ships fired only quieter smoke (puff) rounds from then on (ref B-14, see documents E-7, H-3, and photos K-9, 11, & 12).

(d) Aircraft strafing targets were constructed at Flamenco Peninsula and Culebrita. The keys used in 1969 for aircraft bombing/rocket targets were: Alcarazza, Los Gemelos, Cayo de Agua, Cayo Tiburon, Cayos Geniqui, and Cayo Botella. During 1969, the following Navy aircraft used the range complex: F-4, F-8, A-4, A-6, A-7, OV-10, P-2, and P-3. In addition,

Puerto Rican Air National Guard F-104s and T-28s as well as Air Force B-52s and United Kingdom aircraft made limited use of the range (refs B-10 & B-20, see document E-7 and photos K-6 through K-10).

(e) Navy records indicate that in 1969 only Bullpup missiles with inert warheads were fired at Los Gemelos. Culebra had been considered as a Walleye range but this apparently never went beyond the planning stage. Another document mentions the Zuni rocket but does not clearly state it was fired. Aircraft ordnance expended during 1969 included 20mm HE/HEI projectiles, Mk 44 & Mk 45 flares, various live and practice bombs up to 500 lbs, and 2.75" rockets. The Navy study added "...it is understood that inert 2,000 pound bombs have been dropped during B-52 exercises. The ordnance used by United Kingdom aircraft varied from 28 pound to 1,000 pound bombs and 2-inch rockets." (ref B-16, see document E-7).

(f) Most Navy aircraft flew to the ranges from aircraft carriers, though sometimes they came from nearby NAS Roosevelt Roads. They normally flew over their targets in racetrack patterns about 2 by 6 miles as shown on plates 3 and 4. The lowest altitude was about 500 feet with inert ordnance and 800 to 1000 feet with live ordnance. Night bombing was conducted with illumination by aerial flares or searchlights and the use aircraft radar. Alcarazza and Los Gemelos were favored for high altitude radar bombing (see document E-7).

(g) The aerial mining range (west) south of Cayo de Luis Pena became operational in 1967 and is shown on plate 4. The east range near Culebrita was never used. For this training, aircraft would fly inbound at 300 feet before dropping drill mines at specific coordinates (see document E-7). Later, these mines would be recovered by EOD swimmers or minesweepers. These mines may have contained flares and/or small buoys that were released to indicate that the minesweepers had properly simulated procedures to detonate the mine (ref B-149).

(h) In 1970, the Navy discontinued use of all the targets on the eastern side as well as Cayo del Agua and the west aerial mining range on the western side. Ordnance operations on the entire Culebra complex were terminated 1 October 1975 (ref B-3, see documents E-7 & F-4).

#### (6) OEW Removal

(a) A 1972 Navy report estimated that ships had fired 750,000 rounds at the Flamenco Peninsula, with 80% being 5" rounds. Ten per cent were 3", 6", and 8" rounds. The balance included other calibers including mortars, howitzers, and 16"

rounds. This report also estimated that from 1942 to 1968, 320,000 units of aerial ordnance were delivered, up to 1000 pounds (see document E-8).

(b) Navy records indicate that EOD personnel used to routinely remove surface duds from the target areas (see document E-7). Although complete records are unavailable, the Navy did make attempts to clean the range. An underwater clean-up was started in December 1970, but a court injunction stopped it after claims that demolition was destroying coral and killing fish. Clean-up was complicated by the November 1973 passage of Public Law 93-166, which provided \$12,000,000 to relocate the Culebra range but prohibited decontamination at US expense (see document F-5). The Puerto Rico Army National Guard apparently did a range clearance in 1985, but records of this operation are not available (refs B-29, B-30, & B-112).

(c) Messages indicate that EOD searched Ladrone Cay in March 1973 and found several expended Mk 76 and Mk 106 practice bombs, which were left in place. Records also indicate that in both 1976 and 1978 EOD went to Culebra to dispose of ordnance that had been collected by visitors to Flamenco Beach and transported by DNR to the Lower Camp (see document F-9). In January 1983, after being notified by a scuba diver, EOD divers found a Mk 27 torpedo east of Cayos Geniqui, two 500 pound bombs west of Cayos Geniqui, and one 500 pound bomb west of Cayo Ballena (see document F-10). There is no record of the disposition of these items (ref B-24).

#### (7) Impact areas

(a) Document E-6 shows the impact areas for ordnance that was used in the early 1970s. Document E-7 defines the impact area as "...the zone around a target in which ordnance aimed at the target is likely to fall, except in the rare cases of gross error, plus an allowance for the distance to which explosive effects of live ordnance and scattering of debris from inert ordnance could extend from the point of impact." The bombs and rockets impact area has a 1.5 mile radius for inert ordnance and a 3 mile radius for live ordnance, implying that for live ordnance the inner 1.5 miles is the target area and the outer 1.5 miles is fragment distance.

(b) Plate 2 represents the 1.5 mile impact area shown for the seven known 1969 aerial targets. The 3,000 yard (1.7 miles) distance is used for shore bombardment, using the middle of Flamenco Peninsula for its center. The 1.5 mile aerial bombs and rockets impact area is not shown for the Flamenco Peninsula, as it is included within the 3,000 yard circle. Similarly, the 1 x 1/2 mile impact area for aerial strafing at

Culebrita is not shown because it is included in the impact area for Ladrone Cay. Also, because the launch points are unknown, plate 2 does not show the impact area for the Bullpup missile or the torpedos. The size of these impact areas forms the basis for defining areas A, B, and C.

(8) Ordnance Incidents

Although ships and aircraft were firing at specific targets, there were documented incidents where the ordnance missed its mark, sometimes by a long distance. Document H-2 has a listing (provided by the Navy) of the incidents in a five-year period and includes the 1946 incident where an aircraft dropped a bomb on the OP and killed 9 sailors. The 1965-69 information is summarized in table 4-1 below.

TABLE 4-2 ORDNANCE INCIDENTS 1965-1969				
Date	Ordnance	Intended Target	Actual Target	Comments
10/13/65	5" projectile (2 each)	Flamenco Peninsula	Cayo de Luis Pena	US Navy destroyer
10/19/65	5" projectile (4 each)	Flamenco Peninsula	Cayo de Luis Pena	Australian destroyer
11/5/65	5" projectile (2 each)	Flamenco Peninsula	S of Cayo del Agua	USS Stickle
3/24/69	3" projectile (3 each)	Flamenco Peninsula	Cayo de Luis Pena	LST USS Fort Snelling
6/18/69	20mm practice round	Isla de Culebrita	Eastern Culebra	Marine aircraft
12/1/69	Mk 76 practice bomb	Cayo del Agua	Culebra Harbor	Marine aircraft
NOTE: Data obtained from document H-2.				

c. Interviews With Site-Related Personnel

(1) The team spoke with the Mayor of Culebra our first day on site. Mr. Soto said that there is ordnance in the water almost everywhere, but especially around the keys. He said the Navy dropped practice bombs on southern Culebra until 1944, and he thought that the Navy fired torpedos at the north side of Culebra. He did not think Cayo Lobito or Cayo Norte were ever used as targets. He related incidents of bombs missing their targets, and told of the death of the child from a dud round and

other non-fatal injuries. He also told about the Navy men killed when the bomb hit there OP (see document I-1).

(2) Mr. Abraham Pena is the supervisor of the Puerto Rico Department of Natural Resources (DNR), which owns some of the property on the Flamenco Peninsula. He knew of OEW on the Flamenco Peninsula but nowhere else on DNR property. He did not think that Cayo Norte was ever a target. Mr. Pena knew of an old rifle range at the airport, and he had heard that soldiers had fired and left small arms all over Culebra. He also knew the Navy had two dumps at Lower Camp, but to his knowledge there was no ordnance. He told us that his uncle was killed many years ago after putting a bullet in a fire, and also said that several sailors were killed in an accidental bombing (see document I-2).

(3) LT Robinson is the Chief of Police on Culebra. He said that most OEW would be found on Flamenco Peninsula west of Culebra, and he did not think there was any OEW on Culebra itself. He said that someone swept the beach with metal detectors several years ago. He added that ships from other countries including Canada and Argentina used to bomb the peninsula. He also related the incident where the Navy accidentally bombed the OP and killed several sailors (see document I-3).

(4) Mr. Amaro is a firefighter in Culebra. He has seen huge projectiles in the water west of Flamenco Peninsula, and admitted to recovering other projectiles and chipping off the rotating band. He said he has found clips of bullets near the airport (see document I-4).

(5) While diving from his boat, Mr. Luis Molero has seen large (12" or 16" diameter) projectiles in the water around Cayo Raton, Cayo Yerba, and Cayo del Agua. He has also seen unidentified tubular items about 3' long and 5" in diameter in the shallow water off the north beach of Cayo de Luis Pena (see document I-5).

(6) (a) Mr. Ricardo Pena grew up in the Cerro Balcon area northeast of Lower Camp. He remembers the naval infantry (Marines) on Culebra when he was a child in the 1920s and 1930s because he used to visit them at Lower Camp. He showed us structures that were used for ammunition storage of small arms and projectiles. Mr. Pena took us to the range and showed us the firing point and impact area. He described items which resembled artillery projectiles, and said the Marines fired at silhouette targets. He added that rounds would occasionally overshoot and land near his house with a big blast and smoke. In the impact area, Mr. Pena showed us where he found the dud projectiles he took home many years ago and described how his brother Alberto

was knocking them together when one exploded, killing him (see photos J-48 through J-52).

(b) Mr. Pena also took us to the airport and showed us the general area of the rifle range where he said fragments of the concrete walls still exist (see photo J-53). He said the Marines only fired rifles and pistols at targets that moved up and down. He also described a small pile of 3 or 4 bombs up in the hills of Flamenco Peninsula. Mr. Pena related the story of several sailors killed by a stray bomb. He said that the only Culebra areas with ordnance are Flamenco Peninsula and the mortar range near Cerro Balcon (see document I-6).

(7) Mr. Ramon Feliciano is the former Mayor of Culebra. He said he used to live on Flamenco Peninsula, but his family was kicked out by the Navy in 1937. He said that most ordnance can be found west of Culebra, and foreign ships used the range also. He added that most aerial ordnance was dropped on the eastern keys, and the Walleye missile was fired on Culebrita and Cayo de Agua. Mr. Feliciano said that the Navy fired torpedos at Marc Point, and there was a moving target for aircraft on Cayo Lobo. He is unaware of any ordnance dropped on Cayo Norte, but he said the Marines fired at the airport and left ordnance all over the island in the 1930s. He told of the boy being killed in 1936 and subsequent non-fatal injuries. He said 9 sailors were killed in 1944 when an aircraft dropped a bomb on the OP by mistake (see document I-7).

(8) Mr. Henry Morales works for the Fish & Wildlife Service. He was certain that no ordnance was dropped on Cayo Norte and Cayo Lobito, and he thought Cayo Sombrerito and Cayo de Luis Pena were never targets. He has seen numerous bombs on the Flamenco Peninsula. He said there was a strafing target in the water west of Culebrita and showed us the metal poles still protruding from the water (see document I-8).

(9) Mr. Gene Thomas is a scuba instructor and has made about 20,000 dives in 20 years on Culebra. He previously served in the Navy on a torpedo boat. He said that he has seen underwater OEW virtually everywhere to the west and east of Culebra, with the highest concentration in the area west of Flamenco Peninsula. He has seen everything including bullets, bombs, 16" projectiles, and torpedos. Mr. Thomas added that there is a dump area southwest of Culebra City with lots of brass and other items. He expressed concern over boaters and divers who handle OEW, and he pointed out three areas which he felt should be high priority for clean-up. He said the bottom is mostly sand, and this frequently shifts, covering and uncovering reefs as well as ordnance (see document I-9 and plate 3).

(10) Ms. Teresa Tallevast is the manager of the National Wildlife Refuge and has lived on Culebra for 6 years. She knows of ordnance contamination on FWS property including Flamenco Peninsula and most of the keys. She was unaware of OEW anywhere else on the main island, including her Monte Resaca parcel (the operations area). Her main OEW concerns were the coastline of Flamenco Peninsula as well as the same three areas Mr. Thomas mentioned: the north side of Culebrita, the north beach of Cayo de Luis Pena, and Carlos Rosario Beach off Flamenco Peninsula. She added that endangered species are common to the area, and any site visits and clean-up should be coordinated with her way in advance (see document I-10).

(11) Ms. Nadeen Decicco owns property on Punta Caranero where there are apparent remains of a gun battery built in 1906. She said other residents have told her there are similar sites on the island and that they were constructed but never used. She said they have done some digging and have found belt buckles and wooden barrels but no type of ordnance. Ms. Decicco said she does not want the Corps doing any digging or disturbing her property (see document I-11).

(12) While interviewing Culebra residents, the ASR team did not feel they were getting exaggerated or misleading answers. The people all seemed sincere and forthright in responding to our questions. They told different versions of the local boy killed playing with OEW and of the sailors killed in the OP bombing, but both these incidents were subsequently verified by Navy documents. The team was impressed with the assistance offered by the residents of Culebra.

## 5. SITE ELIGIBILITY

### a. **Confirmed Formerly Used Defense Site**

(1) Former land usage by the War Department of the 2660 acres qualified in the FDE was previously confirmed for the site as summarized in section 4a of this report. The site was used by the Marines as a maneuver area and then by the Navy as a firing range. A recent map showing the former federal property is provided as document G-1. A 1925 property map is provided as document L-9. Table 5-1 provides a summary of the qualified property.

**TABLE 5-1  
PROPERTY QUALIFIED IN FDE**

Location	Size, acres	Comments
Culebra Island	1980.3	Lower Camp, shore, gun sites, Flamenco Peninsula, ops area, airport, S Peninsula
Culebrita	266	OP, strafing range, torpedo range
Cayo de Luis Pena	342.5	OP
Cayo del Agua	7	Aerial bombing
Adjacent cayos	63.82	Aerial bombing
Total qualified	2659.62	

(2) Except for the 87 acre site of the Flamenco Point OP, all property owned or leased by the Navy has been disposed. The three quitclaim deeds are provided as documents G-2 through G-4. Table 5-2 summarizes the present usage of the qualified acreage.

**TABLE 5-2  
PRESENT USAGE OF QUALIFIED PROPERTY**

Grantee	Acres	Comments
DNR	935.98	Southern Flamenco Peninsula and other areas.
FWS	1500*	Northern Flamenco Peninsula, keys, and other areas.
Airport Authority	79.73	Runway and terminal area.
Public Housing Authority	32.34	Southeast of airport
City of Culebra	155.9	Future port area
Coast Guard	4*	Lighthouse on Culebrita
*indicates approximate acreage		

## **b. Potential Formerly Used Defense Site**

(1) Following personal interviews and historical research, the ASR team concluded that the potential FUDS acreage is much greater than the 2660 acres qualified in the FDE. While this figure accurately represents what land the Navy officially had title to, in reality the Marines and then the Navy either controlled, used, or flew over the entire area shown in plate 1 (92,500 acres).

(2) There is a file of real estate records available at Roosevelt Roads, and given enough time, one could probably come close to accounting for every acre the Navy officially controlled in recent years. This would be a futile effort, however, as these records do not accurately reflect all the areas that were used by the Marines between 1902 and 1941, notably the acre mortar range discovered by the ASR team. A 1925 property map implies that this area was leased by the Navy but provides no other information (see document L-9). There is no other historic documentation that mentions this mortar range. In his autobiography, a Marine general states that "I rented the whole of Culebra..." for training in 1923 (ref B-150).

(3) Another related issue is the matter of property boundaries. Records indicate there has been a tremendous amount of confusion over property lines, some of which continues to this day. Apparently the Spanish Crown never had precise boundaries of private property, and the accountability did not improve when the US took over in 1898. In addition, current property maps show lot boundaries but frequently omit ownership information and in some cases, show an owner who gave up the property long ago (e.g. US Navy). Obtaining precise ownership and historical real estate information is nearly impossible (refs B-46, B-74 thru B-80, & B-92). See plate 9 for the best available information on property ownership.

(4) Based on documents obtained and cited in paragraph 4b that the entire island and its keys were in some way "used" if not actually owned or leased, it seems the most practical course of action is for CESAJ to amend the FDE and qualify the entire 92,500 acres within the Naval Defensive Sea Area as FUDS eligible. This total includes 7,300 acres of land and 85,200 acres of water.

## **6. VISUAL SITE INSPECTION**

### **a. General Procedures and Safety**

(1) During the period of 29 September to 6 October 1994, members of the Assessment Team traveled to Culebra Island and

many of its keys. The primary task of the team was to assess OEW presence and potential due to its former usage as a naval gunnery range. Site inspection was limited to non-intrusive methods; i.e. subsurface sampling was not authorized or performed.

(2) Real estate rights-of-entry were not obtained by the team due to the willingness of the current owners to allow the team to visit their property. As such, control and jurisdiction of the site remained with the owners during this inspection.

(3) A site safety plan was developed and utilized by the assessment team to assure safety from injury during the site inspection of this facility. Prior to the inspection, a briefing was conducted which stressed that OEW should only be handled by military EOD personnel (ref B-132).

(4) Prior to the site visit, a thorough review of all available reports, historical documents, texts, and technical ordnance reference materials gathered during the historical records search portion was made to ensure awareness of potential ordnance types and hazards.

#### **b. Area A: Aerial Bombing and Rockets (East)**

(1) Isla de Culebrita is a large island with moderate to steep hills and light to dense vegetation. It has sandy beaches as well as rocky shoreline. The former OP remains as an unmanned Coast Guard lighthouse. On the northeast corner is Marc Point, a rugged cliff and former torpedo impact area. On most of the island, walking appears to be reasonably easy. From the boat, the team did not observe any OEW on Culebrita (see photos J-1 & J-2 and plate 5).

(2) The North Bay of Culebrita is a popular area for boaters. There are several smooth beaches as well as a few rocky sites. In the water remain the old support poles for the water strafing targets. Beyond the beach is dense vegetation. The ASR team swam in, walked about one mile of beach, and did not observe any OEW or any evidence of the former inland strafing target (see photos J-3 & J-4 and plate 5).

(3) Cayo Botella is a small key with mostly rocky shores and light vegetation. The team swam in to the one beach area and walked the island 360°. Except for some rugged areas, walking on the island is fairly easy. The top is fairly level and covered with short grass. On the key, the team observed large quantities of MK 76 practice bombs and fragments of an HE bomb with the suspension lugs. The team observed practice bombs in the shallow water off the beach as well as a MK 80 series bomb (see photos J-5 thru J-8 and plate 5).

(4) Cayos Geniqui is actually two rugged keys that are barely connected by a narrow path of rocks. The western key has a small rocky beach area, sparse vegetation, and is somewhat level on the top. The other key is solid rock. Walking is difficult on both keys. The team swam in to the western key and observed some ordnance components, including a MK 14/15 snakeye fin used on MK 80 series bombs (see photos J-9 thru J-11 and plate 5).

(5) Cayo Tiburon is a rugged, inaccessible key without any vegetation. It is totally covered with rocks and there is no beaching area. Once a person gets on the key, walking will be difficult. The team did not go on this key and did not observe any OEW from the boat (see photo J-12 and plate 5).

(6) Cayo Ballena is similar to the adjacent Cayo Tiburon. The team did not observe any OEW from the boat (see photo J-13 and plate 5).

(7) Cayo Sombrerito has a rugged, inaccessible shoreline. There is a slight amount of vegetation on the fairly level top of the key. The team did not observe any OEW from the boat (see photo J-14 and plate 5).

(8) The eastern half of Cayo Norte is included in area A. This large island has moderate to steep hills with light to heavy vegetation. Most of the southern island has accessible shoreline, but there are rugged rocky areas in the north. There is one part-time residence. The team viewed the southeastern part from the boat and did not observe any OEW (see photos J-15 & J-16 and plate 5).

(9) A small portion of eastern Culebra is included in area A. This section includes mostly rugged shoreline, moderate to steep hills, and moderate to heavy vegetation. There are several scattered residences. The team viewed this area from the boat and did not observe any OEW.

#### **c. Area B: Aerial Bombing and Rockets (West)**

(1) Cayo de Luis Pena is a large island with moderate to steep hills and moderate to heavy vegetation. There is some accessible shoreline as well as some rugged shore areas. The team viewed this from the boat and did not observe any OEW (see photo J-17 and plate 6).

(2) The North Bay of Cayo de Luis Pena is a popular site for boaters. It has smooth sandy beaches with a few areas of rocks. The team swam in, walked about a mile of beach, and did not observe any OEW. The team did observe some suspicious items

in the shallow water off the beach, but was unable to positively identify the items as ordnance due to the algae growth (see photos J-18 & J-19 and plate 6).

(3) Cayo del Agua is a small key with a rocky beach and a mix of level areas and rough rocks. There is a small amount of short grass and brush. Visitors can walk the entire key without difficulty. The former target area has numerous tires as well as a concrete box. The team observed numerous OEW items, including a MK 76 practice bomb and fragments of an HE bomb with the suspension lugs (see photos J-20 thru J-22 and plate 6).

(4) Cayo Yerba is a small key with a rugged rock shoreline. It has sparse vegetation and steep rocks. It would be difficult, though not impossible, to walk most of this key after one manages to land safely. The team viewed this site from the boat and did not observe any OEW (see photo J-23 and plate 6).

(5) Cayo Raton is similar to Cay Yerba (see photo J-24 and plate 6).

(6) El Mono is a tiny pile of rocks. The team viewed this from the boat and did not observe any OEW (see photo J-25 and plate 6).

(7) Cayo Lobo is a large key with a rocky shoreline and one beach area. The team swam in and walked up a slight hill to reach the bowl-shaped target area in the center of the key. The tires are still there, though some are buried under the thick grass. There are four concrete structures on the highest points of the island. Most of this island and some of the shoreline can be walked without great difficulty. The team did not observe any OEW (see photos J-26 & J-27 and plate 6).

(8) Cayo Lobito is a large key with a rugged shoreline. There are steep rocks all around the key, with an almost flat and sparsely vegetated area on the top. A navigation marker is on the highest point. On one end of this key is a large rock formation which is even more rugged than the main area. The team viewed this key from the boat and did not observe any OEW (see photo J-28 and plate 6).

(9) Alcarraza is a massive rock with two smaller rocks on either side. There is a small, rocky area that would probably be suitable for landing swimmers, but they would have extreme difficulty getting around the key. The team viewed this key from the boat and did not observe any OEW (see photo J-29 & plate 6).

(10) Los Gemelos consists of two separate keys about 100 feet apart. The larger one is a pile of rocks that would be difficult to get on and equally difficult to walk on. The smaller key is a tiny group of rocks that barely rises above the water line. The team viewed this site from the boat and did not observe any OEW (see photos J-30 & J-31 and plate 6).

(11) Cayo Botijuela is a tiny key northwest of Alcarraza and is not within the area of the topographic map. The team did not view this site (see plate 7).

**d. Area C: Naval Gunnery and Aerial Bombing**

(1) Piedra Stevens is a small key off the end of Flamenco Peninsula. The entire key is rugged rock. Access and walking will be extremely difficult. The team viewed this site from the boat and did not observe any OEW (see photo J-32 and plate 6).

(2) Carlos Rosario Beach is a popular boating area just north of Punta Tamarindo Grande. The team did not view this site (see plate 6).

(3) Flamenco Beach

(a) The Flamenco Beach area is easily accessible by road and is popular with tourists as well as locals (see photo J-33). Driving north from the airport, a right turn after the lagoon leads to the hotel and the privately-owned property. Going straight leads to the campground, where DNR has an office at the entrance (see photo J-34). The paved public road ends at the parking lot, though official vehicles are allowed to drive further on the unpaved road (see photo J-35). Proceeding north, one passes through the camping/picnic area (see photo J-36) where the ASR team operated the metal detector and detected buried metal objects. No OEW was observed in this area. The camping area ends south of the inland tank target (see photo J-37 and plate 6).

(b) The road continues through another cleared area, and the team observed some metal junk in the woods, possibly the remains of another tank or similar target. The team also observed some aluminum material that could be OEW components. Going further north leads to the beach tank target (see photo J-38). Walking north to a rocky area on the beach, the team found part of an 11.75" Tiny Tim aerial rocket (see photo J-39 and plate 6).

#### (4) Flamenco Peninsula

(a) Leaving the beach area, this road turns to the west heading into the wooded areas going uphill through DNR property. A four-wheel drive is recommended beyond this point; the team walked. The road winds up a moderate slope with heavy vegetation. On the edge of the road, the team observed an expended .50 caliber cartridge case, various fragments, and a large crater. A third tank target was visible from the road (see photo J-40). Over a mile from the beach, there is a gate that separates DNR property from FWS lands. FWS has put up a sign warning visitors of OEW dangers (see photos J-41 & J-42). Inside the FWS boundary, there is a 5" rocket embedded in the side of the hill (see photo J-43). Mr. Pena stated there is other OEW further down the road. While this road/trail is reasonably easy to walk, the rest of the peninsula is not. There is no level ground, and the hills are covered with dense vegetation and frequent boulders (see plate 6).

(b) The team also viewed Flamenco Peninsula from the water while going from Cayo de Luis Pena to Cayo Norte. Photos J-44 thru J-46 show the western side, including a bunkered spotting station. Photo J-47 shows the eastern side of the peninsula.

#### **e. Area D: Mortar Range**

This area is reached by heading north on the concrete road next to the former magazine at the Lower Camp. Mr. Pena showed us the firing point located next to the road (see photo J-48). No OEW was observed at the firing point. The targets were located on a hillside east of the firing point (see photos J-49 & J-50). To reach the impact area, a four-wheel drive is recommended. The impact area is now used for grazing, with a few trees, shrubs, and light grasses growing on the moderate slope (see photo J-51). The team found a mortar fragment in this area, possibly from a 3" Stokes (see photo J-52 and plate 7).

#### **f. Area E: Airfield Rifle Range**

Mr. Pena took the team to this area, which is across the runway from the terminal between the runway and a residential area. The team could not observe the old firing butts or any OEW because of the extremely dense vegetation (see photo J-53).

#### **g. Area F: Southern Rifle Range**

Residents of Culebra did not provide any information on this area, and the ASR team did not obtain the map and learn of

it's existence until after completion of the site visit (see plate 7). This area is hilly and wooded with scattered houses.

**h. Area G: Lower Camp**

This area is now the main offices of DNR and FWS and has the city's desalinization plant. DNR uses an empty 5" projectile as a door stop (see photo J-54). All of the original buildings are gone, though some frames and foundations still remain. The brick naval magazine built in 1905 is still standing (see photo J-55), but there is no evidence of the adjacent Marine magazine. Mr. Pena showed us other structures which he said were used for ammo storage in the 1930s, but there was no OEW found in or near any of these. This area also includes a dock, a seaplane ramp, and a helipad (see plate 8).

**i. Area H: Lower Camp Dump Sites**

These three former Navy trash dumps are on the east and west side of Lower Camp. The team did not observe any OEW (see plate 8 and photos J-56 & J-57).

**j. Area I: Cayo Matojo**

This is a small key located east of Punta Resaca and is relatively inaccessible. The team did not visit this area.

**k. Area J: Navy Gun Sites**

The team located one of these seven sites. It consisted of two concrete pads, about 8' x 10', with 16 1 1/2" bolts in the center of each pad (see photo J-58). These pads are about 100' apart. Between them is the remnants of a T-shaped, below-ground structure about 10'x20', with a 6' wide trench extending toward each pad (see photo J-59). The team did not observe any OEW at this site (see plate 7 for the location of all 7 gun sites).

**l. Area K: Mining West**

This area is in open water. The team did not observe any OEW while transiting this area.

**m. Area L: Marine Water Minefield**

This area is in open water. The team did not observe any OEW while transiting this area.

**n. Area M: Confirmed Water**

This is shallow water from Punta Tamarindo Grande southeast to Punta Melones. The team did not observe any OEW while transiting this area.

**o. Area N: All Other Water**

This area is all water not already included in other areas. The team did not observe any OEW while transiting this area.

**p. Area O: All Other Land**

This area is all land not covered in other areas. It includes the western half of Cayo Norte and most of Culebra. Military sites on Culebra include the airfield, the coaling station, the possible Army gun sites, the entire shoreline, the Marine guns positions shown on document L-10, and the "operations area" located east of the Flamenco Point OP (see photos J-60 & J-61).

**q. Area P: Flamenco Point OP**

This area is still owned by the Navy and is not eligible for consideration under DERP-FUDS (see photo J-65).

**7. EVALUATION OF ORDNANCE HAZARDS**

**a. General Procedures**

(1) Each subsite was evaluated to determine confirmed, potential, or uncontaminated ordnance presence. Confirmed ordnance contamination is based on verifiable historical evidence, direct witness of ordnance items, or reliable indirect witness. Verifiable historical record evidence consists of ordnance items located on site since site closure and documented by local bomb squads, military Explosive Ordnance Demolition (EOD) Teams, newspaper articles, correspondence, and current findings. Direct witness of ordnance items consists of the site inspection team directly locating ordnance items by visual inspection. For this report, reliable indirect witness includes the FWS refuge manager and a long-time local scuba instructor with former Navy ordnance experience. Additional field data is not needed to identify a confirmed site.

(2) Potential ordnance contamination is based on a lack of confirmed ordnance presence. Potential ordnance contamination is inferred from records or indirect witness. Inference from historical records would include common practice in range

operations at that time which could have allowed present day ordnance contamination. Potential ordnance contamination could also be based on indirect witness or from present day site features. Additional field data is needed to confirm potential ordnance subsites.

(3) Uncontaminated ordnance subsites are based on a lack of confirmed or potential ordnance evidence. There is no reasonable evidence, either direct or inferred, to suggest present day ordnance contamination. Additional field data is not needed to assess uncontaminated ordnance subsites. There are no uncontaminated areas in this report.

(4) Table 7-1 has been provided at the conclusion of this section to summarize OEW presence within all areas and subsites.

#### b. Area A: Aerial Bombing and Rockets (East)

(1) In general, this area has **confirmed** ordnance contamination, based on direct witness, reliable indirect witness, and historical records. Sub-sites within this area were used as aerial targets from the early 1960s until 1970 and as torpedo targets circa 1960. Those subsites not specifically documented as targets within this area are still within the 1.5 mile impact area as described in paragraph 4b(29), and exist as potentially contaminated sub-sites.

(2) Isla Culebrita was used as an OP, aircraft strafing range, and a torpedo target (see documents E-7 & K-7). It is entirely within the 1.5 mile impact area of Cayo Botella, and portions are within the impact area of Cayos Geniqui (see plate 2). Interviews and documents did not indicate inland target use other than the strafing range. It may have been used by the Marines in 1914 exercises (see document L-10). FWS staff and a local diver have **confirmed** OEW within this subsite (see plate 3).

(3) Culebrita's North Bay was used as a water strafing range (see documents I-8 & J-3), and is within the 1.5 mile impact areas for Cayo Botella and Cayos Geniqui. FWS staff and a local diver have **confirmed** OEW within this subsite (see plate 3).

(4) Cayo Botella was used as a target for aerial bombing and rockets (see documents E-7 & K-6). OEW has been **confirmed** by FWS and the local diver (see plate 3) as well as the ASR team (see photos J-6 thru J-8).

(5) Cayos Geniqui was used as a target for aerial bombing and rockets and torpedos (see documents E-7 & F-8). OEW

has been **confirmed** by EOD (see document F-10), FWS and the local diver (see plate 3), and the ASR team (see photo J-11).

(6) Cayo Tiburon was used as a target for aerial bombing and rockets (see document E-7). OEW has been **confirmed** by FWS and the local diver (see plate 3).

(7) Cayo Ballena's former usage is unknown. It is less than 1000' from Cayo Tiburon and also within the 1.5 mile impact areas of Cayos Geniqui and Cayo Botella. OEW has been **confirmed** by EOD (see document F-10) and the local diver (see plate 3).

(8) Cayo Sombrerito's former usage is unknown. It is within the 1.5 mile impact areas of Cayo Botella, Cayos Geniqui, and Cayo Tiburon. OEW has been **confirmed** by a local diver (see plate 3).

(9) Cayo Norte may have been used as a run-in line to Cayo Botella, though there is no line visible on 1985 aerial photos (ref B-15, see photo K-13). It also may have been used by the Marines in the 1914 exercises (see document L-10). Interviews and documents did not indicate use as a target nor any OEW found on the key. The eastern half is within the 1.5 mile impact area for Cayo Tiburon, Cayo Botella, and Cayos Geniqui. OEW has been **confirmed** off the eastern shore by a local diver (see plate 3).

(10) The eastern corner of Culebra lies within the 1.5 mile impact area of Cayo Botella and is less than a mile from the Culebrita strafing targets. The Marines may have used this area in 1914 exercises (see document L-10). Interviews and documents did not indicate use as a target. However, on June 18, 1969, residents observed a Marine aircraft firing near their beach and later recovered a 20mm practice projectile (ref B-18 and table 4-2). This one incident **confirms** the presence of OEW within this subsite.

#### c. Area B: Aerial Bombing and Rockets (West)

(1) As a whole, this area has **confirmed** ordnance contamination, based on direct witness, reliable indirect witness, and historical records. Sub-sites within this area were used as aerial targets from about 1960 until 1975. In addition, most of this area is downrange from the Flamenco Peninsula, which was used for Naval gunnery and aerial bombing from about 1935 until 1975.

(2) Cayo de Luis Pena was used as an OP and radar site (see document E-7). It was also a run-in line to the aerial target on Cayo del Agua (see photo K-10). Also, it may have been

used by the Marines in 1914 exercises (see document L-10). It is within the 1.5 mile impact area for Cayo del Agua. Interviews and documents did not indicate use as a target, though the bay to the east is known as Target Bay. There were three documented incidents when it was struck by errant naval gunfire directed at Flamenco Peninsula (see table 4-2). This subsite is considered as **potentially** contaminated.

(3) The former usage of North Bay of Luis Pena is unknown. It is within the 1.5 mile impact area for Cayo del Agua and the 1.7 mile naval gunnery impact area for Flamenco Peninsula. FWS, a local diver, and a transient boater have **confirmed** OEW in the water (see plate 3). In addition, the ASR team observed underwater objects which may have been OEW (see photo J-19).

(4) Cayo del Agua was used for aerial bombing and rockets (see documenta E-7 & K-8). OEW has been **confirmed** by FWS and a local diver (see plate 3) as well as the ASR team (see photo J-22).

(5) Cayo Yerba's former usage is unknown. It is within the 1.5 mile impact area of Cayo del Agua. OEW was **confirmed** by FWS and the diver (see plate 3).

(6) Cayo Raton's former usage is unknown. It is 2000' from the impact area of Cayo del Agua. OEW was **confirmed** by FWS and a local diver (see plate 3).

(7) Former usage of El Mono is unknown. It is less than a mile from the impact area at Cayo Lobo. A local diver **confirmed** OEW in this subsite (see plate 3).

(8) Cayo Lobo was used for aerial bombing and rockets (see document E-7). Items dropped in 1974 for the Babcock electronic scoring system included the 2.75" rocket and the MK 76 and Mk 106 practice bombs. It is not known if live bombs were used previously. A 1934 Marine letter mentioned Cayo Lobo as a tentative site for experimental naval gunfire (see document F-3). OEW was **confirmed** in the subsite by FWS and a local diver (see plate 3).

(9) Cayo Lobito had a flight line approach marker for Los Gemelos. It is within the 1.5 mile impact area for Cayo Lobo. Interviews and documents did not indicate use as a target. OEW was **confirmed** in this subsite by FWS and a local diver (see plate 3).

(10) Alcarraza was used 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 Mk 83 1000 pound bombs (see document E-7). OEW was **confirmed** in this subsite by FWS and a local diver (see plate 3).

(11) Los Gemelos was used 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 (see document E-7). OEW was **confirmed** in this subsite by the diver (see plate 3).

(12) Cayo Botijuela's former usage is unknown. It is less than a mile from Alcarraza and within the 1.5 mile impact area. OEW was **confirmed** in this subsite by a local diver (see plate 3).

#### d. Area C: Naval Gunnery and Aerial Bombs and Rockets

(1) Overall, this area has **confirmed** ordnance contamination, based on direct witness, reliable indirect witness, and historical records. Sub-sites within this area were used as aerial and naval gunnery targets from 1935 until 1975, with known targets located on the eastern (bay) side of the peninsula. This was the only area with documented use by naval gunfire (see document E-7).

(2) Parts of the Flamenco Peninsula were used for aerial bombing, rockets, and strafing as well as naval gunnery, though aerial use ended in 1969 (see photos K-3, K-9, & K-12). Firing was directed from the Flamenco Point OP (see document E-7). The Marines also used the peninsula for training from 1903 to 1941, and it is likely they fired weapons there (refs B-97, B-98, & B-124). OEW was **confirmed** by FWS and a local diver (see plate 3) and the ASR team (see photo J-43).

(3) Former usage of Piedra Stevens is unknown. It is within the 1.7 mile naval gunnery impact area of Flamenco Peninsula as well as the 1.5 mile aerial bombing impact areas of Alcarraza and Los Gemelos. OEW was **confirmed** in this subsite by a local diver (see plate 3).

(4) Former usage of the Carlos Rosario Beach site is unknown. It is within the 1.7 mile impact area of the Flamenco Peninsula, all of which was owned by the Navy and used for aerial and naval gunnery. It is also within the 1.5 mile impact area of Cayo del Agua. OEW was **confirmed** in this subsite by FWS and a local diver (see plate 3).

(5) Flamenco Beach is on the southern edge of the property that was owned by the Navy and the two tanks were among

the targets used (see photos J-37, J-38, & K-11). The private beach property and lagoon to the east were outside of the Navy-owned property and apparently not targets. However, they fall within the 1.7 mile impact area for naval gunfire and aerial bombing. OEW was **confirmed** by the diver (see plate 2) and the ASR team (see photo J-39).

**e. Area D: Mortar Range**

This area is considered **confirmed** based on mortar fragments found by the ASR team (see photo J-52). This determination is also based on the interview of a local resident who described its use as an artillery range in the 1930s. There is no documentation on this range. The one known civilian fatality took place around 1935 when a boy died while playing with a dud found on this range (see document I-6).

**f. Area E: Airfield Rifle Range**

(1) A 1902 sketch shows a trail from Lower Camp going west to the "target range", which may be this site. More specific usage is based on a 1913 Marine map which shows "old rifle range" in this location (see document L-10) and later maps which in 1944 show "brick walls" (see document L-3) and in 1947 "ruins of brick walls" (see document L-4). A 1938 photo shows evidence of brick walls (see document K-14), and a 1968 photo shows what could be remnants of these walls (see photo K-3). A long-time resident described how in the 1920s & 1930s the soldiers used to fire rifles and pistols at targets that moved up and down (see document I-6). A much younger resident told of finding live bullets (in clips) near the airport (see document I-4).

(2) Historical records indicate that the airfield was built circa 1920. After that date, it is unlikely the Marines used explosive items (e.g. hand or rifle grenades) on this range. Fragments produced by these items could have damaged aircraft, punctured tires, or ignited fuel stores. In addition, a 1934 Marine letter requested an area in tract 91 (Flamenco Peninsula) for actual firing of infantry and light artillery weapons (see document F-2). The use of ordnance other than small arms (which is not considered OEW if expended) appears unlikely after 1920. However, earlier contamination cannot be ruled out, and it lies just outside of the 1.7 mile impact area for Flamenco Peninsula. This area is considered as **potential**.

**g. Area F: Southern Peninsula Rifle Range**

OEW contamination for this area is **potential**. The only reference for this area is the 1913 Marine map which shows "old

rifle range" on the end of the peninsula southeast of Culebra City, near the old coaling station (see document L-10). The use of ordnance other than small arms (which is not considered OEW if expended) cannot be ruled out. It is also possible that a stray bomb from area A or B could have landed here.

**h. Area G: Lower Camp**

This area is considered **potential**. It was used by the Navy and Marines beginning about 1905, and there were two structures used as magazines (see documents L-1 & L-2). The team did not find any OEW near these structures or anywhere else in the camp. DNR employees were not aware of any OEW burial sites, and no OEW has been reported there. However, since the site history goes back 90 years, the possibility of buried OEW exists anywhere on the camp. The camp is over a mile from any of the area A and B impact areas, but a stray round could have landed there (see plate 8).

**i. Area H: Lower Camp Dumps**

This area is considered **potential**. Two dumps (east and west) were used by the Navy when they closed the base. A third (southeast) shows in a 1943 aerial photo (see document K-16) and was excavated by FWS archeologists in 1992, and they found a fired bullet casing. DNR employees were not aware of OEW dumped at any of these sites. However, since DoD usage dates back to 1902, it is possible all three dumps were used for OEW. If there is buried OEW at the Lower Camp, the most likely location is in these dumps. The INPR identified the western dump as a potential HTRW site. This ASR also recommended the eastern and southeastern dumps as potential HTRW sites (see plate 8).

**j. Area I: Cayo Matojo**

This area is considered **potential**. The only source for information is a second-hand report from a transient FWS employee who though he saw OEW. This key is 1 1/2 miles east of Flamenco Point, in an area where no one has ever reported finding OEW. It is possible that a stray bomb, projectile, mine, or torpedo could have landed here, as has been documented in other instances (see table 4-2 and plate 4).

**k. Area J: Navy Gun Sites**

These sites are considered **potential** because of their likely former usage as coastal defense sites (see documents L-5 & L-7). The quitclaim deed to DNR refers to these as having mounts for 6-pounder, 4", and 5" guns (see document G-2). The site the team visited had what appeared to be two concrete gun mounts with

a trench in between. The owner reported finding military artifacts but no OEW and said that "1906" was marked on the trench wall (see document I-11). There is no proof that guns were actually emplaced on these sites nor any indication that OEW was buried, but the possibility exists. It is also possible that a stray round landed here, or that the Marines used these sites for training.

**l. Area K: Mining West**

This area is considered **potential** because of its former usage as a training area for mines dropped from aircraft between 1967 and 1969 (see documents E-7 and L-12). These were probably not HE mines, but drill mines containing signal flares and/or small buoys. The size of area K is based on the safety zone shown in document E-6. This area is in the same general location as the underwater brass dump HTRW project (see plate 4).

**m. Area L: Marine Water Minefields**

This area is considered **potential**. The locations of these minefields were obtained from a 1913 Marine map planning for a major exercise (see document L-10). There is no information that these mines were all actually emplaced, though other references describe mine-laying and mine-sweeping trials during this exercise. There was no information on whether they used live HE mines, practice mines with a small TNT charge, or inert shapes. Documents indicate that underwater mine training took place as early as 1903, but specific locations are unknown.

**n. Area M: Confirmed Water**

(1) This area is considered **confirmed** based on the interview of a local diver (see document I-9 & plate 3). He reported seeing OEW in the shallow areas of western Culebra Island between Punta Tamarindo and Punta Melones. There is no documented impact area here, and this OEW could be rounds fired at Flamenco Peninsula that overshot. The fact that the 1913 Marine map calls this area "Target Bay" (as does the current NOAA chart) does raise questions (see documents L-8 and L-10).

(2) This same diver also **confirmed** OEW in small areas south of Culebra City off Playa Sardinias. These items could be stray projectiles or bombs from areas B and C, or they could be mines from areas K or L. One source said Punta del Soldado had been used as a target for practice bombs in the early 1940s (see document I-1). This use of Punta Soldado was not confirmed in any other interviews or documents.

**o. Area N: All Other Water**

(1) This area is considered **potential**. Although the diver has not observed any OEW in this area, it is quite possible there is OEW buried in the sands. As shown in table 4-2, bombs or projectiles have been known to miss the target. With 80 years of known ordnance usage, there is a strong likelihood that additional bombs, rockets, projectiles, mines, or torpedos landed outside of their impact area.

(2) Included in this area is the water where coastal artillery may have been fired. The Army planned to emplace two 6" guns on Dolphin Head and Flamenco Peninsula. The Navy had 7 gun sites on southern Culebra that may have had 6 pounders, 4", and 5" guns (see document L-5). In addition, the 1913 Marine map (document L-10) shows firing arcs for numerous 3" and 5" guns that may or may not have been emplaced. If any of these guns actually existed, it is likely that they did practice firing out toward open water, using HE or practice rounds.

**p. Area O: All Other Land**

(1) This area is considered **potential**. Although there is no information to confirm ordnance on this area, there is enough information not to call it uncontaminated. As shown in table 4-2, bombs or projectiles have been known to miss the target. With 80 years of known ordnance usage, there is a strong likelihood that additional bombs, rockets, projectiles, mines, or torpedos landed way out of the impact area in areas that were not owned by the Navy.

(2) Historical records show there was almost constant Marine training from 1903 until 1940, but except for the two rifle ranges (areas E & F), these records are not clear in confirming specific locations of ordnance usage. The Navy owned the entire shoreline of Culebra Island, and it is likely the Marines used most of it to practice amphibious landings. The mortar range (area D) does not appear anywhere in historic records, although a 1925 property map implies that the Navy leased property in that general area (see document L-9). This map describes some of the property as "...supposedly belonging to the Navy Department", implying that their records weren't precise. It is possible that there are other Marine ranges that remain undiscovered.

(3) Specific military sites in this area include the Army gun site on Dolphin Head, the Marine gun sites and mine casemates shown in document L-10, the operations area located east of Flamenco Point (see documents L-6 & L-7), the airfield, and the coaling station. One non-military site is the downtown

residence with an ordnance display in her yard. The only part of area O not on Culebra Island is the western half of Cayo Norte.

**q. Area P: Flamenco Point OP**

This area is not eligible for consideration under DERP-FUDS. It is mentioned and a photo is included only because it was the central range control center.

**r.** Table 7-1 summarizes the OEW presence within each area and subsite.

**TABLE 7-1  
OEW PRESENCE**

Area & subsite	Confirmed	Potential	Comments
<b>A-1</b> Isla Culebrita	FWS & local diver	-	Large key with varied terrain. North beach is popular with boaters.
<b>A-2</b> Culebrita North Bay	FWS & local diver	-	Clear, shallow water. Popular with boaters.
<b>A-3</b> Cayo Botella	FWS, local diver, EOD, ASR team	-	Accessible w/light vegetation.
<b>A-4</b> Cayos Geniqui	FWS, local diver, EOD, ASR team	-	Two separate keys. One rugged and inaccessible. Other is accessible though rugged.
<b>A-5</b> Cayo Tiburon	FWS & local diver	-	Inaccessible and rugged.
<b>A-6</b> Cayo Ballena	EOD & local diver	-	Inaccessible and rugged.
<b>A-7</b> Cayo Sombrerito	Local diver	-	Inaccessible and rugged.
<b>A-8</b> Cayo Norte (eastern half)	Local diver (water)	-	Large key w/varied terrain. Privately owned by a part-time resident.
<b>A-9</b> Culebra Island (eastern segment)	One stray practice 20mm (table 4-2)	Within 1.5 mi of Cayo Botella and Culebrita	Eastern edge of Culebra. Varied terrain.
<b>B-1</b> Cayo de Luis Pena	-	Hit by long rounds 3x (table 4-2)	Large key w/varied terrain. Beaches are popular with boaters.
<b>B-2</b> North Bay, Cayo de Luis Pena	FWS & local diver	-	Clear, shallow water. Popular with boaters.
<b>B-3</b> Cayo del Agua	FWS, local diver, & ASR team	-	Accessible with light vegetation.

**TABLE 7-1  
OEW PRESENCE**

Area & subsite	Confirmed	Potential	Comments
<b>B-4</b> Cayo Yerba	FWS & local diver	-	Inaccessible and rugged.
<b>B-5</b> Cayo Raton	FWS & local diver	-	Inaccessible and rugged.
<b>B-6</b> El Mono	Local diver	-	Inaccessible, tiny, & rugged.
<b>B-7</b> Cayo Lobo	FWS & local diver	-	Accessible w/large grassy target area and rugged coast.
<b>B-8</b> Cayo Lobito	FWS & local diver	-	Inaccessible with rugged shore and grassy hilltop.
<b>B-9</b> Alcarraza	FWS & local diver	-	Inaccessible, extremely rugged.
<b>B-10</b> Los Gemelos	Local diver	-	Two keys: One small, one tiny. Both inaccessible and rugged.
<b>B-11</b> Cayo Botijuela	Local diver	-	Inaccessible and rugged.
<b>C-1</b> Flamenco Peninsula	FWS, local diver, & ASR team	-	Large peninsula w/varied terrain. Hills w/dense vegetation and some rugged coast. Some popular beaches.
<b>C-2</b> Flamenco Beach (Note: A three acre site on part of this beach is an interim removal project.)	Diver and ASR team	-	Accessible, popular beaches.
<b>C-3</b> Carlos Rosario Beach	FWS & local diver	-	Accessible and popular with boaters.
<b>C-4</b> Piedra Stevens	Local diver	-	Inaccessible and rugged.
<b>D</b> Mortar range	ASR team	-	Remote grazeland, hilly.
<b>E</b> Airfield rifle range	-	Based on maps and interviews.	Dense vegetation. Adjacent to airport and housing area.

**TABLE 7-1  
OEW PRESENCE**

Area & subsite	Confirmed	Potential	Comments
<b>F</b> Southern rifle range	-	Based on a 1913 map.	Dense vegetation, scattered houses.
<b>G</b> Lower Camp	-	Had two magazines, goes back to 1902.	Light to moderate vegetation. Used as DNR & FWS headquarters.
<b>H</b> Lower Camp dumps	-	Three known dumping areas.	Same as area G.
<b>I</b> Cayo Matojo	-	Second-hand report from FWS.	Inaccessible and rugged. Not near any impact area.
<b>J</b> Navy Gun sites (7)	-	Likely sites of 6 lb, 4" & 5" guns.	7 separate sites. One near a house, others all over Southern Culebra.
<b>K</b> Mining west	-	Used as aerial mining range.	Open water. Above a potential HTRW site (brass dump).
<b>L</b> Marine water minefield	-	Based on 1913 map and other documentation.	Primarily open water.
<b>M</b> Confirmed water	Local diver	-	Shallow coastal water.
<b>N</b> All other water	-	Possible contamination	Mostly north and south of Culebra.
<b>O</b> All other land	-	Possible contamination	On Culebra and Cayo Norte.
<b>P</b> Flamenco Point OP	still Navy-owned,	not FUDS-eligible,	not evaluated

8. SITE ORDNANCE TECHNICAL DATA

a. **End Item Technical Data**

(1) Historical records show that the Marines carried and fired numerous types of weapons on Culebra between 1901 and 1941. The only mention of CWM is during a 1924 exercise which included gas troops. Table 8-1 provides a listing of Marine weapons specifically mentioned in references. These items may not be found on Culebra, and items not listed may be found. Drawings of some of these rounds may be found in appendix D.

TABLE 8-1 USMC WEAPONS/ORDNANCE		
Type	Typical charge	Filler
Small arms up to .50 cal	Ball, blank, armor-piercing	Solid
75mm pack howitzer, 3"/50 & 5"/40 guns, 81mm mortar, 155mm howitzer	HE WP Smoke Practice	TNT or other White phosphorous Smoke mixture Sand or solid
Mine, contact or dormant controlled	HE Practice	TNT or other Sand

(2) Records indicate that the Army and the Navy may have installed fixed coastal defense weapons on Culebra. Table 8-2 provides a listing only of the specific coastal weapons mentioned in historic references. These items may not be found on Culebra, and items not listed may be found. Drawings of some of these rounds may be found in appendix D.

TABLE 8-2 COASTAL DEFENSE WEAPONS		
Type	Typical charge	Filler
<b>Army:</b> 6"	HE AP Practice	TNT or other Explosive D Solid or sand
<b>Navy:</b> 4", 5", 6 pounder	HE AP Practice	TNT or other Explosive D Solid or sand

(3) Navy records confirm that live and drill torpedos were fired at Cayos Geniqui and at Culebrita. Table 8-3 provides a listing of torpedos from a 1959 letter and EOD reports. All these items may not be found on Culebra, and items not listed may be found. Drawings of some of these rounds may be found in appendix D.

TABLE 8-3 SUBMARINE-LAUNCHED TORPEDOS		
Model	Range, yards	Warhead, HE
MK 14-3A	9,000	643 lbs
MK 16-6, -7	11,000	746 lbs
MK 27-4	5,000	95 lbs
MK 28-3	4,000	585 lbs
MK 15	unknown	drill

(4) Navy records confirm that numerous types of weapons were fired in surface gunnery practice over a 40 year period, including weapons from foreign ships. A 1972 report estimated that 750,000 rounds had been fired at the Flamenco Peninsula. Table 8-4 provides a listing of items specified in Navy documents, primarily for 1969. These items are likely to be found in and around Culebra, and items not listed may also be found. Drawings of some of these rounds may be found in appendix D.

TABLE 8-4 SURFACE GUNNERY ORDNANCE		
Type	Typical charge	Filler
40mm gun, 81mm mortar,	HE	TNT or other
3"/50, 5"/38, 5"/54,	WP	White phosphorous
6"/47, 8"/55, "up to	HC (high capacity)	Expl D or other
and including 16"/50"	HC (smoke)	Smoke mixture
	AP	Explosive D
	Illuminating	Magnesium
	Practice	Solid

(5) Navy records confirm extensive aerial weapons training over a 40 year period, with use by Marine, Navy, Air Force (B-52s), Air National Guard (F-104 & T-28), and Royal Air Force (UK) aircraft. A 1972 report estimated that 320,000 units of aerial ordnance were delivered on the Culebra ranges. Table 8-5 provides a listing of items specified in Navy documents, primarily for 1969. Items not listed are likely to be found as well. Drawings of some of the items may be found in appendix D.

**TABLE 8-5  
AERIAL ORDNANCE**

Type	Typical charge	Filler
Cartridge, 20mm	HE	RDX or tetryl
	HEI	RDX & incendiary mix
	Practice	Inert
Rocket, 2.75" FFAR	HE	HBX or other
	WP	White phosphorous
	Practice	Inert
Flares, parachute, Mk 44 & Mk 45	Illuminating charge	Pyrotechnic composition
Practice bombs, Mk 76 & Mk 106	Smoke signal Mk 4 or CXU-3	Titanium tetrachloride
Bomb GP, Mk 82/83	190/445 lbs HE	Tritonal, TNT, Comp B, or Amatol
Bomb, 2000 lb, practice	None or spotting charge	Inert or titanium tetrachloride
Bombs, 28 to 1000 lb (UK)	Unknown	Unknown
Rocket, 2" (UK)	Unknown	Unknown
Bullpup missile (AGM-12)	Live motor, inert warhead	Inert
Mine, aerial	Drill	Signal flare

(6) Although the team was unable to locate range clearance records, there were documents found that verified the presence of certain munitions. Table 8-6 is a listing of items documented by EOD reports as well as OEW viewed by the ASR team.

TABLE 8-6 ORDNANCE VERIFIED		
Item	Location	Comments
<b>EOD:</b>		
Expended Mk76 & 106	Cayo Botella	Surface, 16 Mar 73
Mk 27 HE torpedo	E of Cayos Geniqui	Water, 19 Jan 83
2 500 lb HE bombs	W of Cayos Geniqui	Water, 19 Jan 83
500 lb HE bomb	W of Cayo Ballena	Water, 19 Jan 83
<b>ASR Team:</b>		
.50 cal brass	Flamenco Peninsula	On hillside trail
Mortar fragments, possibly 3" Stokes	Mortar range	See photo J-52 18° 18' 58" N 65° 16' 8" W
5" & 6" projectiles Mk 76, 81mm fins	Residence in downtown Culebra	See photos J-62 thru J-64
5" projectile	DNR headquarters	See photo J-54
5" rocket	Flamenco Peninsula	See photo J-43 18° 20' 22" N 65° 20' 5" W
11.75" Tiny Tim aerial rocket	Flamenco Beach	See photo J-39 18° 20' 10" N 65° 19' 28" W
Mk 76, Mk 106, HE bomb frags & fins, Mk 80 series bomb	Cayo Botella	Water and surface see photos J-6 thru J-8
Mk 76, bomb frags	Cayo del Agua	See photo J-22
Mk 14/15 fin	Cayos Geniqui	See photo J-11

## b. Chemical Data of Ordnance Fillers

Because of the extremely wide variety of munitions used in and around Culebra, a complete listing of fillers would be impractical. It is likely that nearly every type of non-nuclear filler in the Navy inventory was used at Culebra. Table 8-7 provides a partial list of common fillers.

**TABLE 8-7**  
**CHEMICAL DATA OF ORDNANCE FILLERS**

Energetic Material	Synonyms	Chemical Compounds
TNT	2,4,6-trinitrotoluene	$C_7H_5(NO_2)_3$
Explosive D (Ammonium Picrate)	Ammonium 2,4,6-trinitrophenolate	$C_6H_2(NO_2)_3NOH_4$
Amatol 50/50 50% TNT 50% Ammonium Nitrate	See above AN	See above $NH_4NO_3$
Composition B 60% RDX 39% TNT 1% wax	Cyclotrimethylene-trinitramine See above	$C_3H_6N_3(NO_2)_3$ See above
Picratol 52% Ammonium Picrate 48% TNT	Ammonium 2,4,6-trinitrophenolate See above	$C_6H_2(NO_2)_3NOH_4$ See above
Tritonal 80% TNT 20% flaked aluminum	See above	See above Al
RDX	Cyclotrimethylene-trinitramine	$C_3H_6N_3(NO_2)_3$
Tetryl	2,4,6-Trinitrophenyl-methylnitramine	$C_6H_2(NO_2)_3N NO_2CH_3$
HC	Hexachloroethane	Zn + $C_2Cl_6$
WP	White phosphorous	P
Napalm	Napthenic palmitic	

## 9. OTHER ENVIRONMENTAL HAZARDS

### a. **Hazardous, Toxic, and Radiological Waste**

(1) The INPR recommended an HTRW project on the west side of the Lower Camp. There are two additional Navy dumps on the east and southeast sides which should also be considered as HTRW projects (see plate 8 and photos J-56, J-57, & K-16). In addition, a 1953 map (document L-2) shows a 3000 gallon gasoline tank (no. 37, location E-5) and a 500 gallon tank (no. 51, location D-3) at the camp. These tanks also appear on a 1950 map (ref B-82). The ASR team was not aware of these tanks during the site visit and did not verify their presence. They should be considered for a potential CON/HTRW project (see plate 8).

(2) Real estate documents indicate that the Navy modified the old Culebrita lighthouse into an OP in 1965 (see photo K-7). Improvements included a helicopter pad, aircraft beacon, optical landing system, electric power plant, stand-by generator plant, fuel storage and septic tanks, and a sanitary sewer line (refs B-10 & B-66). The ASR team did not visit the OP area to verify their presence, but these facilities appear to be on the four-acre site that now belongs to the Coast Guard. Ms. Tallevast of Fish & Wildlife (who own the remainder of Culebrita) was unaware of any HTRW problems from this site but could not confirm that the tanks had been removed. This should be considered for a potential CON/HTRW project (see plate 5).

(3) There was also an OP constructed at Cayo de Luis Pena (see photo K-10). Real estate documents show that the Navy had an observation building, storage building, microwave building, generator building, four radar vans, Nike-Ajax radar, a house trailer, sanitary sewer, and fuel and water storage tanks (refs B-54 & B-60). The ASR team did not visit the OP area. Ms. Tallevast of Fish & Wildlife (who own the entire island) was unaware of any HTRW problems but could not confirm the tanks had been removed. This should be considered for a potential CON/HTRW project (see plate 6).

(4) The Navy had a spotting station located at Duck Point on the eastern side of Culebra. Real estate records indicate the Navy constructed an observation shelter, helipad, toilet, and generator shed (ref B-47). There is no mention of fuel storage tanks, but any generator would need fuel. The ASR team did not visit this site. There is a possibility there are tanks at this site, and it should be considered for a potential CON/HTRW project (see plate 5).

(5) An experienced scuba diver reported there is an underwater dump southeast of Cayo de Luis Pena (see plate 6 and document I-9). He reported that there are large quantities of expended cartridge cases (brass) there. If the Navy used this area as a dump for brass, it is possible they also dumped other material, and the area should be considered for a potential HTRW project in addition to the OEW considerations. This dump is in the same general area as the Mining West range (area K).

(6) Although the abandoned Flamenco Point OP is still owned by the Navy and not FUDS-eligible, documents indicate that the Navy had facilities outside of this 87 acre site (refs B-54 & B-59). One map shows a generator/transformer station and also a gasoline tank just south of the former OP on FUDS-eligible property. The ASR team drove by this site but did not notice if transformers or the gas tank were still present. There is a possibility the tank and transformers remain, and this site should be considered as a potential CON/HTRW project (see plate 6). Table 9-1 summarizes all the potential HTRW projects.

#### **b. Building Demolition/Debris Removal**

Most of the permanent construction was at the Lower Camp, Area. Some of the remaining structures are in poor condition, but they do not appear to pose a hazard. The ASR team did observe about 6 heavy metal poles in the water west of Culebrita, which were used to support strafing targets (see photo J-3 and plate 5). The poles protrude 1' out of the water and are not marked on navigational charts. It is recommended that these poles be considered for a BD/DR project, as their existence presents a hazard to small craft. This information is summarized in table 9-1.

**TABLE 9-1**  
**POTENTIAL HTRW & BD/DR CONSIDERATIONS**

LOCATION	SI/Classification	COMMENTS
Lower Camp	Southeastern and eastern dumps (C) HTRW	See photos J-56 & K-16, doc L-2, and plate 8
Lower Camp	Fuel tanks (P) CON/HTRW	See doc L-2, plate 8
Culebrita OP	Fuel tanks (P) CON/HTRW	See plate 5 & photo K-7 (USCG property)
Luis Pena OP	Fuel tanks (P) CON/HTRW	See plate 6 & photo K-10
Duck Point Spotting Station	Fuel tanks (P) CON/HTRW	See plate 5
SE of Luis Pena	Brass dump (C) HTRW	See plate 4, doc I-9
Flamenco Point OP generator site	Gasoline tank (P) transformers (P) CON/HTRW	See plate 6 (on FUDS eligible property)
Culebrita Beach	Metal poles (C) BD/DR	See plate 5 & photo J-3
(C): Existence Confirmed      (P): Existence Potential		