

**Final**

**Action Memorandum  
Non-Time Critical Removal Action  
in the Surface Impact Area**

**Former Vieques Naval Training Range  
Vieques, Puerto Rico**



Prepared for

**Department of the Navy  
Naval Facilities Engineering Command  
Atlantic Division**

Contract No.  
N62470-08-D-1000  
CTO-023

**September 2009**

Prepared by

**CH2MHILL**

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**Virginia Beach, Virginia**

**DATE:** February 6, 2009

**SUBJECT:** Non-Time Critical Removal Action in the Surface Impact Area

This Action Memorandum documents approval for the non-time critical removal Action (NTCRA) as described herein for the Munitions Response Area recognized as the Surface Impact Area (SIA) at the Former Vieques Naval Training Range, Vieques, Puerto Rico.

This Action Memorandum serves to identify the response action chosen for implementation at the SIA. The following work plan: *Final Non-Time Critical Removal Action Work Plan, Surface Munitions and Explosives of Concern at Munitions Response Area-Surface Impact Area, Munitions Response Sites 1 through 7, Former VNTR, Vieques, Puerto Rico, January 2009* details the methods and procedures to be followed during execution of the NTCRA. This Decision Document substantiates the need for the selected remedial action at the SIA and was developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) as amended, and is consistent with the National Oil and Hazardous Substance Pollution Contingency Plan (NCP).

Land surface conditions within the SIA meet the NCP section 300.415(b)(2) criteria for conducting a removal action and the NAVFAC Vieques MR Team recommends approval of the proposed removal action. The total estimated cost to complete the entire NTCRA is estimated to be \$29,088,446. Response actions to finalize the NTCRA should be expedited to minimize safety risks within the SIA.

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- A Final SIA Surface Removal EE/CA (electronic)
- B Final Non-Time Critical Removal Action Work Plan, Surface Munitions and Explosives of Concern at Munitions Response Area-Surface Impact Area, Munitions Response Sites 1 through 7, Former VNTR, Vieques, Puerto Rico, January 2009 (electronic)
- C Public Notice

# Acronyms and Abbreviations

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AFWTF	Atlantic Fleet Weapons Training Facility
AMSL	Above Mean Sea Level
ATG	Air-to-Ground
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CSM	Conceptual Site Model
CFR	Code of Federal Regulations
DoD	Department of Defense
DOI	Department of Interior
DoN	Department of Navy
ECA	Eastern Conservation Area
EE/CA	Engineering Evaluation/Cost Analysis
EMA	Eastern Maneuver Area
EQB	Environmental Quality Board
ESS	Explosive Safety Submission
EZ	Exclusion Zone
HE	High Explosives
LIA	Live Impact Area
MC	Munitions Constituents
MD	Munitions Debris
MEC	Munitions and Explosives of Concern
MPPEH	Munitions Posing a Potential Explosive Hazard
MR	Munitions Response
MRA	Munitions Response Area
MRS	Munitions Response Site
NAVFAC	Naval Facilities Engineering Command
NGFS	Naval Gunfire Support
NPL	National Priorities List
NTCRA	Non Time Critical Removal Action
OE	Ordnance Explosives
OP	Observation Point
ORS	Ordnance-Related Scrap
PREQB	Puerto Rico Environmental Quality Board
SAM	Surface to Air Missile
SIA	Surface Impact Area
SUXOS	Senior UXO Supervisor

USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UXO	Unexploded Ordnance
UXOSO	UXO Safety Officer
VNTR	Vieques Naval Training Range

## I. Purpose

This Action Memorandum documents approval for a non-time critical removal action (NTCRA) for the Munitions Response Area (MRA) recognized as the Surface Impact Area (SIA) at the former Vieques Naval Training Range (VNTR) on Vieques, Puerto Rico. The Engineering Evaluation/Cost Analysis (EE/CA) (CH2M HILL, October 2008; Attachment A) and the Final Non-Time Critical Removal Action Work Plan, Surface Munitions and Explosives of Concern at Munitions Response Area-Surface Impact Area, Munitions Response Sites (MRSs) 1 through 7, Former VNTR, Vieques, Puerto Rico, January 2009 (CH2M HILL, January 2009; Attachment B) focus on the health and safety issues in the SIA related to munitions and explosives of concern (MEC), which present an acute exposure hazard. Considering the ease of accessibility the SIA from trespassers who come ashore from boats and gain access from municipal areas, the NTCRA presents the most effective alternative to address the imminent hazard associated with the MEC. The MEC exist on the ground surface and must be removed to be protective of human safety before any further characterization of the land can be safely completed.

The Engineering Evaluation/Cost Analysis (EE/CA) (CH2M HILL, October 2008; Attachment A) and the Final Non-Time Critical Removal Action Work Plan, Surface Munitions and Explosives of Concern at Munitions Response Area-Surface Impact Area, Munitions Response Sites 1 through 7, Former VNTR, Vieques, Puerto Rico, January 2009 (CH2M HILL, January 2009; Attachment B) focus on reducing risks to human health associated with the MEC through minimizing the potential for human contact. This action will reduce the potential for unauthorized persons in the SIA to come into contact with MEC. This Action Memorandum serves as the Decision Document for the EE/CA for the SIA and for the Navy to conduct the work proposed therein. The alternatives evaluated in the EE/CA are provided below:

- **Alternative 1** - No action
- **Alternative 2** - Engineering controls to prevent access by unauthorized personnel.
- **Alternative 3** - Removal of surface detected MEC from select areas within the MRA-SIA with a high potential for trespassing.

This Action Memorandum was completed in accordance with the remedial program requirements defined by the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) as amended, the Superfund Amendments and Reauthorization Act of 1986 (SARA), the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and the U.S. Environmental Protection Agency's (USEPA) Superfund Removal Procedures Action Memorandum Guidance (USEPA, 1990).

The Department of the Navy has broad authority under CERCLA Section 104 and Executive Order 12580 to carry out remedial actions when the release is on the Department of Navy (DoN) installation, or the sole source of the release is from, the DoN installation. The Navy Installation Restoration (IR) Program was initiated to identify, assess, characterize, and clean up or control contamination from past hazardous waste disposal operations and hazardous material spills at Navy and Marine Corps activities. This Action Memorandum follows the guidelines published in the March 2001 *Navy/Marine Corps IR Manual* (Naval Facilities Engineering Services Center [NFESC], 2001) and the USEPA *Guidance on*

*Conducting Non-Time-Critical Removal Actions Under CERCLA* (USEPA, 1993). This Action Memorandum addresses a NTCRA for conducting surface munitions removal actions to address explosive hazards of munitions that have been identified, through previous investigations, as potentially posing a high explosive safety risk at the former VNTR.

Following completion of this NTCRA in the SIA, an additional evaluation of the SIA will be performed to determine if any additional responses are necessary. An additional decision document will be produced prior to site closure.

## **II. Site Conditions and Background**

This section presents an evaluation of the site of the proposed NTCRA, its location and characteristics, and current National Priorities List (NPL) status. This section also reviews any previous and current actions conducted by the Navy within the SIA and briefly discusses roles of the stakeholders involved with the Munitions Response Program for the Former VNTR.

### **A. Physical Location**

Vieques is located in the Caribbean Sea approximately 7 miles southeast of the eastern tip of the island of Puerto Rico and 20 miles southwest of St. Thomas, U.S. Virgin Islands. Vieques is the largest offshore island of the Commonwealth of Puerto Rico. It is approximately 20 miles long and 4.5 miles wide, and has an area of approximately 33,088 acres (51 square miles). Figure 1 shows the location of Vieques with respect to the island of Puerto Rico.

The former VNTR is situated in the eastern half of the Island of Vieques, and is bordered on the west by the community of Isabel Segunda, to the north by Vieques Sound, and to the south by the Caribbean Sea. The former VNTR consist of approximately 14,500 acres and is divided operationally into four MRAs that (from west to east) include: the Eastern Maneuver Area (EMA), an area approximately 10,673 acres; the SIA, approximately 2,500 acres; the 900-acre Live Impact Area (LIA) and the 200-acre Eastern Conservation Area (ECA) on the easternmost tip of Vieques. Figure 2 presents a site map of VNTR.

### **B. Site Description**

The SIA was established in the 1950s when several Marine targets were constructed at various locations across the area. Marine artillery ranging from 76 millimeter (mm) to 175mm was directed toward these targets from artillery gun positions within the SIA and EMA. During 1969, the construction of bulls-eye targets 1 and 2 established the eastern and western boundaries of the SIA. At that time, a permanent observation post (OP) with a helicopter pad was also constructed on Cerro Matias. In 1971, a strafing target was installed adjacent to one of the targets. The aerial photograph analysis identified numerous craters within the eastern two-thirds of the SIA that were caused by mortar and artillery fire, naval gunfire, and aerial bombing; these craters were most visible on the 1962 aerial photographs. In addition, the aerial photograph analysis identified several artillery gun positions and observation points (Ops) within the SIA that may have been used for artillery fire (CH2M HILL, 2006).

## C. Removal Site Evaluation

Previous investigations identified potential unacceptable risks due to the presence of MEC on the ground surface in the SIA. A chronological summary of the studies, investigations, and evaluations including the SIA is provided below.

### Preliminary Range Assessment

Nineteen MEC areas were investigated within the former VNTR as part of the Preliminary Range Assessment (CH2M HILL, 2003), an analysis of historical aerial photographs, and interviews of personnel identified 43 additional potential MEC areas within the former VNTR boundaries. These areas include five potential ranges, 32 mortar or artillery gun positions, four observation posts, and two munitions storage areas.

The information from the field reconnaissance, archive search and the aerial photo analysis was evaluated to develop the MEC portion of a conceptual site model (CSM) for the former VNTR. The CSM indicated that the entire 900 acres of the LIA had been impacted by MEC from air-to-ground (ATG) ordnance delivery and naval gunfire. The activities of the LIA have also potentially impacted the 200 acres of the adjacent ECA. The aerial photo analysis identified numerous craters within the entire 2,500 acres of the MRA-SIA which were caused by mortar and artillery fire, naval gunfire and aerial bombing. Safety fans developed for the six ranges and several artillery fans within the EMA were potentially impacted by MEC.

The roads and beaches addressed in this EE/CA are those that are located within the MEC impacted areas of MRA-SIA within the former VNTR.

### Expanded Range Assessment and Phase I Site Inspection Report

An Expanded Range Assessment and Phase I Site Inspection (CH2M HILL, 2007) was conducted to prioritize future munitions response actions. The beaches (Beach Area) within the range fan area and MRSs in the MRA-LIA, MRA-SIA, and MRA-EMA were evaluated to determine potential risks posed by MEC at the sites. A summary of the results of the investigation are presented below. The MRS locations are shown on Figure 2.

MRA-SIA MRS 1 was the only MRS inspected in the MRA-SIA as part of the ERA and Phase I SI. A potential for exposure to explosive hazard exists at the MRA-SIA MRS 1 (based on a site inspection of approximately 25 percent of that MRS) based on the high explosive (HE) hazard associated with the surface MEC identified at the MRS. However, access to the areas is limited or very difficult due to very dense vegetation and rough terrain (e.g., steep slopes). The subsurface was evaluated at MRS 1 using handheld magnetometers and a total of 30 subsurface anomalies were located, which is only slightly more than 1 anomaly/acre, which is a low density.

### MRA-SIA Phase II

A total of seven MRSs, two photo-identified (PI) Sites, and one potential area of concern (PAOC) site were inspected as part of the Phase II SI. A potential for exposure to explosive hazard exists at the MRA-SIA MRSs 2 through 7 (based on a transect evaluation of the MRSs) because of the HE hazard associated with the surface MEC identified at the MRSs. Transects walked through the MRA-SIA identified 1,055 projectiles/mortars, 229 bombs,

141 flares/pyrotechnics, 6 grenades, 222 MEC components, 137 rockets/missiles, and 323 munitions debris (MD)/range related debris items (approximate weight of 173, 342 lbs) on the ground surface. Access to the interior area of the MRA-SIA is limited or very difficult due to dense vegetation and rough terrain (e.g., steep slopes).

#### **D. Site Characteristics**

The topography of Vieques is characterized by gentle to steep rolling hills and valleys throughout the island, with the eastern side exhibiting a more rugged terrain. Figure 3 illustrates the topography of the VNTR. The SIA is relatively flat with elevations ranging from 0 to approximately 50 ft above mean sea level (amsl). The coastal area is relatively narrow; however, the southern coast exhibits wider expanses of beach.

Vegetative cover on the SIA varies from thick shrub vegetation to tall grasses. The shrub canopy consists primarily of deciduous trees, with the non-native mesquite dominating the species distribution. A number of tree species are thorny, and low-lying brush is present throughout. Tall grasses also populate the landscape in areas where the thorny tree and brush species have not populated.

The Navy has owned portions of Vieques since 1941, when land was purchased for use as an ammunition storage facility in support of World War II training requirements. Although the Island of Culebra was the focal point for naval gunfire in the 1960s and early 1970s, VNTR, formerly known as the Atlantic Fleet Weapons Training Facility (AFWTF), began developing facilities on the eastern end of Vieques in 1964, when it established a gunnery range in the LIA, also known as the Air Impact Area, and began construction of Observation Point (OP) 1 on Cerro Matias the following year.

In 1965, ATG training activity began in the MRA-LIA where several mock-ups, such as old tanks and vehicles, were used as targets for aerial bombing. Since the mid-1970s, naval gunfire was practiced at the MRA-LIA, where several point and area targets for ships were constructed. Locations of the ATG bombing targets and the naval gunfire targets in the MRA-LIA are shown on Figure 4. Based on the naval gunfire and ATG gunfire that occurred from the 1970s through 2003, the entire 900 acres of the LIA has been impacted by MEC.

By the 1970s, the LIA maintained several targets for aerial bombing including old tanks and vehicles used as mock-ups, two bulls-eye targets and a strafing target. Additionally, several point and area targets for ships to practice naval gunfire support (NGFS) were established in the LIA. The locations of these targets are shown on Figure 4.

### **III. Release or Threatened Release into the Environment of a Hazardous Substance, Pollutant, or Contaminant**

As mentioned in previous sections virtually the entire MRA-SIA exhibits a relatively high degree of risk from exposure to explosive hazards. While the threat of release of contamination in the traditional sense is considered minimal there is a high threat from the possibility of unintentional detonation of the MEC present on the ground surface of the MRA-SIA. Once the risk of exposure to explosive hazards has been lessened or removed, assessment of more traditional environmental contamination can proceed.

## **IV. National Priorities List Status**

On March 14, 2005, areas on and around Vieques Island were placed on the NPL. The cleanup activities at federal or formerly federal facilities that are listed on the NPL are funded by the responsible federal agency, such as the Navy in the case of Vieques.

With the listing on the NPL and the creation of an FFA, all future environmental restoration activities on Vieques will be conducted under CERCLA, with EPA as the lead regulatory agency. Although the Navy will continue to conduct investigations and cleanup activities, EPA is responsible for oversight to ensure investigation and cleanup activities are conducted in accordance with applicable laws and regulations.

## **V. Maps, Pictures, and Other Graphical Representations**

Several figures that provide graphical representation of the MRA-SIA and its surroundings are provided both in this Action Memorandum and the EE/CA (Attachment A). The figures included with this memorandum are:

- 1 Regional Location Map
- 2 Former VNTR Site Map
- 3 Topography of the former VNTR
- 4 Map of Range Related Site Features
- 5 Surface MEC Removal Action Areas with MRA-SIA
- 6 MRA-SIA-ERA/SI Surface Findings

## **VI. Summary of Actions to Date**

### **A. Previous Actions**

Other than standard range maintenance during the time when the former VNTR was operational, there have not been any actions to date in the MRA-SIA.

### **B. Current Actions**

There are no current actions. The near-future removal action is described herein and in the EE/CA (CH2M HILL, 2008; Attachment A).

## **VII. State and Local Authority's Role**

### **A. State and Local Actions to Date**

A site or facility can be placed on the NPL if the site scores sufficiently high on EPA's Hazard Ranking System (based on preliminary investigation) or if the Governor of a state or territory requests EPA to list the site; each state and territory can designate one top-priority site, regardless of Hazard Ranking System scores.

In 2003, the Governor of Puerto Rico requested that EPA list certain areas of concern in and around Vieques and Culebra on the NPL. On May 26, 2004, the President of the Puerto Rico Environmental Quality Board (EQB) sent a letter to the Regional Administrator of EPA, "clarifying "... the specified land areas as well as the waters and keys in and around the municipalities of Vieques and Culebra" that the Commonwealth of Puerto Rico and the Navy had agreed to. On February 11, 2005, EPA published a final rule in the Federal Register that adds the Vieques portion to the NPL as a new site.

Initial investigations are focusing on these NPL "Agreed Areas" in and around Vieques "that potentially contain CERCLA hazardous substances, pollutants or contaminants left from past military activities" (70 *Federal Register* 7182, February 11, 2005). They include eight sites on western Vieques, all of the former VNTR on the eastern Vieques, and certain underwater areas that are broadly defined pending further investigation (see Figure 2). In accordance with standard practice for NPL listing, the description of the NPL listed areas is not a fixed boundary, but is subject to change as more information is gathered on the nature and extent of contamination (70 *Federal Register* 7182, February 11, 2005; EQB letter to EPA dated May 26, 2004).

## **B. Potential for Continued State/Local Response**

The Federal Facility Agreement (FFA) for Vieques has been developed and signed by the Navy (as the responsible party), EPA (as the lead regulatory agency), EQB (as the local regulatory agency), and DOI (and the land administrator). The purpose of the FFA is to ensure that potential environmental contamination from past activities are evaluated and cleanup actions are implemented, as necessary, to protect human health and the environment. The FFA also formally establishes the procedural framework and schedule for carrying out these activities.

The Navy will continue to be the lead agency and the Navy's Installation Restoration Program will continue to be the exclusive source of funding for remedial actions for the Former VNTR. As members of the CERCLA Technical Committee the Department of Interior (USFWS), the U.S. EPA (Region II) and the Commonwealth of Puerto Rico (Environmental Quality Board) will continue to provide technical support and oversight until actions addressing the contaminated area are complete.

## **VIII. Threats to Public Health, Welfare or the Environment, and Statutory and Regulatory Authorities**

Section 300.415 of the NCP lists the factors to be considered in determining the appropriateness of a NTCRA. Paragraph (b)(2)(i) of Section 300.415 applies to the conditions as follows:

- 300.451(b)(2)(i) Actual or potential exposures to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants.

The ground surface of the MRA-SIA has a significant population of MEC and, considering the degree of human trespassing, there is the potential for direct exposures to MEC in the absence of a removal action.

## **IX. Endangerment Determination**

The exposure from explosive hazards, if not addressed by implementing the response action discussed in this Action Memorandum, may present an endangerment to the safety and welfare of humans who lawfully or unlawfully enter the MRA-SIA.

## **X. Proposed Actions and Estimated Costs**

### **A. Proposed Actions**

The removal action alternative would include the removal of all surface MEC from selected areas throughout the MRA-SIA. The areas identified for surface MEC removal are:

- The roadways throughout the MRA-SIA plus 100 meters each side. Because of the steep terrain and dense vegetation in the SIA it is unlikely that unauthorized users will access the central portion of the SIA. Therefore, a 100 meter clearance area along each side of the roads is expected to significantly reduce the explosive risk in areas off the roadways that could reasonably be accessed by unauthorized personnel/recreational user.
- The shoreline inland 100 meters. Because of the steep terrain and dense vegetation in the central portion of the SIA, it is unlikely that unauthorized users will access this area. However, several recreational boaters have been documented to trespass in the SIA from the shoreline. Therefore, a 100 meter clearance inland from the shoreline is expected to significantly reduce the explosive risk in areas off the beaches that could reasonably be accessed by unauthorized personnel/recreational users.
- From the eastern boundary of the SIA westward to the approximate extent of where high-explosives containing bombs are expected to be located based on the ERA/SI data. The eastern portion of the MRA-SIA transects show a mix of MEC items that are similar to that found in the MRA-LIA, specifically high explosive bombs. Therefore, this entire area will be surface cleared to reduce risk. There are also a number of access routes through this area (e.g., road to OP-1) that present access points for authorized and unauthorized personnel. The northwestern portion of the MRA-SIA contains a number of practice bombs (e.g., BDU-33) as shown on Figure 6; however, these items do not pose the same high explosive hazard as the items located in the more eastern portion of the MRA-SIA. The BDU 33 type practice bombs are not fitted with a sensitive fuze. However, if the BDU 33 failed to function upon impact, it may still contain a few grams of energetic material that can function when disturbed.

A majority of the site will not require site restoration following the clearance activities; however, some restoration may be required in beach areas or other sensitive habitat/ecological areas depending on the extent of removal activities required.

## **Proposed Action Description**

The following Definable Features of Work present the general activities proposed in association with the NTCRA of the MRA-SIA.

### ***Mobilization***

A mobilization period is necessary to organize and train project staff and to inventory and test equipment.

### ***Project Site Layout***

Following an initial reconnaissance of the work area, the survey team will locate and mark the site boundaries with stakes and establish ground controls in accordance with the location, surveying, and mapping plan. The project site will be divided into grids measuring 30 meters by 30 meters. In areas where terrain and vegetation conditions permit, adjacent grids may be combined and addressed as a single grid.

### ***Site Preparation***

A survey team will perform initial reconnaissance of the site upon mobilization. During the initial reconnaissance, the survey team will examine the site to determine the amount of vegetative material that must be removed to accomplish the scope of work and determine the amount of MEC and range/munitions debris on the surface of the site. The survey team will document the site reconnaissance. Photographs will be taken of the overall site vegetation, MEC, debris found on the surface, and any other notable features.

### ***Vegetation Removal***

Vegetation removal will be conducted by manual vegetation clearance. USFWS biologists will be notified in advance of the areas where vegetation clearance will be conducted and if necessary will conduct a site reconnaissance of the proposed work area prior to vegetation removal activities to identify and flag any biota that may be Federally protected. Cutting trees larger than 3 inches in diameter will be prohibited unless absolutely necessary. Trees will be felled into an area that has already been surface swept for MEC.

### ***MEC Investigation Operations and Removal Actions***

A visual survey will be performed to locate all surface MEC for 100 percent of the project area. All metallic items present at ground surface or partially exposed at the surface will be removed. Magnetometer sweeps will be employed (mag and flag) for identification and clearance of all metallic items at the surface. UXO technicians will work individual search lanes approximately 3 to 5 feet wide and will search each lane using a hand held magnetometer (e.g., Schonstedt Model GA-52Cx). Whenever a metallic surface object is encountered the technician will halt and investigate the anomaly real-time. Throughout this operation the UXO Technician III will closely monitor individual performance to ensure these procedures are being performed with due diligence and attention to detail.

MEC items will be removed by hand or using small scale mechanized equipment to move larger items. The use of small scale mechanized equipment will be monitored by a UXO safety officer (UXOSO). MEC items which are safe to move may be consolidated for disposal/demilitarization within a grid, or several adjacent grids.

Non-MEC metallic items will be removed from the grid. These metallic items will be thoroughly screened for MEC. Large items, such as target vehicles, will require additional

screening for environmental pollutants (petroleum products, coolants, batteries, etc.). These items may also require onsite disassembly to facilitate removal.

### ***Demolition Procedures***

During demolition activities, the senior UXO supervisor (SUXOS) will have overall control of the Site. An exclusion zone (EZ) will be established around the demolition site according to the Explosive Operations Site Approval and Explosive Safety Submission (ESS). Only the SUXOS, UXO Team, and UXO-qualified safety personnel will be allowed within the EZ once the disposal operations have begun. The UXOSO will ensure safe work practices are observed, and the UXO Technician III will perform the necessary steps to safely dispose of the MEC.

### ***Management of Materiel that Presents a Potential Explosive Hazard (MPPEH)***

During removal operations, UXO Technicians will encounter the following types of metallic contamination: MEC items; MPPEH/ MD that is contaminated with explosives or other hazardous materials; nonhazardous ordnance-related scrap (ORS) metal; and general metallic debris. Because the metal scrap recovered will ultimately be disposed of off-site, it is imperative that procedures be established to preclude live ordnance or hazardous materials from becoming intermingled with nonhazardous metal scrap.

### ***Removal of Scrap Metal/Range Residue***

The UXO Disposal Team will collect the scrap piles deposited at the grid corner markers by the UXO Clearance Team and will perform an inspection to confirm that segregation of the MPPEH/MD has been done correctly and that no live MEC has been placed in the MPPEH/MD pile. The MPPEH/MD will be inspected and divided into two groups: 1) MPPEH requiring further demilitarization; and 2) MD that does not require further demilitarization.

### ***Certification/Disposal of Scrap Metal***

The contractor will ensure that the quantities of demilitarized property designated for and recycled are accurate and that these quantities are readily verifiable. Recycling facilities will not accept any property unless the DD Form 1348-1A contains the demilitarization code or clear text statement of the demilitarization required. The generating activity is responsible for issuing a letter specifying who is authorized to sign the statement of inert certification. This letter will be kept in the project files and with the generating activity. It must be updated as needed. Personnel designated as authorized to sign on behalf of the contractor must have an authorization letter from the principle identified on that contractor's BATFE License. The SUXOS will sign the certificate, typed on the DD Form 1348-1A, which states:

"We certify and verify that the AEDA residue, Range Residue and/or Explosive Contaminated property listed has been 100 percent properly inspected by us and to the best of my knowledge and belief, are inert and/or free of explosives or other dangerous materials."

### **1. Contribution to Remedial Performance**

Removal of the surface MEC within the MRA-SIA will greatly mitigate the risk from exposure to explosive hazards, will contribute to the efficient performance of any long term remedial action, and meets the NCP removal criteria.

## 2. Description of Alternative Technologies

Because this action is being recommended early in the CERCLA process and due to the unique nature of MEC contamination the alternatives available to reduce or remove the surface MEC and associated risk are limited to removal. An alternative does exist that would reduce the risk from exposure but it would not reduce the level of contamination: using Land Use Controls, such as fencing, to restrict the accessibility from unauthorized personnel to the SIA. However, this alternative would not likely restrict trespassers from the site and would not result in a risk reduction for site workers (i.e., FWS biologists and workers involved in future CERCLA actions at the SIA). In addition, this alternative is considered undesirable by USFWS and PR DNER due to the detriment to several species of Sea Turtle which nest on the beach and near shore areas of the island. The NTCRA is readily implementable, cost-effective, and will reduce or eliminate the risks to human health and the environment from surface MEC.

## 3. Applicable or Relevant and Appropriate Requirements (ARARs)

The NCP requires that removal actions attain Federal and State Applicable or Relevant and Appropriate Requirements (ARARs), with limited exception, to the extent practicable. Analysis of the removal action alternatives for the MRA-SIA with the applicable ARARs is presented in Tables 1-1 through 1-4. The removal action set forth in this Action Memorandum will comply with ARARs to the extent practicable.

## 4. Project Schedule

The Final EE/CA was made available to the public for comment (Attachment C) for 30 days beginning on September 1, 2008. No comments were received during the public comment period. Therefore, no responsiveness summary is included.

The proposed estimated project schedule is:

Task	Estimated Duration	Start Date	Completion Date
EE/CA Public Comment Period	1 Month	September 1, 2008	October 1, 2008
Preparation of Work Plan	2 Months		
Subcontracting and Mobilization	2 Months		
Removal Action	2 Years, 4 Months		
After Action Report Writing	2 Months		

The contract to conduct this remedial action was awarded in Fiscal Year (FY) 2008, with the initiation of the project in FY2009, and completion in FY2011.

## B. Estimated Costs

The NCP 40 Code of Federal Regulations (CFR) Part 300.415 dictates statutory limits of \$2 million and 12 months of USEPA fund-financed removal actions, with statutory exemption for emergencies and actions consistent with the removal action to be taken. This

removal action will not be USEPA fund-financed. The Navy Environmental Restoration Program does not limit the cost or duration of the removal action (DoN, 2006).

The Navy will contract with the appropriate contractors to perform the required work associated with the removal action in the MRA-SIA. The estimated cost of the removal action is \$29,088,446; the estimated costs are itemized in Table 2.

## **XI. Expected Change in the Situation Should Action Be Delayed or Not Taken**

If no action is taken or the action is delayed, the potential for direct contact with MEC and the threat of unintentional detonation will remain.

## **XII. Outstanding Policy Issues**

There are no outstanding policy issues regarding this action.

## **XIII. Enforcement**

The Navy can and will perform the proposed response promptly and properly.

## **XIV. Recommendation**

This Action Memorandum presents the selected remedial action for the Munitions Response Area recognized as the Surface Impact Area, Former Vieques Naval Training Range, Puerto Rico. The selected action, a NTCRA, was developed in accordance with CERCLA as amended, and is consistent with the NCP. Conditions at the sites meet the NCP section 300.415(b)(2) criteria for remedial action. The Naval Facilities Engineering Command, Atlantic Division recommends approval of the proposed NTCRA. If approved, the total project costs will be \$29.1 Million. The NTCRA should commence as soon as practical, due to the potential threat to human health and the environment from the MEC contamination located in the MRA-SIA.

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# Contents

## Tables

- 1-1 Federal Location-Specific Applicable or Relevant and Appropriate Requirements
- 1-2 Puerto Rico Location-Specific Applicable or Relevant and Appropriate Requirements
- 1-3 Puerto Rico Action-Specific Applicable or Relevant and Appropriate Requirements
- 1-4 Federal Action-Specific Applicable or Relevant and Appropriate Requirements

## References

BNA. 1988. *The Resource Conservation and Recovery Act of 1976*.

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**Table 1-1  
Federal Location-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Protection of Floodplain*</b>					
Within floodplain	Actions taken should avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values.	Action that will occur in a floodplain (i.e., lowlands and relatively flat areas adjoining inland and coastal waters and other flood-prone areas).	40 CFR Part 6, Appendix A; excluding Sections 6(a)(2), 6(a)(4), 6(a)(6); 40 CFR 6.302	Applicable	Removal activities may require compliance with this order. Measures required may include erosion control.
<b>Protection of Wetlands*</b>					
Wetland	Action to minimize the destruction, loss, or degradation of wetlands.	Wetland as defined by Executive Order 11990 Section 7.	40 CFR 6, Appendix A; excluding Sections 6(a)(2), 6(a)(4), 6(a)(6); 40 CFR 6.302	Relevant and Appropriate	Federal or Puerto Rico regulated wetlands are present. Nationwide Permit No. 38 allows for activities in wetlands to contain, stabilize, or remove hazardous or toxic materials. "Notification" is required to the District Engineer and the wetlands on the site should be delineated. Activities undertaken entirely on a CERCLA site by authority of CERCLA, as approved or required by EPA, are not required to obtain permits under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act, although the substantive requirements of these permits shall be met. NWP 38 notification will put in place coordination with natural resource and historic resource trustees regarding the potential to adversely affect threatened and endangered species and sites protected under the National Historic Preservation Act.

**Table 1-1  
Federal Location-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Clean Water Act, Section 404*a</b>					
Wetland	Action to prohibit discharge of dredged or fill material into wetland without permit.	Wetland as defined by Executive Order 11990 Section 7.	40 CFR 230.10; 40 CFR 231 (231.1, 231.2, 231.7, 231.8)	Relevant and Appropriate	Non-time critical removal action may include removal and restoration of wetland sediments. Activities undertaken entirely on a CERCLA site by authority of CERCLA, as approved or required by EPA, are not required to obtain permits under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act, although the substantive requirements of these permits shall be met.
<b>Endangered Species Act of 1978*</b>					
Endangered species	Action to ensure that any action is not likely to jeopardize the continued existence of endangered or threatened species or adversely affect its critical habitat.	Applies to actions that affect endangered or threatened species or their habitat.	16 USC 1531 50 CFR Part 402	Relevant and Appropriate	Multiple federally listed or proposed endangered species are known to exist at the former VNTR. A Consultation with US Fish and Wildlife Service as necessary will be completed under this ARAR.
<b>Federal Fish and Wildlife Conservation Act</b>					
Fish and Wildlife	Requires that activities avoid, minimize, or compensate for impacts to fish and wildlife and their habitats.	Applies to actions that affect fish and wildlife and their habitat.	16 USC §662 et seq.	Relevant and Appropriate	Site Restoration at the former VNTR will provide enhanced habitat for fish and wildlife species.

**Table 1-1  
Federal Location-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

<b>Location</b>	<b>Requirement</b>	<b>Prerequisite</b>	<b>Citation</b>	<b>ARAR Determination</b>	<b>Comment</b>
<b>Coastal Zone and Management Act</b>					
Coastal Zone	Requires that activities conducted within a coastal zone be consistent with an approved state management program.	Applies to sites located within a coastal zone.	16 USC §1451 et seq.	Relevant and Appropriate	Parts of the former VNTR and surrounding vicinity are located within the coastal zone. Activities will be conducted in accordance with applicable management program(s).
<b>National Historical Preservation Act (NHPA) of 1966 and Archaeological Resources Protection Act of 1979</b>					
Historical Locations and Archaeological Artifacts	Provides for the recovery and preservation of historical and archaeological significant artifacts. Implementing regulations for NHPA (36 CFR Part 65) establish the National Register of Historic Places and provide for preservation of historic properties and minimization of damage to historic landmarks.	Applies to historical properties and landmarks, and archaeological artifacts.	NHPA: 16 USC §470; 36 CFR Part 65. Archaeological Resources Protection Act.	Relevant and Appropriate	Based upon historical site use and filling activities that were conducted in the vicinity, it is not likely that historical landmarks or artifacts exist in the surrounding vicinity.

\* Statutes and policies, and their citations are provided as headings to identify general categories of potential ARARs for the convenience of the reader. Listing the statutes and policies does not indicate that Navy accepts the entire statutes or policies as potential ARARs. Specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs.

ARARs - Applicable or relevant and appropriate requirements

CFR - Code of Federal Regulations

NWP - Nationwide Permit

USC - United States Code

**Table 1-2  
Puerto Rico Location-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Puerto Rico Water Control Laws and Puerto Rico Wetlands Regulations*</b>					
<b>Coastal Zone Management Act; NOAA Regulations of Federal Consistency with approved State Coastal Zone Management Programs (Natural Patrimony Program Law of Puerto Rico)</b>					
Within coastal zone	Conduct activities within a coastal Management Zone in a manner consistent with local requirements.	Activities conducted at Natural Reserves and Special Areas of Planification	Section 307(c) of 16 USC 1456(c); also see 15 CFR 930 and 923.45	Relevant and Appropriate	Portions of the former VNTR are located in the Coastal Zone, but is not located in areas classified as Natural Reserves or Special Areas of Planification.

\* Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader. Listing the statutes and policies does not indicate that Navy accepts the entire statutes or policies as potential ARARs. Specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs.

ARARs - Applicable or relevant and appropriate requirements

CFR - Code of Federal Regulations

CWA - Clean Water Act

NOAA - National Oceanic and Atmospheric Administration

TBC - To Be Considered

USACE - United States Army Corps of Engineers

VAC - Virginia Administrative Code

VDEQ - Virginia Department of Environmental Quality

**Table 1-3  
Puerto Rico Action-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Puerto Rico Environmental Impact Statement Regulations*</b>					
Environmental Impact Statements	Regulations to establish content requirements and administrative procedures for complying with the Environmental Impact Statement (EIS) procedure required by the Environmental Public Policy A	Determination of whether or not actions will have a significant environmental impact in the normal course of their activities	Regulation on Puerto Rico Environmental Impact Statement	Not Applicable	Proposed removal actions do not trigger the requirement to perform an Environmental Impact Statement at the former VNTR.
<b>Puerto Rico Control of Noise</b>					
Noise Control Requirements	These regulations define requirements for the management and control of noise pollution.	Applicable to any activity which may include site preparation, demolition, removal, or disposal, excavation, occurring on premises, right-of-ways, public or private structures or similar property.	Regulation for the Control of Noise Pollution, Puerto Rico Regulation 3418	Applicable	Applicable to management of noise during MEC removal, detonation/demilitarization, and site restoration activities at the former VNTR.

**Table 1-3  
Puerto Rico Action-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Puerto Rico Hazardous Waste and Non-Hazardous Solid Waste Regulations</b>					
Hazardous Waste Staging Transport, and Disposal	These regulations and laws define the requirements for the management of hazardous wastes.	Wastes must meet definition of hazardous waste.	Regulation for the Control of Hazardous and Non-Hazardous Solid Waste, Puerto Rico Regulation 2863.	Relevant and Appropriate	Scrap metal and waste excavated during the MEC removal action the former VNTR will be characterized for disposal. Existing data indicate waste will be non-hazardous; however, any identified hazardous waste will be managed accordingly.
Solid Waste Staging Transport, and Disposal	These regulations and laws define the requirements for the management of solid wastes, including the submittal of a Non-Hazardous Solid Waste Operating Plan. Any disposal facility must be properly permitted and in compliance with all operational and monitoring requirements of the permit and regulations.	Wastes must meet definition of solid waste.	Regulation for the Control of Hazardous and Non-Hazardous Solid Waste, Puerto Rico Regulation 2863	Applicable	Applicable to management and staging, transportation, and off-site disposal of any debris classified as a solid waste at the former VNTR.
<b>Puerto Rico Solid Waste Management Regulations</b>					
Solid Waste Staging Transport, and Disposal	These regulations and laws define the requirements for the management of solid wastes. Any disposal facility must be properly permitted and in compliance with all operational and monitoring requirements of the permit and regulations.	Wastes must meet definition of solid waste.	Regulation for the Management of Non-Hazardous Solid Waste, Puerto Rico Regulation 5717	Applicable	Applicable to management and staging, transportation, and off-site disposal of any debris classified as a solid waste.

**Table 1-3  
Puerto Rico Action-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Puerto Rico Air Pollution Control Regulations*</b>					
Discharge to air	Puerto Rico Ambient Air Quality Standards - standards for ambient air quality to protect public health and welfare (including standards for particulate matter and lead).	Contamination of air affecting public health and welfare.	Regulation For The Control Of Atmospheric Pollution Of The Commonwealth Of Puerto Rico., Puerto Rico Regulation 5300	Applicable	Applicable for all site removal activities that may generate air discharges. No discharges to air are anticipated other than fugitive dust.
Discharge of visible emissions and fugitive dust	Fugitive dust/emissions may not be discharged to the atmosphere at amounts in excess of standards.	Any source of fugitive dust/emissions.	Regulation For The Control Of Atmospheric Pollution Of The Commonwealth Of Puerto Rico., Puerto Rico Regulation 5300	Applicable	Applicable for any site removal activities that generate fugitive dust.
Discharge of toxic pollutants	Toxic pollutants may not be discharged to the atmosphere at amounts in excess of standards.	Any source of toxic pollutants	Regulation For The Control Of Atmospheric Pollution Of The Commonwealth Of Puerto Rico., Puerto Rico Regulation 5300	Not Applicable	No toxic air pollutants are anticipated as part of this NTCRA.

**Table 1-3  
Puerto Rico Action-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Puerto Rico Regulation for the Control of Erosion and Prevention of Sedimentation</b>					
Erosion / Sediment Control	Regulates erosion / sedimentation control practices and management, including a Control of Erosion and Sediment (CES) Plan and a CES Permit.	Land disturbing activities.	Regulation for the Control of Erosion and Prevention of Sedimentation, Puerto Rico Regulation 5754	Applicable	Applicable for any site removal activities resulting in possible erosion and sedimentation. The NTCRA will include meeting the substantive requirements for erosion and sediment control including a CES Plan and CES Permit.
Explosives	Law of Explosives of Puerto Rico		28 June 1969, Law Number 134	Applicable	
<p>* Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs. Specific ARARs are addressed in the table below each general heading.</p> <p>ARAR - Applicable or relevant and appropriate requirement</p> <p>CFR - Code of Federal Regulations</p> <p>NTCRA - Non-time critical removal action</p> <p>TBC - To Be Considered</p>					

**Table 1-4  
Federal Action-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

Requirement	Prerequisite	Citation	ARAR Determination	Comment
Explosives and Blasting Agents; Welding and Cutting Activities	Occupational Safety and Health Administration	29 CFR Part 1910 §H.109, and §Q.	Relevant and Appropriate	
Occupational Safety and Health Administration - General Construction Work	Construction work.	29 CFR Part 1926	Applicable	Construction work at the former VNTR will adhere to these regulations.
EPA Final Military Munitions Rule	Remedial actions generate munitions that are subject to RCRA requirements.	40 CFR 260, et al.	Applicable	The remedial actions for the former VNTR will likely generate military munitions waste which may be classified as hazardous.
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980	NCP and Hazardous Waste Handling; Military Munitions	40 CFR Parts 266, 300, 370.	Relevant and Appropriate	
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980	EPA Guidance	42 U.S.C. Section 9601	Applicable	
Superfund Amendments and Reauthorization Act (SARA) of 1986	EPA Guidance	42 U.S.C. Section 11001	Applicable	
Handbook on Management of Unexploded Ordnance at Closed, Transferring, and Transferred Ranges	EPA Guidance	March 2000 (Draft)	Applicable	
Resource Conservation and Recovery Act	EPA Guidance	42 U.S.C. Section 6901	Not Applicable	

**Table 1-4  
Federal Action-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

<b>Requirement</b>	<b>Prerequisite</b>	<b>Citation</b>	<b>ARAR Determination</b>	<b>Comment</b>
Hazardous Waste Regulations*	EPA Guidance	Title 126	Applicable	
Emergency Planning & Community Right-to-Know and Contingency Planning Regulations (Reporting Requirements)	EPA Guidance	Title 126		
UXO Technicians and Personnel	Minimum qualifications	DDESB Technical Paper 18	Relevant and Appropriate	
DoD Contractors Safety Manual for Ammunition and Explosives	Department of Defense Guidance	DOD 4145.26M	Applicable	
Defense Demilitarization Manual	Department of Defense Guidance	DOD 4160.21-M-1	Relevant and Appropriate	The former VNTR is not located at a DOD Component. Demilitarization of live ordnance will follow the instructions provided.
Environmental and Explosives Safety Management on Department of Defense Active and Inactive Ranges Within the United States	Department of Defense Guidance	DOD 4715.11	Applicable	
Ammunition and Explosives Safety Standards	Action involves a transfer of DOD lands.	DOD 6055.9-STD	Relevant and Appropriate	Remedial actions for the former VNTR include a transfer of DOD lands.
Safety and Occupational Health Policy for the Department of Defense	Actions taking place on DOD lands.	DOD Directive 1000.3	Relevant and Appropriate	Remedial actions for the former VNTR will adhere to these regulations.
Solid Waste Management – Collection, Disposal, Resource Recovery, and Recycling Program	Actions taking place on DOD lands which include the generation of solid waste.	DOD Directive 4165.6	Relevant and Appropriate	Remedial actions for the former VNTR will adhere to these regulations.

**Table 1-4  
Federal Action-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

<b>Requirement</b>	<b>Prerequisite</b>	<b>Citation</b>	<b>ARAR Determination</b>	<b>Comment</b>
Transportation and Traffic Management	Actions taking place on DOD lands which create a significant traffic flow.	DOD Directive 4500.9	Relevant and Appropriate	Remedial actions for the former VNTR will adhere to these regulations during construction.
Natural Resource Management Plan	Actions taking place on DOD lands.	DOD Directive 4700.4	Relevant and Appropriate	Remedial actions for the former VNTR will adhere to these regulations
Archaeological and Historical Resources Management Plan	Actions taking place on DOD lands.	DOD Directive 4710.1	Applicable	An evaluation of the former VNTR will be conducted as necessary to determine any archeological or historical resources
Protection and Enhancement of Environmental Quality	Actions taking place on DOD lands.	DOD Directive 5100.5	Relevant and Appropriate	Remedial actions for the former VNTR will adhere to these regulations
Environmental Effects in the United States of DOD Actions	Actions taking place on DOD lands.	DOD Directive 6050.1	Relevant and Appropriate	Remedial actions for the former VNTR will adhere to these regulations
Safety and Health Requirements for Hazardous, Toxic, and Radioactive Waste and Ordnance and Explosive Waste Activities	Actions which include a HTRW or OE site.	ER 385-1-92	Relevant and Appropriate	The former VNTR is not located on a USACE Command, but the requirements in this regulation for OE safety are relevant to these sites.
Military munitions response program oversight	Department of Defense Guidance	NOSSA 8020.15	Applicable	
Inter-service Responsibilities for Explosive Ordnance Disposal	US Navy and Department of the Army guidance	OPNAVINST 8027.1 AR 75-14	Applicable	
Interim Final Management Principles for Implementing Response Action at Closed, Transferring, and Transferred Ranges	OE Guidance Memoranda	December 19, 2000	Applicable	

**Table 1-4  
Federal Action-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

<b>Requirement</b>	<b>Prerequisite</b>	<b>Citation</b>	<b>ARAR Determination</b>	<b>Comment</b>
Application of the Hazardous Waste Operations and Emergency Response Regulation to Ordnance and Explosives Sites	OE Guidance Memoranda	January 20, 1994	Applicable	
Coordination with the Ordnance and Explosives Center of Expertise (OE CX)	OE Guidance Memoranda	May 7, 1997	Applicable	
Ammunition and Explosives Ashore: Safety Regulations for Handling, Storing, Production, Renovation, and Shipping	US Navy Guidance	NAVSEA OP 5 Vol 1	Applicable	
Navy Transportation Safety Handbook for Ammunition, Explosives, and Related Hazardous Materials	US Navy Guidance	NAVSEA OP 2165	Applicable	
Motor Vehicle Driver's Handbook, Ammunition, Explosives, and Related Hazardous Materials	US Navy Guidance	NAVSEA OP 2239	Applicable	
Demilitarization and Disposal of Excess, Surplus, and Foreign Excess Ammunition, Explosives and Other Dangerous Articles and Inert Ordnance Material	US Navy Guidance	NAVSEA 4570.1	Applicable	
DOD Ammunition and Explosives Hazard Classification Procedures Joint Technical Bulletin	US Navy Guidance	NAVSEAINST 8020.1H	Applicable	
Operational Risk Management (ORM)	US Navy Guidance	OPNAVINST 3500.39A	Applicable	

**Table 1-4  
Federal Action-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

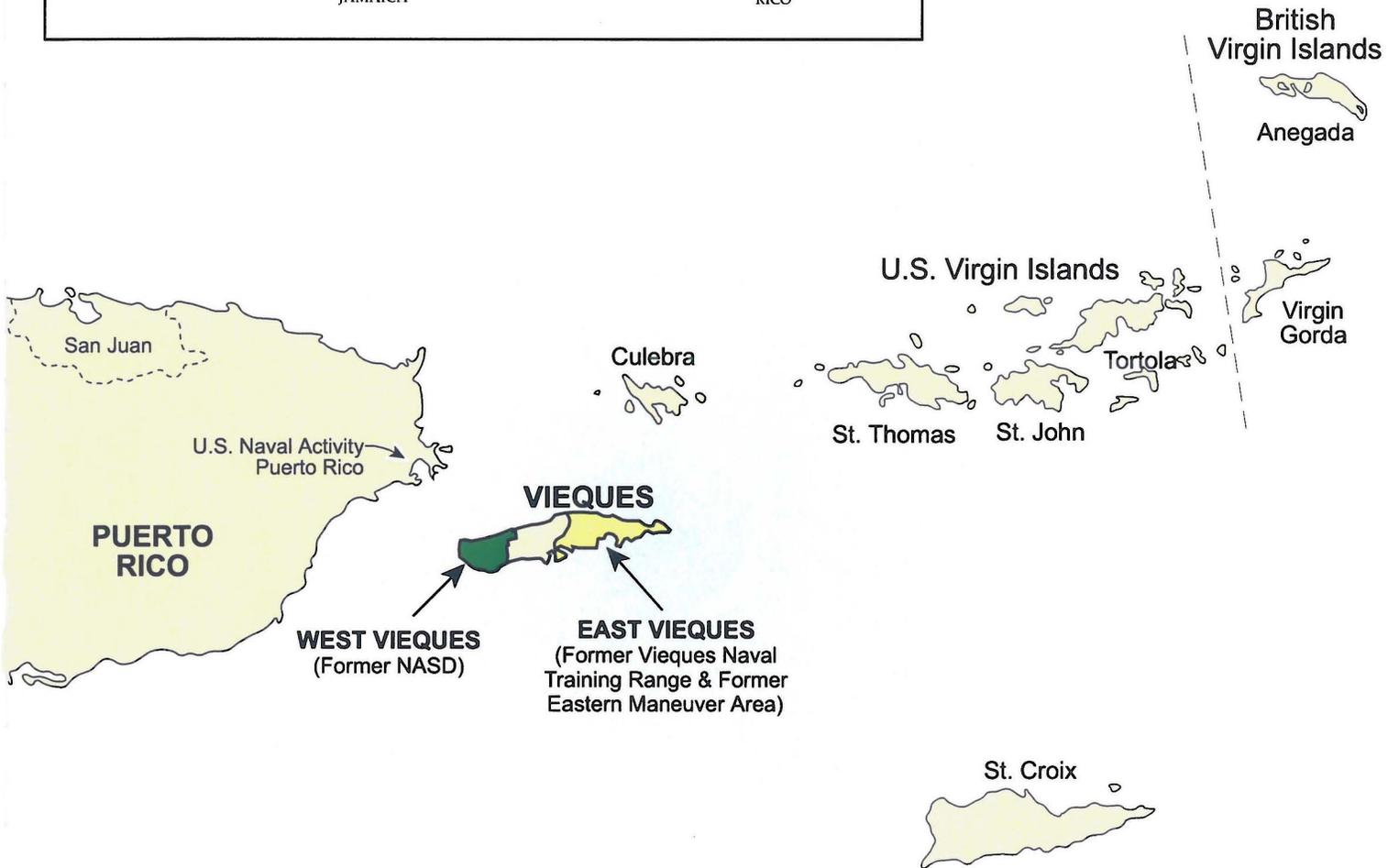
<b>Requirement</b>	<b>Prerequisite</b>	<b>Citation</b>	<b>ARAR Determination</b>	<b>Comment</b>
Department of the Navy Explosives Safety Policy	US Navy Guidance	OPNAVINST 8020.14	Applicable	
U.S. Navy Explosives Safety Policies, Requirements, and Procedures	US Navy Guidance	OPNAVINST 8023.2	Applicable	
Navy Munitions Disposition Policy	US Navy Guidance	OPNAVINST 8026.2A	Applicable	
Responsibilities for Technical Escort of Dangerous Materials	US Navy Guidance	OPNAVINST 8070.1B	Applicable	
Responsibilities for Issuance and Administration of Waivers and Exemptions from Department of Defense Explosive Safety Standards	US Navy Guidance	SECNAVINST 8023.3C	Applicable	

**Table 2**  
**Detailed Cost Estimate**  
**Alternative 3 - Surface MEC Removal in Select Areas**  
**Former VNTR**  
**Vieques, Puerto Rico**

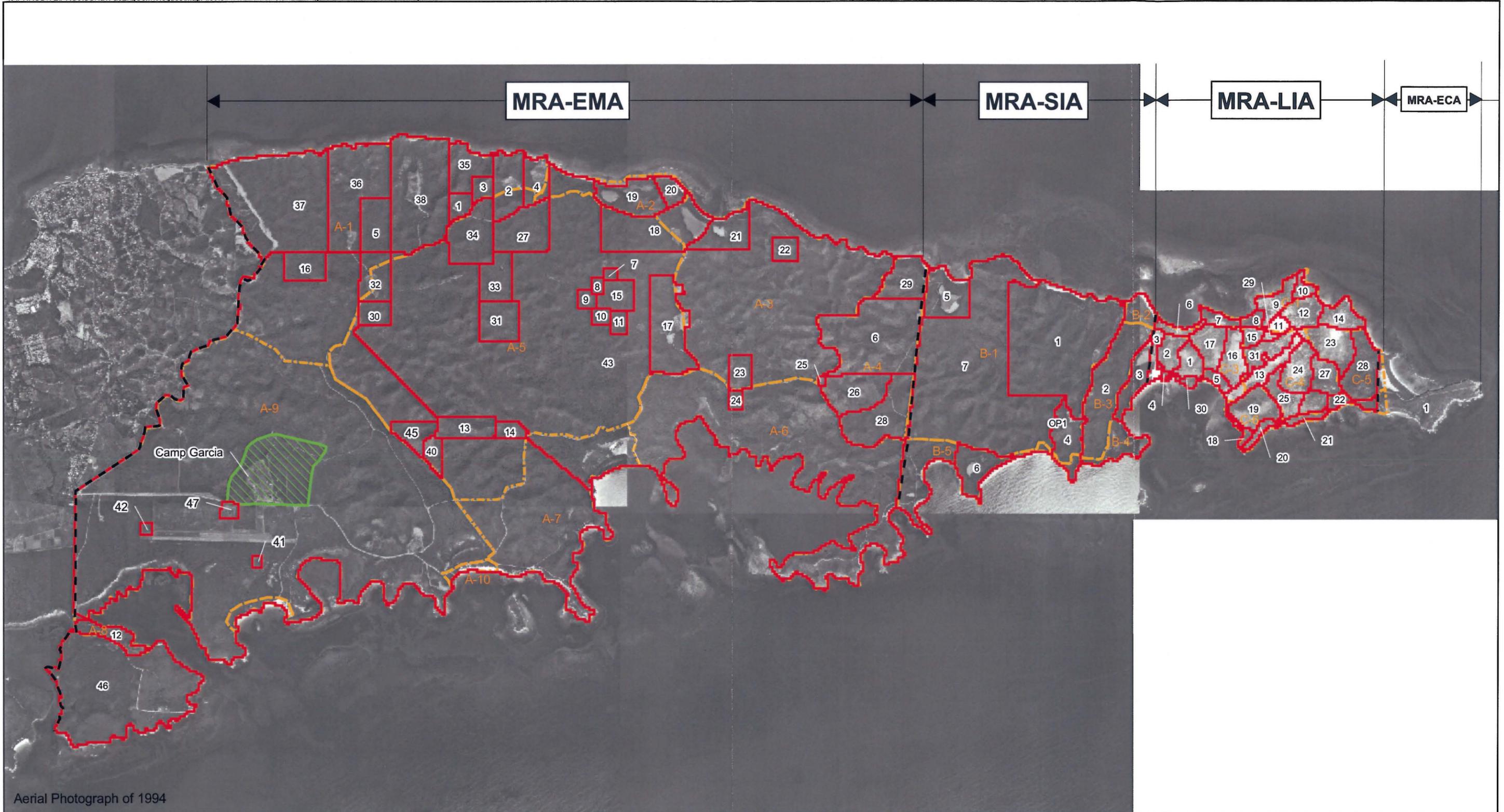
Item	Quantity	Units	Unit Cost	Adjustment*	Subtotal
<b>1 EXPENSES AND CONSUMABLES</b>					
1.1 Per diem - meals (assuming 10 person team)	467	day	\$57.00	30	\$798,000
1.2 Per diem - lodging	467	day	\$60.00	30	\$840,000
1.3 Transportation	467	day	\$60.00	20	\$560,000
1.4 Equipment	93	wk	\$8,000.00	1	\$746,667
<b>2 MOBILIZATION/DEMOBILIZATION AND SITE SETUP</b>					
2.1 Mobilization	1	ea	\$75,000.00	1	\$75,000
2.2 Demobilization	1	ea	\$50,000.00	1	\$50,000
2.3 Crew Rotation	16	ea	\$25,000.00	1	\$400,000
2.4 Flora and Avian Habitat Survey	300	ac	\$400.00	1	\$120,000
<b>3 SURFACE CLEARANCE</b>					
3.1 Surface Clearance	700	ac	\$12,000.00	1	\$8,400,000
3.2 Demilitarization/Venting	49	day	\$9,000.00	1	\$437,143
<b>4 DEMILITARIZATION OF MEC ITEMS</b>					
4.1 MD/RRD Processing	3900	ton	\$1,300.00	1	\$5,070,000
<b>Subtotal</b>					<b>\$17,496,810</b>
<b>Project Management</b>	8%				\$1,399,745
<b>Remedial Design</b>	15%				\$2,624,521
<b>Construction Management</b>	10%				\$1,749,681
<b>Contingency</b>	25%				\$5,817,689
<b>TOTAL COST</b>					<b>\$29,088,446</b>
<b>Upper Limit of Cost Accuracy</b>	150%				<b>\$43,632,669</b>
<b>Lower Limit of Cost Accuracy</b>	70%				<b>\$20,361,912</b>

**Figures**

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**Figure 1**  
**Regional Location Map**  
*Former VNTR, Vieques, Puerto Rico*

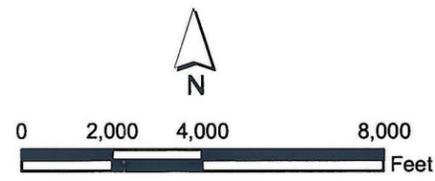


Aerial Photograph of 1994

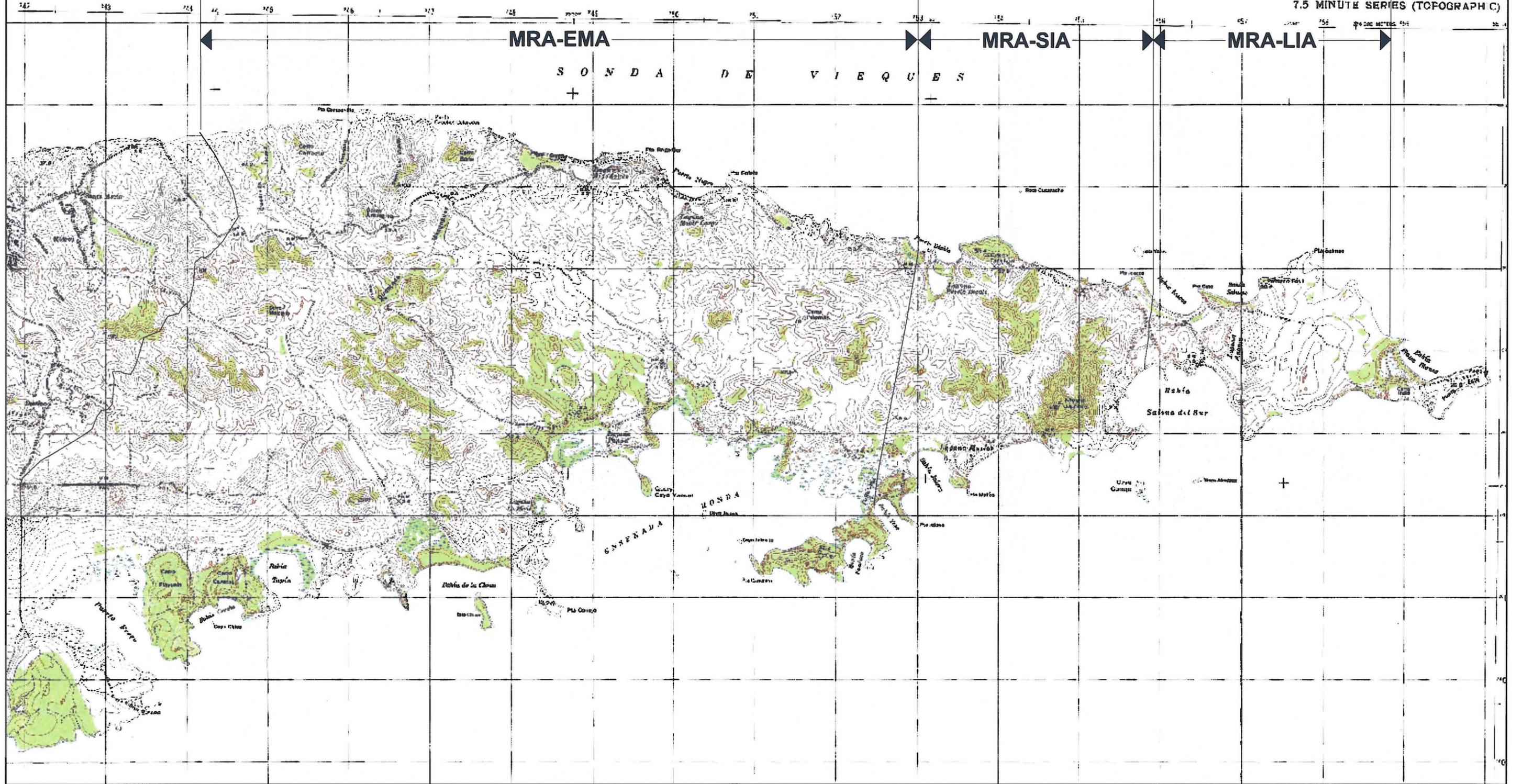
- Legend**
- MRS Boundary and Number
  - Camp Garcia
  - Parcel Boundary and Designation

**Notes :**

- MRS Numbers Do Not Signify Priority
- EMA-MRS 43 and SIA-MRS 7 include all terrestrial area within the range fan(s) not designated as other MRSs.



**Figure 2**  
Former VNTR Site Map  
Former VNTR  
Vieques, Puerto Rico



MRAs - Munitions Response Areas  
EMA - Eastern Maneuver Area  
LIA - Live Impact Area  
SIA - Surface Impact Area

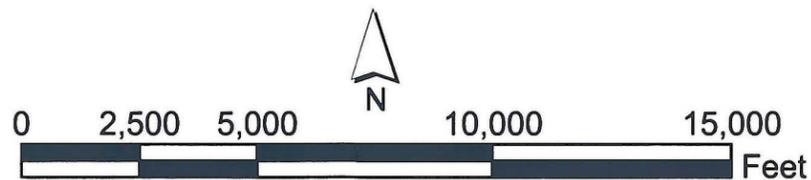
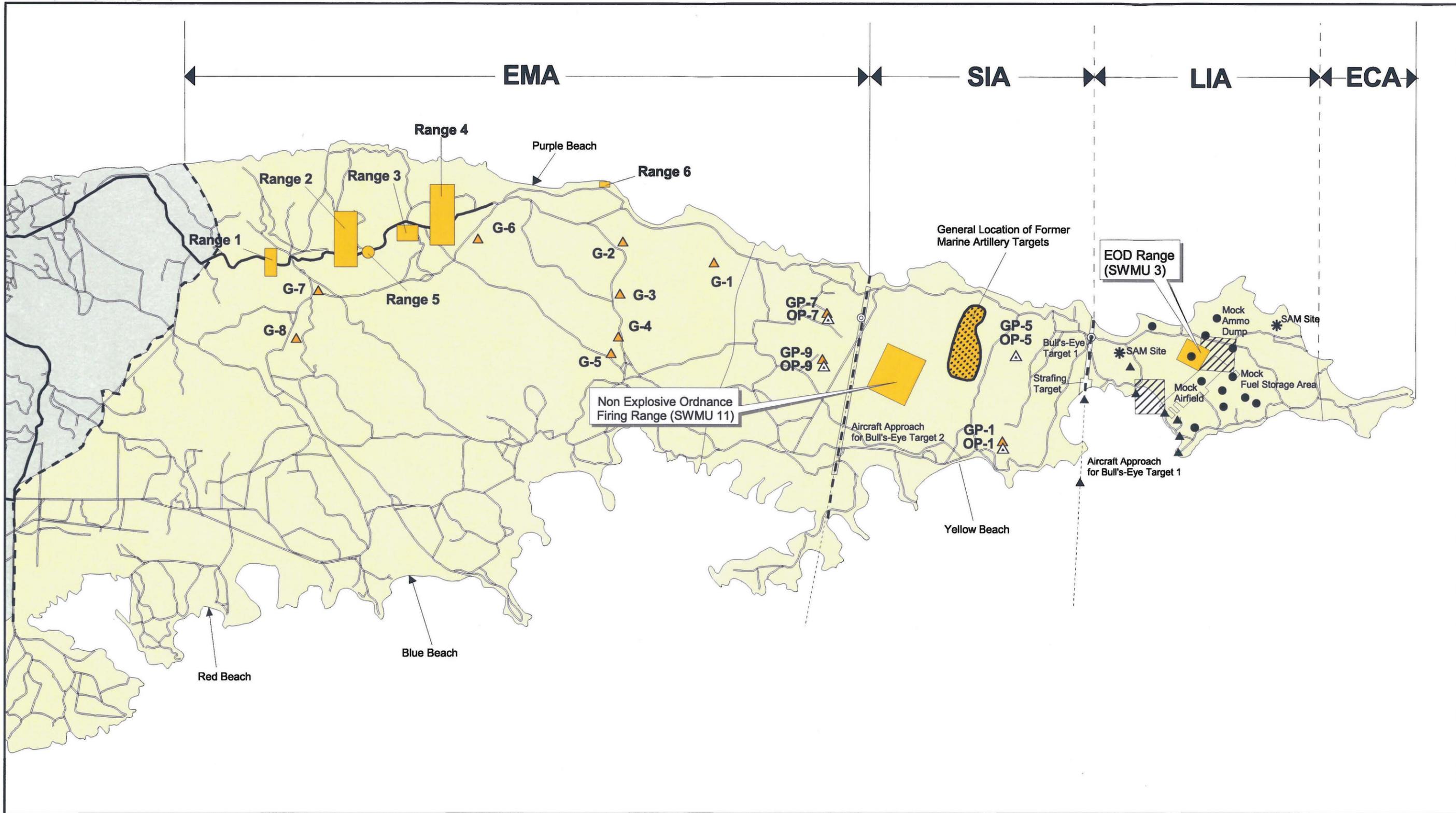


Figure 3  
Topographic Map  
Former VNTR,  
Vieques, Puerto Rico



**LEGEND**

- |  |  |
|--|--|
| Naval Gunfire Support (NGFS) Area Target | Property Line                                |
| Navy Property                            | Small Arms/Artillery Ranges                  |
| Non-Navy Property                        | General Location of Marine Artillery Targets |
| Air-To-Ground (ATG) Target               | Observation Point                            |
| Naval Gunfire Support (NGFS) Target      | Gun Position                                 |

ECA - Eastern Conservation Area  
 LIA - Live Impact Area  
 SIA - Surface Impact Area

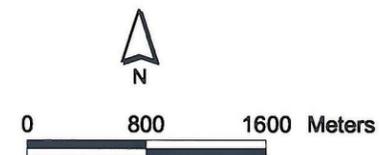
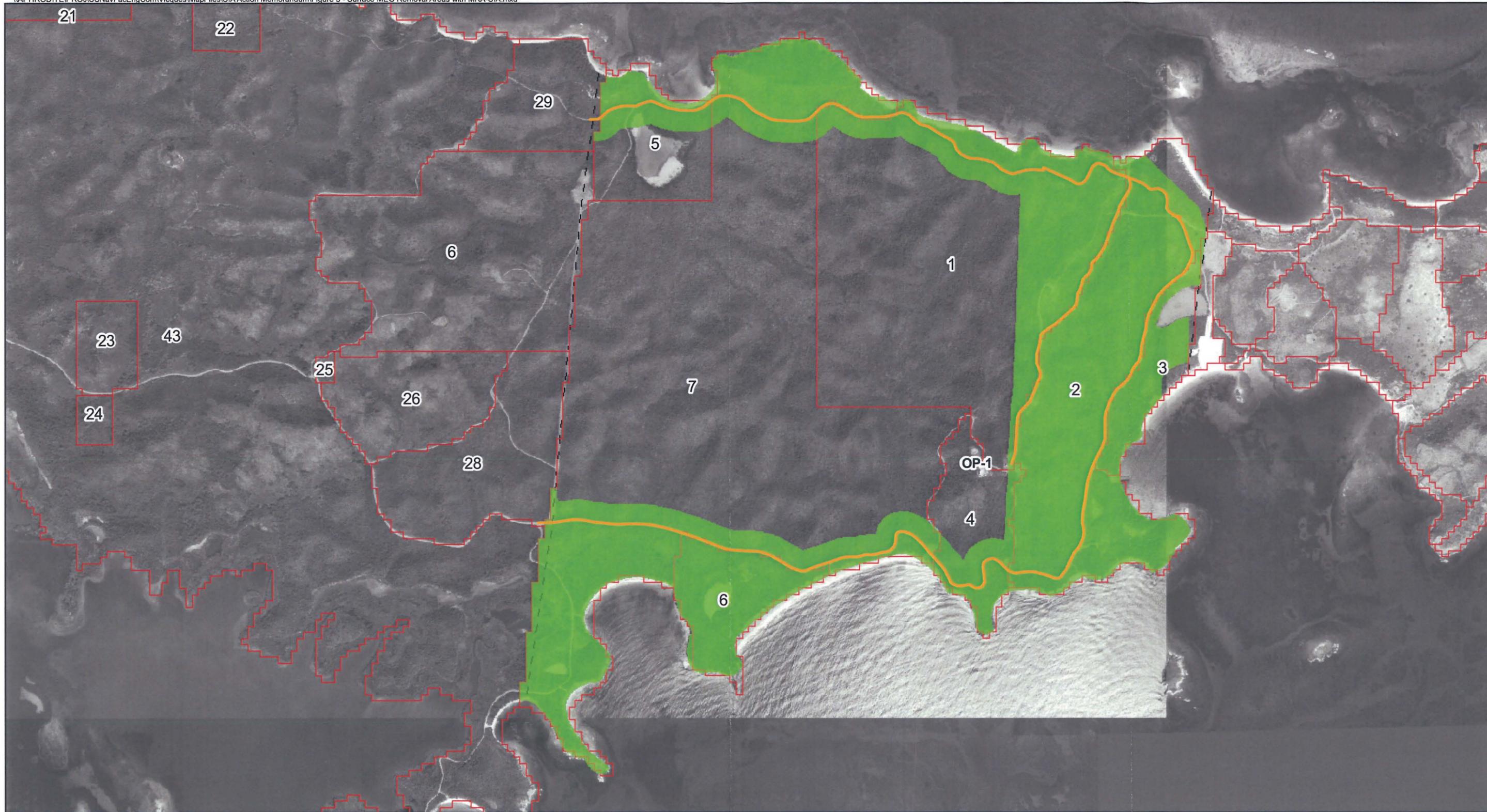


Figure 4  
 Map of Range Related Site Features  
 Former VNTR  
 Vieques, Puerto Rico



**Legend**  
— SIA Roads  
■ Removal Action Area  
□ MRS Boundary

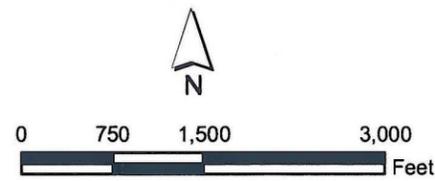
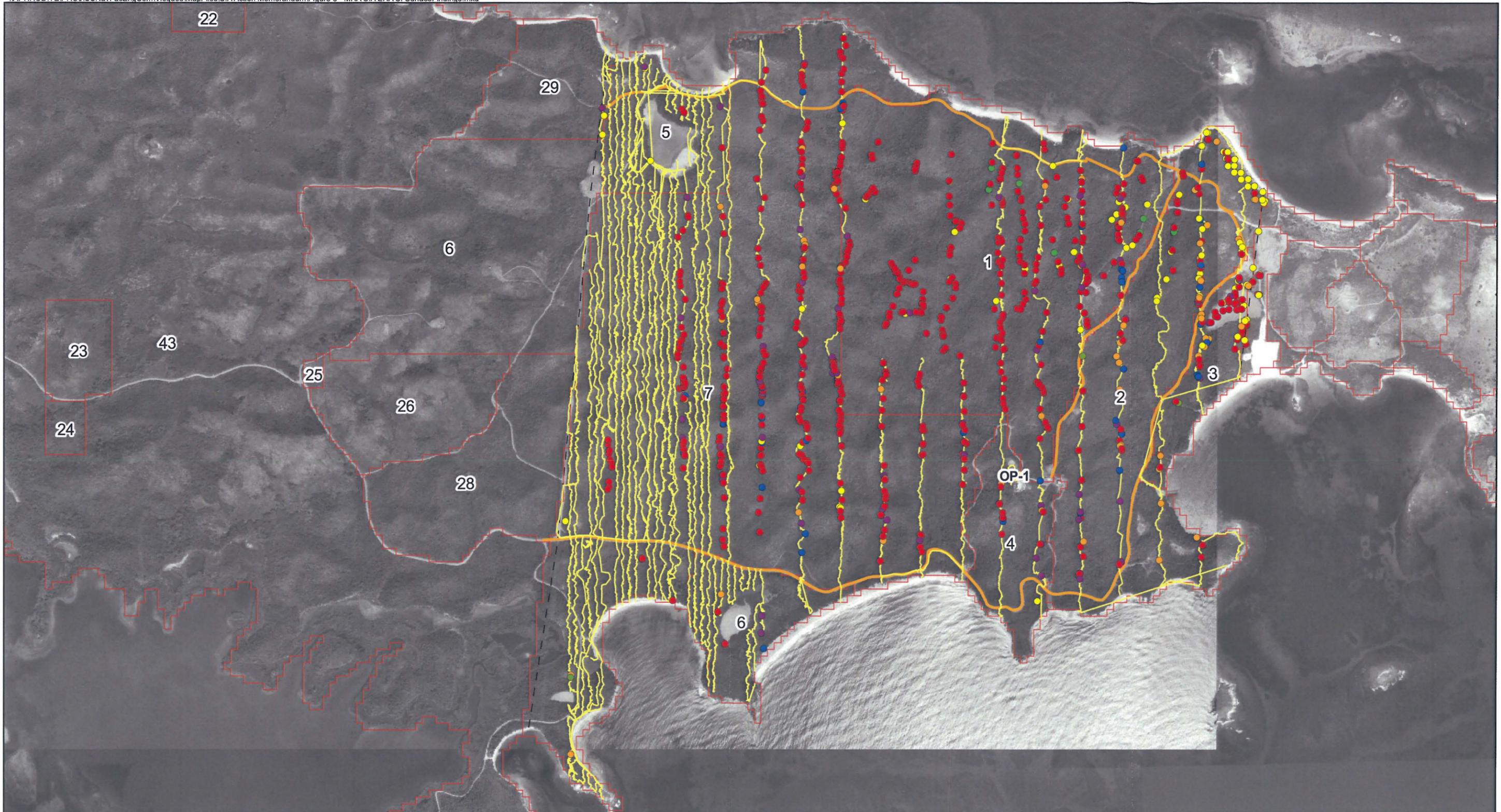


Figure 5  
Surface MEC Removal Actrion Areas with MRA-SIA  
Select Areas within MRA-SIA  
Former VNTR  
Vieques, Puerto Rico



- Legend**
- Bombs
  - Flares-Pyrotechnics
  - Grenades
  - MEC Component
  - Projectiles / Mortars
  - Rockets / Guided Missiles
  - ICMS
  - Transects
  - SIA Roads
  - MRS Boundary

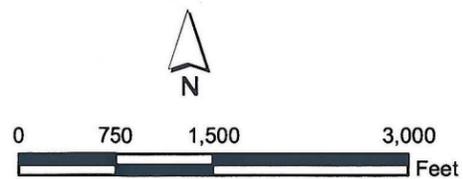


Figure 6  
MRA-SIA-ERA/SI Surface Findings  
Former VNTR  
Vieques, Puerto Rico

**Attachment A**  
**Final SIA Surface Removal EE/CA (electronic)**

---

Final

**Engineering Evaluation/Cost Analysis for Surface  
MEC Removal from the Munitions Response Area-  
Surface Impact Area, Former VNTR**

**Vieques, Puerto Rico**

Contract Task Order 0211

October 2008

Prepared for

**Department of the Navy  
Naval Facilities Engineering Command  
Atlantic**

Under the

**NAVFAC CLEAN III Program  
Contract N62470-02-D-3052**

Prepared by



**CH2MHILL**

**Virginia Beach, Virginia**

# 1 Executive Summary

---

2 This document presents an Engineering Evaluation and Cost Analysis (EE/CA) for a Non-  
3 time-critical Removal Action (NTCRA) for select areas located within the Munitions  
4 Response Area-Surface Impact Area (MRA-SIA), at Vieques Naval Training Range (VNTR)  
5 on Vieques, Puerto Rico. The areas identified for surface clearance of munitions and  
6 explosives of concern (MEC) in this document have the potential for unauthorized public  
7 access and therefore present a risk to human health. The purpose of this document is to  
8 present the interim remedial action alternatives to reduce risks to human health associated  
9 with the MEC that exist at the sites. Reducing risks to human health would be accomplished  
10 by minimizing the potential for human contact. This action will reduce the potential for  
11 unauthorized personnel to come into contact with MEC.

12 This EE/CA will be completed as a NTCRA as required by section 300.415(b)(4)(i) of the  
13 National Oil and Hazardous Substance Pollution Contingency Plan (NCP; 40 Code of  
14 Federal Regulations [CFR] Part 300). Submittal of this document fulfills the requirements for  
15 NTCRAs defined by the Comprehensive Environmental Response, Compensation, and  
16 Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act  
17 of 1986 (SARA). This EE/CA has been prepared in general accordance with the United  
18 States (U.S.) Environmental Protection Agency's (USEPA) guidance document *Superfund,*  
19 *Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA*, PB93-963402  
20 (USEPA, 1993).

21 To address the risks posed by the MEC, alternatives designed to prevent exposure pathways  
22 were analyzed. The three alternatives considered for the select areas are:

- 23 1. No Action.
- 24 2. Engineering controls to prevent access by unauthorized personnel.
- 25 3. Removal of surface detected MEC from select areas within the MRA-SIA with a high  
26 potential for trespassing.

27 Alternative 1 serves as a baseline for the evaluation and is not considered a viable option for  
28 the site.

29 Through analyzing the benefits of Alternatives 2 and 3, Alternative 3, removal of surface  
30 detected MEC from select areas within the MRA-SIA was selected as the recommended  
31 removal action alternative. This alternative has a high level of efficiency in meeting the  
32 remedial action objectives, a relative moderate ease of implementation, and a relatively  
33 higher cost. In addition, this alternative lends itself to potential future remedies that would  
34 allow U.S. Fish and Wildlife Service (USFWS) to implement several of the recommendations  
35 identified in their preferred land use alternative for the wildlife refuge and wilderness area.

# Resumen Ejecutivo

---

1 Este documento presenta una Evaluación de Ingeniería y Análisis de Costo (EE/CA en  
2 inglés) para una acción de remoción de tiempo no-crítico (NCTRA en inglés) para áreas  
3 seleccionadas dentro del Área de Respuesta de Municiones-Área de Impacto de Superficie  
4 (MRA-SIA en inglés) en el Campo de Adiestramiento Naval de Vieques (VNTR en inglés) en  
5 Vieques, Puerto Rico. Las áreas identificadas en este documento para la remoción de  
6 municiones de superficie y explosivos de preocupación (MEC en inglés) tienen el potencial  
7 de que el público ingrese sin autorización por lo que representan un riesgo a la salud  
8 humana. El propósito de este documento es el presentar alternativas para una acción de  
9 remediación interina para reducir los riesgos a la salud humana asociados con el MEC que  
10 existe en el sitio. La reducción de riesgos para la salud humana se conseguiría al minimizar  
11 el potencial de contacto por humanos. Esta acción reducirá el riesgo de que personal  
12 potencialmente no autorizado entre en contacto con MEC.

13 Esta EE/CA se completará como un NTCRA, tal como lo requiere la Sección 300.415(b)(4)(i)  
14 del Plan Nacional de Contingencia de Contaminación de Petróleo y Substancias Peligrosas  
15 (NCP; Código de Reglamentos Federales [CFR] 40 Part 300). El envío de este documento  
16 completa los requisitos del NTCRA definidos en la Ley de Respuesta, Compensación y  
17 Responsabilidad Ambiental del 1980 (CERCLA en inglés) y los Cambios y Re-autorización  
18 de la Ley de Superfondo del 1986 (SARA). Este EE/CA ha sido preparado siguiendo las  
19 guías generales del documento *Guía Superfund para llevar a cabo Acciones de Remoción de*  
20 *Tiempo No-Crítico bajo CERCLA*, PB93-963402 (USEPA, 1993) de la Agencia de Protección  
21 Ambiental de los EEUU (USEPA en inglés).

22 Para considerar el riesgo proveniente del MEC, se analizaron alternativas diseñadas para  
23 prevenir su exposición. Las tres alternativas consideradas para las áreas seleccionadas son:

- 24 1. No tomar ninguna acción
- 25 2. Implementar controles de Ingeniería para prevenir el acceso de personal no autorizado
- 26 3. La remoción de MEC encontrado en superficie de las áreas dentro del MRA-SIA que  
27 tengan un alto potencial de que personas ingresen sin autorización.

28 La alternativa 1 sirve como base para la evaluación y no es considerada una opción viable  
29 para este sitio.

30 A través de un análisis de los beneficios de las Alternativas 2 y 3, la remoción del MEC de  
31 superficie fue seleccionada como la alternativa de acción recomendada. Esta alternativa  
32 tiene un alto grado de eficiencia en cumplir con los objetivos de acción de remediación, una  
33 facilidad de implementación relativamente moderada y un costo relativamente más  
34 elevado. Adicionalmente, esta alternativa está de acuerdo con las remediaciones futuras  
35 potenciales que permitirán que el Servicio de Pesca y Vida Silvestre de EEUU (USFWS en  
36 inglés) implemente varias de las recomendaciones identificadas en su alternativa preferida  
37 para el uso de los terrenos del refugio de vida silvestre.

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# 1 Acronyms and Abbreviations

---

2	AFWTA	Atlantic Fleet Weapons Training Area
3	ARAR	applicable or relevant and appropriate requirement
4	ATG	air-to-ground
5	CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
6	CFR	Code of Federal Regulations
7	CLEAN	Comprehensive Long-term Environmental Action, Navy
8	CSM	conceptual site model
9	CTO	Contract Task Order
10	DOI	Department of the Interior
11	DON	Department of the Navy
12	ECA	Eastern Conservation Area
13	ECHOS	Environmental Cost, Handling, Options, and Solutions
14	EE/CA	Engineering Evaluation/Cost Analysis
15	EIS	Environmental Impact Statement
16	EMA	Eastern Maneuver Area
17	FFA	Federal Facility Agreement
18	FMFLANT	Fleet Marine Force, Atlantic
19	ft	feet/foot
20	HE	high explosive
21	IC	institutional controls
22	IRP	Installation Restoration Program
23	LIA	Live Impact Area
24	LTM	long-term monitoring
25	LUC	land use controls
26	MD	munitions debris
27	MEC	munitions and explosives of concern
28	mm	millimeter
29	MPPEH	material potentially presenting an explosive hazard
30	MRA	Munitions Response Area
31	NASD	Naval Ammunition Support Detachment
32	NATO	North Atlantic Treaty Organization
33	NAVFAC	Naval Facilities Engineering Command, Atlantic Division
34	NCP	National Contingency Plan
35	NGFS	naval gunfire support
36	NRHP	National Register of Historic Places
37	NSRR	Naval Station Roosevelt Roads
38	NTCRA	Non-time-critical Removal Action

1	O&M	operation and maintenance
2	OB/OD	open burn/open detonation
3	OP	observation post
4	PA/SI	Preliminary Assessment/Site Investigation
5	PAOC	potential area of concern
6	PI	photo-identified
7	PRA	Preliminary Range Assessment
8	PRASA	Puerto Rico Aqueduct and Sewer Authority
9	PREQB	Puerto Rico Environmental Quality Board
10	RAO	remedial action objective
11	ROD	Record of Decision
12	SARA	Superfund Amendments and Reauthorization Act
13	SIA	Surface Impact Area
14	SWMU	solid waste management unit
15	U.S.	United States
16	USEPA	United States Environmental Protection Agency
17	USFWS	United States Fish & Wildlife Service
18	USGS	United States Geological Survey
19	UXO	unexploded ordnance
20	VNTR	Vieques Naval Training Range

# Introduction

---

1 This Engineering Evaluation/Cost Analysis (EE/CA) report was prepared by CH2M HILL  
2 under the Naval Facilities Engineering Command, Atlantic Division (NAVFAC),  
3 Comprehensive Long-term Environmental Action – Navy III (CLEAN III) Contract N62470-  
4 02-D-3052, Contract Task Order (CTO) 211. The purpose of the EE/CA is to develop and  
5 evaluate remedial action alternatives for removal of surface munitions and explosives of  
6 concern (MEC) from areas within the Munitions Response Area-Surface Impact Area  
7 (MRA-SIA) at the former Vieques Naval Training Range (VNTR) on east Vieques.

8 This document follows the United States (U.S.) Environmental Protection Agency's  
9 (USEPA's) guidance provided in document 540/R93/057 *Guidance on Conducting Non-Time-*  
10 *Critical Removal Actions Under CERCLA* (USEPA, 1993). This EE/CA is based on the findings  
11 of records reviews and interviews including the Preliminary Range Assessment (PRA)  
12 Report (CH2M HILL, 2003), the *Revised Draft Expanded Range Assessment and Phase I Site*  
13 *Inspection Report* (CH2M HILL, 2007), and the ongoing expanded range assessment and  
14 Phase II site inspection. The EE/CA assumes that no additional site assessment activities  
15 will be necessary to determine the appropriate removal action alternative.

## 1.1 Purpose and Objectives

16 This EE/CA provides the Comprehensive Environmental Response, Compensation, and  
17 Liability Act (CERCLA) documentation to support an interim remedial action for areas in  
18 the MRA-SIA where the likelihood for access by unauthorized personnel (e.g., trespassers)  
19 is significant. The purpose of this EE/CA is to present the Navy's intent to reduce the risks  
20 to human health. The chosen interim action will minimize the potential hazards associated  
21 with MEC at the areas identified to support current and proposed future use and minimize  
22 the potential hazard to unauthorized personnel. This EE/CA presents three removal  
23 alternatives for this interim action. The final remedy for these areas will be determined as  
24 part of the CERCLA process.

25 Submittal of this document fulfills the requirements for NTCRAs defined by CERCLA,  
26 Superfund Amendments and Reauthorization Act (SARA), and the National Oil and  
27 Hazardous Substance Pollution Contingency Plan (NCP). This EE/CA has been prepared in  
28 accordance with USEPA's guidance document *Guidance on Conducting Non-Time-Critical*  
29 *Removal Actions under CERCLA*, PB93-963402 (USEPA, 1993).

## 1.2 Regulatory Framework

30 This document is issued by the U.S. Department of the Navy (DON), in partnership with the  
31 USEPA Region II and the Puerto Rico Environmental Quality Board (PREQB), under Section  
32 104 of CERCLA and SARA of 1986.

1 Section (§)104 of CERCLA and SARA allows an authorized agency to remove, or arrange for  
2 removal of, and to provide for remedial action relating to hazardous substances, pollutants,  
3 or contaminants at any time, or to take any other response measures consistent with the  
4 NCP as deemed necessary to protect public health or welfare and the environment.

5 The NCP, 40 Code of Federal Regulations (CFR) 300, provides regulations for implementing  
6 CERCLA and SARA, and regulations specific to removal actions. The NCP defines a  
7 removal action as the

8 “cleanup or removal of released hazardous substances from  
9 the environment, such actions as may be necessary to monitor,  
10 assess, and evaluate the threat of release of hazardous  
11 substances; the disposal of removed material; or the taking of  
12 such other actions as may be necessary to prevent, minimize,  
13 or mitigate damage to the public health or welfare or to the  
14 environment, which may otherwise result from a release or  
15 threat of release.”

16 For Time-critical Removal Actions, activities shall begin as soon as possible to “abate,  
17 prevent, minimize, stabilize, mitigate, or eliminate the threat to public health or welfare of  
18 the United States or the environment” (40 CFR §300.415[b][3]). The removal action proposed  
19 for the MRA-SIA is non-time-critical.

20 Title 40 CFR §300.415 requires the lead agency to conduct an EE/CA when a NTCRA is  
21 planned for a site. The goals of an EE/CA are to identify the objectives of the removal action  
22 and to analyze the effectiveness, implementability, and cost of various alternatives that may  
23 satisfy these objectives. An EE/CA documents the removal action alternatives and  
24 evaluation and recommendation process.

25 Community involvement requirements for NTCRAs include making the EE/CA available  
26 for public review and comment for a period of 30 days. An announcement of the 30-day  
27 public comment period on the EE/CA is required in a local newspaper. Written responses  
28 to significant comments will be summarized in an Action Memorandum and will be  
29 included in the Administrative Record.

## 1.3 Organization of the EE/CA

30 This EE/CA includes the following sections:

- 31 • Section 1 – Introduction
- 32 • Section 2 – Site Description and Background
- 33 • Section 3 – Removal Action Objective and Scope
- 34 • Section 4 – Identification and Detailed Analysis of Removal Action Alternatives
- 35 • Section 5 – Comparative Analysis of the Removal Action Alternatives
- 36 • Section 6 – Recommended Removal Action Alternative
- 37 • Section 7 – References

# Site Description and Background

---

1 This section presents the background, history (including military operations), and the  
2 physical setting of the MRA-SIA and the former VNTR. The selection of proposed clearance  
3 areas within the MRA-SIA is based on observed trespassing events the presence of MEC.  
4 The action will reduce risk posed to unauthorized personnel (e.g., trespassers) who frequent  
5 the sites.

## 2.1 Site Location and Description

6 Vieques is located in the Caribbean Sea approximately 7 miles southeast of the eastern tip of  
7 the island of Puerto Rico and 20 miles southwest of St. Thomas, U.S. Virgin Islands. Vieques  
8 is the largest offshore island of the Commonwealth of Puerto Rico. It is approximately 20  
9 miles long and 4.5 miles wide, and has an area of approximately 33,088 acres (51 square  
10 miles). Figure 2-1 shows the regional location of Vieques with respect to the island of Puerto  
11 Rico.

### 2.1.1 Former Vieques Naval Training Range

12 The former VNTR is situated in the eastern half of the Island of Vieques, and is bordered on  
13 the west by the community of Isabel Segunda, to the north by Vieques Sound, and to the  
14 south by the Caribbean Sea. The former VNTR consists of approximately 14,500 acres and is  
15 divided operationally into four MRAs that (from west to east) include: the Eastern  
16 Maneuver Area (EMA), an area approximately 10,673 acres; the SIA, approximately 2,500  
17 acres; the 900-acre Live Impact Area (LIA), and the 200-acre Eastern Conservation Area  
18 (ECA) on the easternmost tip of Vieques (CH2M HILL, 2006). Figure 2-2 presents a site map  
19 of former VNTR.

20 The areas to be addressed as part of the EE/CA are present in one of the five MRAs that  
21 make up the former VNTR, the MRA-SIA. The description of the MRA-SIA is presented  
22 below.

#### Munitions Response Area-Surface Impact Area (MRA-SIA)

23 The SIA was established in the 1950s, when several Marine targets were constructed there.  
24 Marine artillery ranging from 76 millimeter (mm) to 175mm were directed toward these  
25 targets from artillery gun positions within the SIA and EMA. During 1969, the construction  
26 of bulls-eye targets 1 and 2, established the eastern and western boundaries of the SIA. At  
27 that time, a permanent observation post (OP) with a helicopter pad was also constructed on  
28 Cerro Matias. In 1971, a strafing target was installed adjacent to one of the targets. The aerial  
29 photo analysis identified numerous craters within the eastern two-thirds of the SIA that  
30 were caused by mortar and artillery fire, naval gunfire, and aerial bombing. The craters  
31 were most visible on the 1962 aerial photographs. In addition, the aerial photo analysis  
32 identified several artillery gun positions and OPs within the SIA that may have been used  
33 for artillery fire (CH2M HILL, 2006).

1 Sandy beach areas are intermix with rocky beaches along the south marine boundary and  
2 predominate along the northern marine boundary of the SIA. Yellow Beach lies within the  
3 SIA along its southern coast.

## 2.1.2 Geology

4 The geology of Vieques Island is characterized on the east side by marine volcanic andesites  
5 (generally lava tuff and *tuffaceous breccia*) intruded by a plutonic rock complex. These  
6 igneous rocks are generally overlain by alluvial deposits with some patches of limestone.  
7 The plutonic intrusive rocks consist of granodiorites and quartz-diorites, and are exposed  
8 over a large percentage of the island.

9 The geology of the western side of the island is dominated by the plutonic complex with  
10 some overlying alluvial deposits especially near the marine borders. A gradual change in  
11 texture from coarse to fine-grained quartz-diorite has been observed from western to  
12 eastern Vieques. A saprolite formation occurs at the surface of the plutonic complex in some  
13 areas.

14 Limestone occurs in sectors of the island's northern, southern, and eastern parts. The most  
15 extensive areas of limestone are found on the southern coastal peninsulas. The limestone is  
16 generally soft, yellowish, and well-indurated where exposed to the atmosphere. The alluvial  
17 deposits are generally of Quaternary age, consisting of a mixture of sand, silt, and clay that  
18 together have an average thickness of 30 feet (ft) in western Vieques and range from 5 to 50  
19 ft thick on the eastern end of Vieques. The alluvial materials are beach and dune deposits,  
20 and swamp and marsh deposits. The beach and dune sands are composed of calcite, quartz,  
21 plutonic rock fragments, and minor magnetite (USGS, 1989).

22 Soils on Vieques Island are primarily residual, due to both climatic and subsurface rock  
23 conditions. They typically are classified into five groups and range from rock land soils  
24 where bedrock is exposed to deep, well-drained soils within the alluvial deposits to shallow  
25 soils (USDA, 1977).

## 2.1.3 Hydrology

26 The streambeds found on Vieques flow either northerly or southerly until they reach the  
27 Caribbean Sea or Atlantic Ocean. Vieques does not have any perennial surface drainage, and  
28 receives an island wide long term average of 45 inches of rainfall per year. The eastern side  
29 of the island receives approximately 25 inches/year, while the western side around Solid  
30 Waste Management Unit (SWMU 4) averages approximately 50 inches per year. Of the total  
31 rainfall, approximately 90 percent is lost to evaporation, based on statistics from the U.S.  
32 Virgin Islands. Of the remaining 10 percent, approximately 5 percent infiltrates into the  
33 groundwater system and 5 percent becomes surface runoff. (USGS, 1989).

### Surface Water

34 Surface water deposits in the former VNTR occur primarily in coastal lagoons and  
35 intermittent streams, known locally as arroyos and quebradas that channel water  
36 downward from hills during rain events. Some of these arroyos and quebradas have  
37 standing water year-round, especially in areas abutting the coastline where terrain has  
38 leveled sufficiently to allow for standing water. Several mid- to large-sized lagoons are

1 present near the Purple Beach area just east of Puerto Negro and to the south within the  
2 Ensonada Honda area, the Bahía de la Chiva area, and the South Coast Bays area.

3 Some rainwater does pool for some time in low-lying areas following storm events, but  
4 these features typically dissipate within a few days.

### Groundwater

5 The groundwater on Vieques is derived from rainfall. The water flows downhill as  
6 intermittent stream runoff or seeps into the soil and underlying deposits. Water in pore  
7 space, cracks, and fractures in bedrock eventually flows into alluvial deposits or to the  
8 ocean. Yearly variations in island-wide rainfall influence groundwater levels locally.  
9 Groundwater levels also exhibit fluctuations near the coastline because of tidal influences.

10 The groundwater on the island is broken up into two aquifers: the Valle de Resolución,  
11 located beneath the island's western portion (the only known groundwater aquifer on the  
12 former Naval Ammunition Support Detachment (NASD) property that contains potentially  
13 potable water), and the Valle de Esperanza located beneath the island's southern portion  
14 near Camp Garcia. As discussed above, approximately 5 percent of the annual precipitation  
15 infiltrates through the ground and supplies the aquifers. The Valle de Esperanza is the more  
16 productive of the two aquifers and, therefore, was used as a source of potable water by the  
17 Navy. The Puerto Rico Aqueduct and Sewer Authority (PRASA) managed a series of 16  
18 wells which pumped approximately 450,000 gallons of water per day, although these wells  
19 are no longer active because of the installation of a water line from the island of Puerto Rico  
20 to Vieques in 1978.

21 The U.S. Geological Survey (USGS) performed a groundwater study on Vieques, including  
22 tests on the wells near Esperanza. The results indicated that the groundwater contained  
23 high concentrations of sodium bicarbonate. Because of its high sodium content, the  
24 groundwater on Vieques is not suitable for extended use for irrigation or other potable  
25 water use. The high levels of sodium result from sea spray infiltrating into the ground and  
26 saltwater entering the groundwater supply through excessive groundwater withdrawal  
27 (Vargas, 1995).

## 2.1.4 Natural Resources

### Eastern Vieques

28 The eastern end of Vieques houses a variety of natural resources in the form of wide-  
29 ranging plant and wildlife species. A number of conservation zones have been established  
30 in the former VNTR to help protect these valuable resources. A final Biological Assessment  
31 for the LIA (GMI, 2006) and amendment to the Final BA (GMI, 2007) has been developed  
32 and presents the mitigation measures that will be implemented to avoid impacts to  
33 threatened/endangered species during investigation and removal action activities. The  
34 approach for expanding the biological assessment to the remainder of the former VNTR,  
35 including the MRA-SIA, was submitted and agreed to by the U.S. Fish and Wildlife Service  
36 (USFWS) and portions of the field effort have been conducted. The identified Conservation  
37 Zones are:

- 1 • The Punta Este Conservation zone, which is located on the southeastern end of the LIA  
2 and consists primarily of drought-resistant scrub that no longer can be found elsewhere  
3 in Puerto Rico except on Navy property in Vieques.
- 4 • The Cayo Conejo Conservation Zone, a small island located southwest of the LIA in the  
5 Bahia Salina del Sur area. This area is an important nesting habitat for the endangered  
6 brown pelican and one of the last nesting areas for this species in Puerto Rico.
- 7 • The Ensonada Honda Conservation Zone, which lies between Blue and Yellow Beaches  
8 on the southern coast of Vieques. This area has the best example of lowland forest  
9 growth on Vieques and is also home to a variety of extensive mangrove populations that  
10 appear to be healthy and expanding.
- 11 • The South Coast Bays Conservation Zone, located on the southern coastline of Vieques  
12 directly south of the Camp Garcia area and western portions of the EMA. Two bays at  
13 this location, Bahia Tapon and Puerto Mosquito, have bioluminescent properties and are  
14 a valuable tourism resource for the island.

15 The intent of the conservation zones is the preservation of these unique areas as important  
16 components of the overall environmental health of Vieques.

17 Sea turtle nesting occurs primarily from February through November. The sea turtles that  
18 have been observed on Vieques are the green, leatherback, and hawksbill sea turtles.

## 2.1.5 Cultural Resources

19 A number of resources exist in the former VNTR that are of interest from a cultural  
20 perspective including a number of conservation zones, cultural resources, and prehistoric  
21 sites (Indian and Spanish historical sites). A total of up to 300 sites with the potential to  
22 contain significant cultural resources exist within Vieques (U.S. Navy, 1999). Seventeen  
23 archeological sites and districts on Vieques are currently listed on the National Register of  
24 Historic Places (NRHP) based on surveys completed in 1999 by personnel from the Puerto  
25 Rico State Preservation Office. One such area is the Puerto Ferro Lighthouse in the EMA,  
26 which has been determined to be eligible for the NRHP (TEC, 2002).

27 Seventeen archaeological sites and districts currently are listed on the NRHP system for  
28 Vieques with approximately a half dozen on the island's eastern end as shown on a land use  
29 map of U.S. Naval facilities on Vieques (GMI, 1996). This information has been confirmed by  
30 the review of other cultural resource maps for Vieques recovered during the record search  
31 and NRHP web-based searches.

## 2.2 Site History

### 2.2.1 General Site History

32 The sugarcane industry was the major economic base of Vieques during the late 19th  
33 century and early 20th century. Several sugarcane operations in Vieques were largely  
34 discontinued in the early 1940s when the U.S. Navy purchased large portions of the island.  
35 The U.S. Navy primarily used this land to conduct activities related to military training. The  
36 eastern end of Vieques Island was used for all aspects of naval gunfire training, including

1 air-to-ground (ATG) ordnance delivery and amphibious landings, as well as housing the  
2 main base of operations for these activities, Camp Garcia.

3 Although the island of Culebra was the focal point for naval gunfire in the 1960s and early  
4 1970s, the development of facilities on the eastern end of Vieques was undertaken in 1964,  
5 when a gunnery range was established in the LIA. In 1965, the Navy established the LIA, also  
6 known as the Air Impact Area, and began construction of OP 1 on Cerro Matias.

7 By the 1970s, the LIA maintained several targets for aerial bombing including old tanks and  
8 vehicles used as mock-ups, two bulls-eye targets and a strafing target. Additionally, several  
9 point and area targets for ships to practice naval gunfire support (NGFS) were established in  
10 the LIA.

11 The Environmental Impact Statement (EIS) for Vieques (Tippetts et al., 1979) provides a  
12 detailed discussion on the development of training facilities in the former VNTR leading up  
13 to 1979. The former VNTR provided logistics support, scheduling assistance, and facilities  
14 for NGFS and ATG ordnance delivery training for Atlantic Fleet ships, North Atlantic  
15 Treaty Organization (NATO) ships, air wings, and smaller air units from other allied  
16 nations and the Puerto Rican National Guard. The Fleet Marine Force, Atlantic (FMFLANT),  
17 conducted training for Marine amphibious units, battalion landing teams, and combat  
18 engineering units in the EMA. Occasionally, naval units of allied nations having a presence  
19 in the Caribbean and the Puerto Rican National Guard also utilized the EMA.

20 Adjacent to and west of the MRA-SIA, the 10,673-acre EMA (established in 1947) provided  
21 maneuvering space and ranges for the training of Marine amphibious units and battalion  
22 landing teams in exercises of amphibious landings, small-arms fire, artillery and tank fire,  
23 shore fire control, and combat engineering tasks. It is demarcated by the western property  
24 line east to the western front friendly-fire line where the MRA-SIA begins. Portions of the  
25 training areas within the EMA were in continuous use since World War II, when the Navy  
26 acquired title to the land, until 2003.

27 The Atlantic Fleet's ships, aircraft, and Marine forces carried out training in all aspects of  
28 Naval gunfire support, ATG ordnance delivery, air-to-surface mine delivery, amphibious  
29 landings, small-arms fire, artillery and tank fire, and combat engineering. As part of normal  
30 operations, unexploded ordnance (UXO) was cleared periodically from the LIA and  
31 destroyed. The Navy also operated a waste munitions open burn and open detonation  
32 (OB/OD) facility under a USEPA interim status Subpart X permit within the LIA.  
33 Additionally, unserviceable military munitions were periodically received from Naval  
34 Station Roosevelt Roads (NSRR) and from the NASD on the West End of Vieques, for  
35 demolition at the OB/OD area in the LIA.

## 2.2.2 National Priorities List Listing

36 In 2003, the Governor of Puerto Rico requested USEPA to list the former VNTR (and NASD)  
37 on the NPL. On May 26, 2004, the President of PREQB sent a letter to the Regional  
38 Administrator of USEPA acknowledging that USEPA, PREQB, and the Department of the  
39 Interior (DOI) concurred with the designation of the former Naval facilities of eastern and  
40 western Vieques as an NPL site. In addition, a clarification of the Atlantic Fleet Weapons  
41 Training Area (AFWTA) was provided and stated that initial areas of Preliminary  
42 Assessment/Site Inspection (PA/SI) under CERCLA will focus on "agreed areas" in and

1 around Vieques and Culebra where the Navy conducted operations, including “those  
2 waters in and around Vieques where contamination has come to be located.” On February 7,  
3 2005, Vieques was placed on the NPL.

4 As a result of the NPL listing, a Federal Facility Agreement (FFA) was developed and  
5 signed by the Navy, USEPA, PREQB and DOI. The purpose of the FFA is to ensure that  
6 potential environmental contamination from past activities are adequately evaluated and  
7 appropriate remedial actions are implemented, as necessary, to protect human health and  
8 the environment. The FFA will also establish the procedural framework and schedule for  
9 implementing these activities. With the listing on the NPL and the creation of an FFA, all  
10 future environmental restoration activities on Vieques will be conducted under CERCLA,  
11 with USEPA as the lead regulatory agency.

## 2.3 Current and Future Land Use

12 The former VNTR was transferred to the DOI in 2003 and must be managed by DOI as part  
13 of the National Wildlife Refuge System, pursuant to section 1049 of the Nation Defense  
14 Authorization Act for Fiscal Year 2002 (Public Law 107-107). In addition, the LIA including  
15 the OB/OD Site, must be managed as a wilderness area where public access will be  
16 restricted (Public Laws 106-398 and 107-107). A Comprehensive Conservation Plan for the  
17 Vieques National Wildlife Refuge has been developed as is done with all other refuges, and  
18 outlines its land use plan for managing the refuge. The Department of Interior Fish and  
19 Wildlife Service preliminary land use plan for the former VNTR is presented in Figure 2-3.  
20 While all military activities have ceased at the former VNTR the U.S. Navy retains  
21 responsibility for any MEC and/or environmental concerns that may exist there. Any land  
22 use controls (LUCs) such as access restrictions that are planned for the former LIA are  
23 expected to be consistent with those established for state and federal wildlife refuges. It is  
24 likely that future site activities (particularly intrusive) will require the support of qualified  
25 UXO technicians. The level of support required will depend on the probability of  
26 encountering MEC. The need for UXO support should be included in the planning for any  
27 activities.

## 2.4 Previous Investigations

### 2.4.1 Eastern Vieques

#### Preliminary Range Assessment

28 Nineteen MEC areas were investigated within the former VNTR as part of the Preliminary  
29 Range Assessment (CH2M HILL, 2003), an analysis of historical aerial photographs, and  
30 interviews of personnel identified 43 additional potential MEC areas within the former  
31 VNTR boundaries. These areas include five potential ranges, 32 mortar or artillery gun  
32 positions, four observation posts, and two munitions storage areas.

33 The information from the field reconnaissance, archive search and the aerial photo analysis  
34 was evaluated to develop the MEC portion of a conceptual site model (CSM) for the former  
35 VNTR. The CSM indicated that the entire 900 acres of the LIA had been impacted by MEC  
36 from ATG ordnance delivery and naval gunfire. The activities of the LIA have also

1 potentially impacted the 200 acres of the adjacent ECA. The aerial photo analysis identified  
2 numerous craters within the entire 2,500 acres of the MRA-SIA which were caused by  
3 mortar and artillery fire, naval gunfire and aerial bombing. Safety fans developed for the six  
4 ranges and several artillery fans within the EMA were potentially impacted by MEC.

5 The roads and beaches addressed in this EE/CA are those that are located within the MEC  
6 impacted areas of MRA-SIA within the former VNTR.

### Expanded Range Assessment and Phase I Site Inspection Report

7 An Expanded Range Assessment and Phase I Site Inspection (CH2M HILL, 2007) was  
8 conducted to prioritize future munitions response actions. The beaches (Beach Area) within  
9 the range fan area and MRSs in the MRA-LIA, MRA-SIA, and MRA-EMA were evaluated to  
10 determine potential risks posed by MEC at the sites. A summary of the results of the  
11 investigation are presented below. The MRS locations are shown on Figure 2-2.

12 **MRA-SIA Phase I** MRA-SIA MRS 1 was the only MRS inspected in the MRA-SIA as part of  
13 the ERA and Phase I SI. A potential for exposure to explosive hazard exists at the MRA-SIA  
14 MRS 1 (based on a site inspection of approximately 25 percent of that MRS) based on the  
15 high explosive (HE) hazard associated with the surface MEC identified at the MRS.  
16 However, access to the areas is limited or very difficult due to very dense vegetation and  
17 rough terrain (e.g., steep slopes). The subsurface was evaluated at MRS 1 using handheld  
18 magnetometers and a total of 30 subsurface anomalies were located, which is only slightly  
19 more than 1 anomaly/acre, which is a low density.

20 **MRA-SIA Phase II** A total of seven MRSs, two photo-identified (PI) Sites, and one potential  
21 area of concern (PAOC) site were inspected as part of the Phase II SI. A potential for  
22 exposure to explosive hazard exists at the MRA-SIA MRSs 2-7 (based on a transect  
23 evaluation of the MRSs) because of the HE hazard associated with the surface MEC  
24 identified at the MRSs. As of June 1, 2008, 1,055 projectiles/mortars, 229 bombs, 141  
25 flares/pyrotechnics, 6 grenades, 222 MEC components, 137 rockets missiles, and 323  
26 munitions debris (MD)/range related debris with an approximate weight of 173, 342 lbs,  
27 have been identified in the MRA-SIA. Access to the interior area of the MRA-SIA is limited  
28 or very difficult due to dense vegetation and rough terrain (e.g., steep slopes).

## 2.5 Evaluation of Risk

29 Historical documentation from military operations and recent MEC data collected since  
30 those operations ceased indicate that there are a substantial number of MEC items across the  
31 MRA-SIA (CH2M HILL, 2007). Numerous MEC items have been located during both the  
32 Phase I and ongoing Phase II SI in the MRA-SIA using a transect approach and covering  
33 approximately 10 percent of each MRS. Table 2-1 lists the numbers of munitions related  
34 items located and projected densities for each MRS. Additionally, Figure 2-4 shows the  
35 locations and categories of the MEC items located.

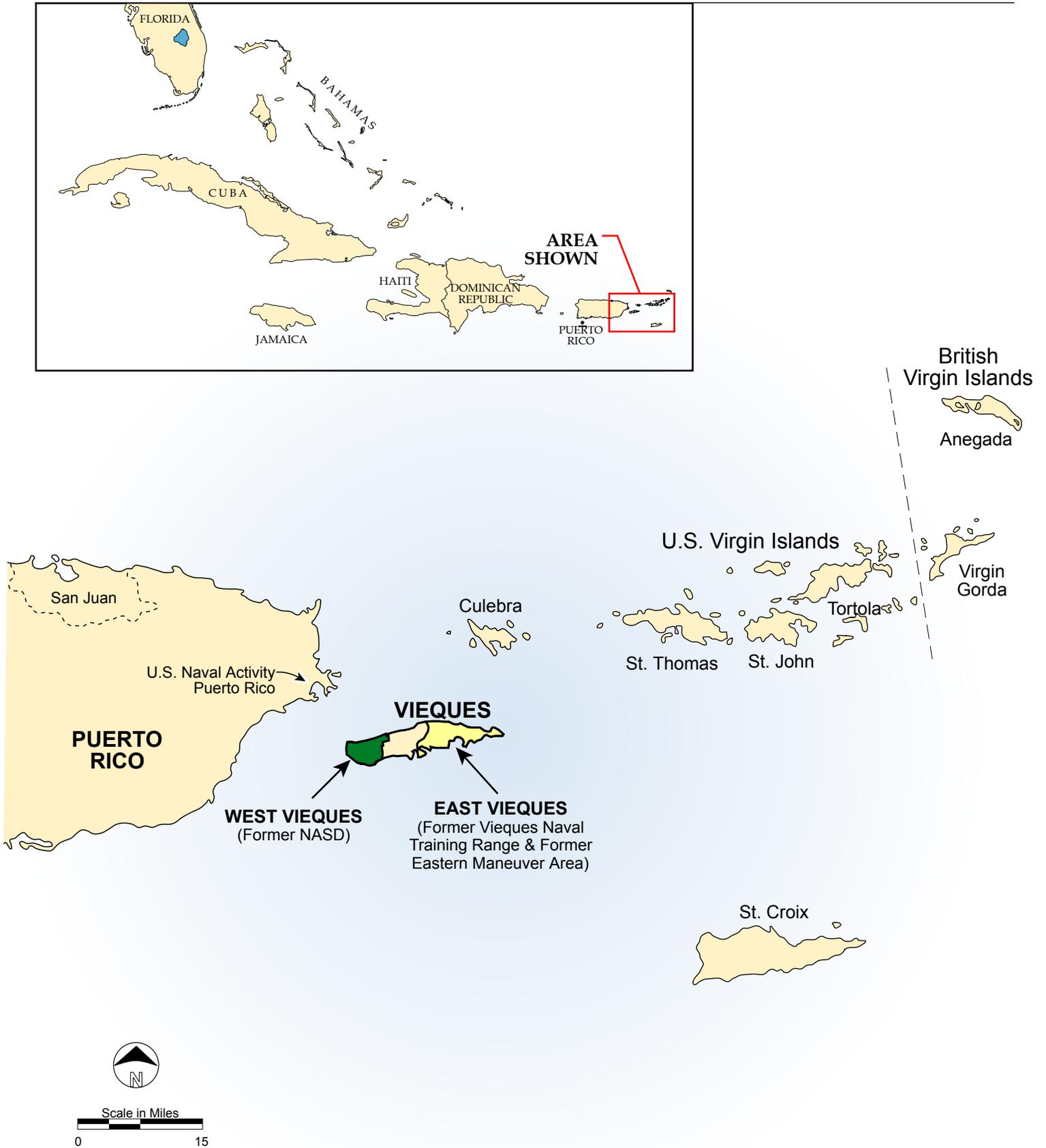
36 A significant number of munitions related items are present at the surface in the MRA-SIA.  
37 A brief summary of trends, by item class, observed to date is presented below:

- 1 • Bomb densities are the greatest on the western side of MRS 5, which is immediately  
2 adjacent to the MRA-EMA. This can be attributed to a target located in that area and the  
3 resulting high density of small practice bombs (e.g., BDU-33).
- 4 • Bomb densities are high along roadways in MRSs 2 and 3. The bomb types in these areas  
5 are highly varied, small practice bombs such as the BDU-33 in addition to Mk series  
6 bombs.
- 7 • Rockets/ guided missiles are scattered throughout the MRA-SIA with no apparent  
8 pattern.
- 9 • Projectiles/ mortars are found throughout the MRA-SIA. The densities are less in MRSs 2  
10 and 3.
- 11 • Grenades/ flares-pyrotechnics have been found sporadically across the MRA-SIA.

TABLE 2-1  
MRA-SIA Site Inspection Results and Projected Densities

Inspection (items located)				Projected Density (items/acre)			
Bombs	Rockets/ Guided Missiles	Projectiles/ Mortars	Grenades/ Flares- Pyrotechnics	Bombs	Rockets/ Guided Missiles	Projectiles/ Mortars	Grenades/ Flares- Pyrotechnics
222	140	1054	148	3	2	15	2

12 As Figure 2-4 shows, MEC items are located in close proximity to access routes (roads) and  
13 beach areas. Throughout the life of the ongoing removal action, trespassing has been  
14 observed throughout the former VNTR on numerous occasions. The observed trespassing  
15 includes pleasure boaters accessing beaches and areas beyond the beaches, commercial  
16 snorkeling trips to the beaches along the northern coast of the former VNTR, horseback  
17 riders, organized protest groups, and others. Efforts to curtail the trespassing are often  
18 ignored or met with resistance and do not appear to have a lasting effect. Although a  
19 majority of trespassing is on the beaches, there has been evidence of people accessing inland  
20 portions of the former VNTR; such evidence includes vandalism to contractor property,  
21 burned areas from campfires, and trash and other debris. Although the majority of the  
22 trespassing to date has been conducted in the MRA-LIA, boaters have been identified along  
23 the shoreline of the SIA and horseback trails have been identified throughout the SIA by the  
24 SI field teams. The most frequently observed trespassers are vacationers accessing the  
25 beaches along the LIA from boats that are anchored in the bays. Project personnel regularly  
26 contact the trespassers, explaining the risk and asking them to observe the exclusion zones  
27 shown on nautical maps, in attempts to have them leave the project site. The guards hired to  
28 patrol the magazines and central processing compound are also present on site during  
29 nights, weekends, and holidays, with few exceptions, frequently report boats in the bays  
30 and people on shore.





Aerial Photograph of 1994

**Legend**  
 [Red Outline] MRS Boundary and Number  
 [Green Hatched] Camp Garcia  
 [Yellow Dashed] Parcel Boundary and Designation

Notes :  
 - MRS Numbers Do Not Signify Priority  
 - EMA-MRS 43 and SIA-MRS 7 include all terrestrial area within the range fan(s) not designated as other MRSs.

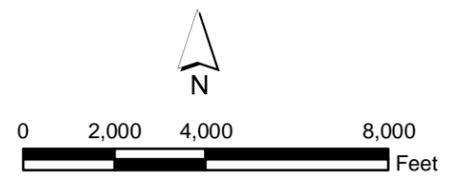


Figure 2-2  
 Former VNTR Site Map  
 Former VNTR  
 Vieques, Puerto Rico

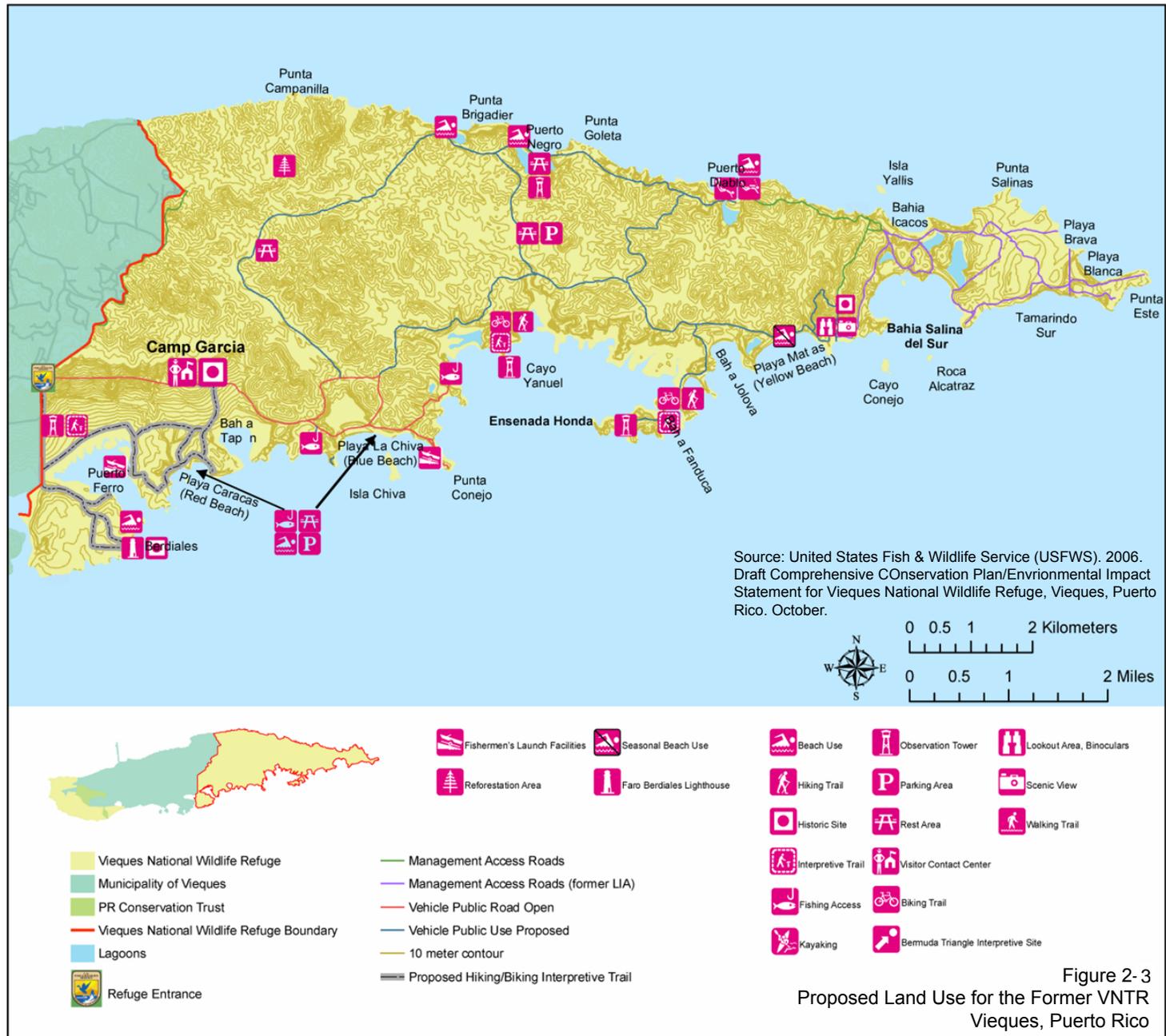
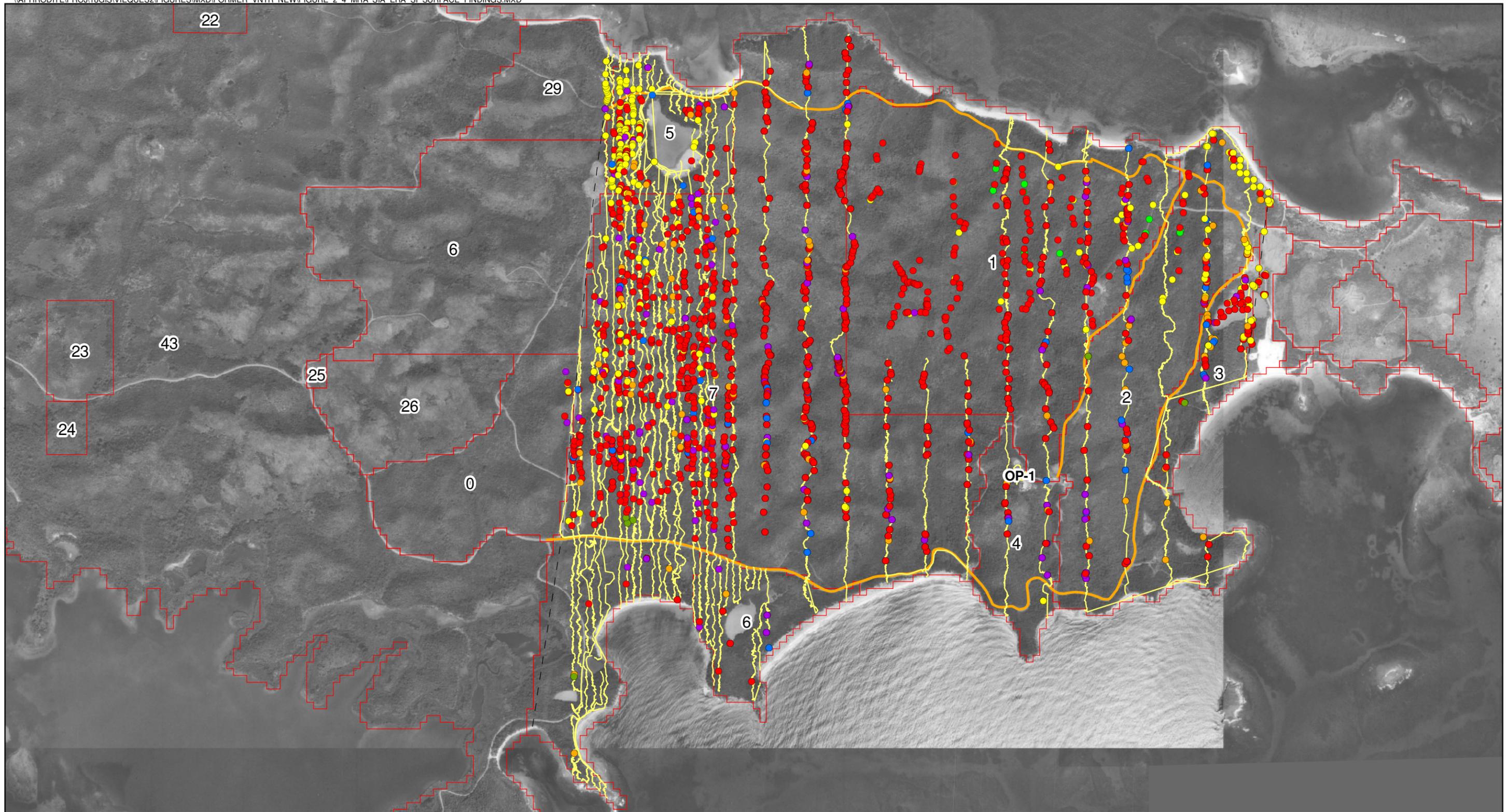


Figure 2-3  
Proposed Land Use for the Former VNTR  
Vieques, Puerto Rico



- Legend**
- Bombs
  - Flares-Pyrotechnics
  - Grenades
  - MEC Component
  - Projectiles / Mortars
  - Rockets / Guided Missiles
  - ICMS
  - Transects
  - SIA Roads
  - MRS Boundary

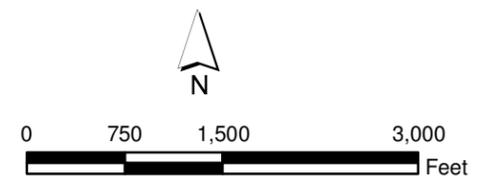


Figure 2-4  
MRA-SIA-ERA/SI Surface Findings  
Former VNTR  
Vieques, Puerto Rico

# Removal Action Objective and Scope

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1 This section presents information that forms the basis for the site’s removal action objectives  
2 (RAOs). This information includes statutory limits on removal actions, the removal action  
3 objectives and scope, applicable or relevant and appropriate requirements (ARARs), and a  
4 discussion of the selection of cleanup criteria.

## 3.1 Statutory Limits on Removal Actions

5 The NCP 40 CFR Part 300.415 dictates statutory limits of \$2 million and 12 months of  
6 USEPA fund-financed removal actions, with statutory exemptions for emergencies and  
7 actions consistent with the remedial action to be taken. This removal action will not be  
8 USEPA fund-financed. The Navy/Marine Corps Installation Restoration Program (IRP)  
9 Manual does not limit the cost or duration of the removal action; however, cost-effectiveness  
10 is a recommended criterion for the evaluation of removal action alternatives.

## 3.2 Removal Action Objective and Scope

### 3.2.1 Removal Action Objectives

11 General RAOs are defined by the NCP and as amended by SARA. The NCP requires that  
12 the selected remedy meet the following general RAOs:

- 13 • Each selected remedial action shall be protective of human health and the environment.
- 14 • Onsite remedial actions that are selected must attain those ARARs that are identified at  
15 the time of the Record of Decision (ROD) signature.
- 16 • Each remedial action selected shall be cost effective; costs shall be proportional to  
17 effectiveness.
- 18 • Each remedial action shall use permanent solutions and alternative treatment  
19 technologies or resource-recovery technologies to the maximum extent practicable.  
20 However in the case of this interim action, future actions may be required as part of the  
21 permanent solution.

22 The statutory scope of CERCLA was amended by SARA to include the following general  
23 objectives for remedial action at all CERCLA sites:

- 24 • Remedial actions shall attain a degree of cleanup of hazardous substances, pollutants,  
25 and contaminants released into the environment and of control of further releases at a  
26 minimum, which assures protection of human health and the environment.
- 27 • Remedial actions where treatment that permanently and significantly reduces the  
28 volume, toxicity, or mobility of the hazardous substances, pollutants, and contaminants  
29 as a principal element is preferred.

- 1 • The least favored remedial actions are those that include offsite transport and disposal of  
2 hazardous substances or contaminated materials without treatment where practicable  
3 treatment technologies are available.
- 4 • The selected remedy must comply with, or attain, the level of any standard,  
5 requirement, criteria, or limitation under any federal environmental law or any  
6 promulgated standard, requirement, criteria, or limitation under a state environmental  
7 or facility citing law that is more stringent than any federal standard, requirement,  
8 criteria, or limitation.

9 The site specific proposed RAO is to implement measures along the beaches and roadways  
10 of the former VNTR and at SWMU 4 that will isolate, and reduce MEC explosive hazards  
11 from energetic materials that pose a potential explosive safety risk to recreational site users,  
12 USFWS wildlife refuge site workers, trespassers, and other authorized personnel/workers,  
13 based on current and future land use scenarios.

### 3.2.2 Remedial Action Scope

14 In the preparation of this EE/CA, three removal action alternatives were evaluated that can  
15 meet the objectives listed above. The general scope of each removal alternative evaluated is  
16 defined in this section.

17 The removal action will address select areas within the MRA-SIA that have a MEC hazard  
18 and a potential for access by unauthorized personnel. All evaluated scenarios will meet the  
19 objectives above and will consider the following:

- 20 • The selected remedial alternative will limit the potential exposure to MEC (reduce  
21 explosive risk) present in the MRA-SIA by unauthorized personnel.
- 22 • Prior to conducting work, measures necessary to protect threatened/endangered flora  
23 and fauna (including habitat where warranted) will be implemented in accordance with  
24 the Biological Assessment. An approved amendment to the Biological Assessment (GMI,  
25 2007) includes the beach area and turtle nesting habitat. The areas within the MRA-SIA  
26 identified in the approved approach will be evaluated with respect to  
27 threatened/endangered flora and fauna and habitat prior to work being carried out in  
28 those areas.

## 3.3 Determination of Remedial Action Schedule

29 The EE/CA will be placed in the Administrative Record, and notice of its availability for  
30 public review along with a brief summary will be published in the local newspaper. The  
31 EE/CA is then available for a 30-day public comment period. Following the public comment  
32 period, a Responsiveness Summary summarizing responses to significant comments will be  
33 prepared and included in the Administrative Record. Since this removal action has been  
34 designated non-time-critical, the start date will be initiated following the resolution of the  
35 comments.

36 The total project period is anticipated to last less than an estimated 36 to 39 months, from  
37 the end of the public comment period through completion of remedial actions. This is an  
38 estimated schedule for project completion, should critical milestones not be met, the total

1 project timeframe would also be extended. Critical milestone periods related to the EE/CA  
2 are summarized below:

- 3 • EE/CA Public Comment Period – 1 month
- 4 • Contracting – 6 month
- 5 • Preparation – 3 months (includes preparation of work plan[s]), ecological resources  
6 surveys and evaluations (if required), submittal reviews, and mobilization
- 7 • Remedial Action – 26 to 29 months

### 3.4 Applicable or Relevant and Appropriate Requirements

8 The remedial action will, to the extent practicable, comply with ARARs under federal and  
9 Puerto Rico laws. Appendix A contains the ARAR tables and provides a summary of each  
10 potentially related environmental and munitions regulation. Other federal and Puerto Rico  
11 advisories, criteria, or guidance will be considered, as appropriate, in formulating the  
12 remedial action. Applicable requirements are those requirements specific to the conditions  
13 at the former VNTR and the surrounding vicinity that satisfy all jurisdiction prerequisites of  
14 the law or requirements. Relevant and appropriate requirements are those that do not have  
15 jurisdiction authority over the particular circumstances at the former VNTR and surrounding  
16 vicinity, but are meant to address similar situations, and therefore, are suitable for use at  
17 these sites. Federal ARARs are determined by the lead agency. As outlined by 40 CFR  
18 300.415(j), the lead agency may consider the urgency of the situation and the scope of the  
19 remedial action to be conducted in determining whether compliance with ARARs is  
20 practicable.

21 The NCP, 40 CFR 300.400(g)(2), specifies the following factors to consider in determining  
22 what requirements of environmental laws are relevant and appropriate:

- 23 • The purpose of the requirement in relation to the purpose of CERCLA.
- 24 • The medium (or media) regulated by the requirement.
- 25 • The substance(s) regulated by the requirement.
- 26 • The actions or activities regulated by the requirement.
- 27 • Variations, waivers, or exemptions of the requirement.
- 28 • The type of place regulated and the type of place affected by the release or CERCLA action.
- 29 • The type and size of the facility or structure regulated by the requirement or affected by  
30 the release.
- 31 • Consideration of the use or potential use of affected resources in the requirement.

32 In some circumstances, a requirement may be relevant to the particular site-specific  
33 situation but not appropriate because of differences in the purpose of the requirement, the  
34 duration of the regulated activity, or the physical size or characteristic of the situation it is

1 intended to address. There is more discretion in the judgment of relevant and appropriate  
2 requirements than in the determination of applicable requirements.

3 Three classifications of requirements are defined by USEPA in the ARAR determination  
4 process: chemical-specific, location-specific, and action-specific. Each is described below.

5 *Chemical-specific ARARs* are health or risk management-based criteria or methodologies that  
6 result in the establishment of numerical values for a given medium that would meet the  
7 NCP “threshold criterion” of overall protection of human health and the environment.  
8 These requirements generally set protective cleanup concentrations for the chemicals of  
9 concern in the designated media, or set safe concentrations of discharge for remedial  
10 activity. Any chemical constituents of concern identified at the munitions response sites will  
11 be addressed, as a separate munitions response action, following the reduction of the  
12 explosive safety risk by the subsurface removal of munitions.

13 *Location-specific ARARs* restrict remedial activities based on the characteristics of the  
14 surrounding environments. Location-specific ARARs may include restrictions on remedial  
15 actions within wetlands or floodplains, the protection of known endangered species, or  
16 restrictions for protected waterways. Federal and Puerto Rico location-specific regulations  
17 that have been reviewed are summarized in Appendix A.

18 *Action-specific ARARs* are requirements that define acceptable treatment and disposal  
19 procedures for munitions to ensure the protection of public health and safety. Federal and  
20 Puerto Rico action-specific ARARs that may affect the development and conceptual  
21 arrangement of remedial alternatives are summarized in Appendix A.

# Identification and Detailed Analysis of Removal Action Alternatives

---

## 4.1 Alternatives Description

1 Based on the analysis of the nature and extent of MEC contamination and the cleanup  
2 objectives developed in the previous section, three remedial action alternatives were  
3 developed. The following are the remedial action alternatives considered for detailed  
4 evaluation at the former VNTR MRA-SIA:

- 5 1. No Action.
- 6 2. Engineering controls (physical barrier) to prevent access to restricted areas.
- 7 3. Removal of surface detected MEC from areas within the MRA-SIA with the highest  
8 potential for trespassing.

9 A description of each of these alternatives is provided below.

### 4.1.1 Alternative 1—No Action

10 The no action alternative implies that no surface MEC remedial work would be completed  
11 for the areas with potential unauthorized personnel access within the MRA-SIA.

### 4.1.2 Alternative 2- Engineering Controls

12 The engineering controls alternative would provide physical barriers and signage to prevent  
13 access. As part of this alternative, fencing would be placed along all potential access points  
14 and frequent signage would be put in place. The fencing would be constructed of 10 ft high  
15 chain link topped with barbed wire. Gates will be put in place at strategic points to allow  
16 USFWS and other site worker access. Signs identifying the areas as having an MEC hazard  
17 would be placed every 100 ft along the fence line. Intrusive work and limited vegetation  
18 clearance would be required during fence installation; therefore, MEC avoidance will be  
19 required. The total number of linear feet of fence would be 48,300 ft and 480 signs would be  
20 installed. Figure 4-1 presents the proposed fencing and signage locations.

### 4.1.3 Alternative 3—Removal of Surface MEC from Select areas of the MRA-SIA

21 The removal action alternative would include the removal of all surface MEC from the  
22 selected areas. Figure 4-2 and the bullets below present the areas of MEC removal within the  
23 MRA-SIA that would be conducted for Alternative 3.

- 24 • The roadways plus 100 meters each side. Because of the steep terrain and dense  
25 vegetation in the SIA it is unlikely that unauthorized users will access the central portion  
26 of the SIA. Therefore, a 100 meter clearance area along each side of the roads is expected

1 to significantly reduce the explosive risk in areas off the roadways that could reasonably  
 2 be accessed by unauthorized personnel/recreational user.

3 • The shoreline inland 100 meters. Because of the steep terrain and dense vegetation in the  
 4 central portion of the SIA, it is unlikely that unauthorized users will access this area.  
 5 However, several recreational boaters have been documented to trespass in the SIA from  
 6 the shoreline. Therefore, a 100 meter clearance inland from the shoreline is expected to  
 7 significantly reduce the explosive risk in areas off the beaches that could reasonably be  
 8 accessed by unauthorized personnel/recreational users.

9 • From the eastern boundary of the SIA westward to the approximate extent of where HEs  
 10 containing bombs are expected to be located based on the ERA/SI data. The eastern  
 11 portion of the MRA-SIA transects show a mix of MEC items that are similar to that  
 12 found in the MRA-LIA, specifically high explosive bombs. Therefore, this entire area  
 13 will be surface cleared to reduce risk. There are also a number of access routes through  
 14 this area (e.g., road to OP-1) that present access points for authorized and unauthorized  
 15 personnel. The northwestern portion of the MRA-SIA contains a number of practice  
 16 bombs (e.g., BDU-33) as shown on Figure 4-2; however, these items do not pose the  
 17 same high explosive hazard that the items located in the more eastern portion of the  
 18 MRA-SIA do. The BDU 33 type practice bombs are not fitted with a sensitive fuze. If the  
 19 BDU 33 failed to function upon impact, it would only contain a few grams of energetic  
 20 material.

21 Table 4-1 presents the phases of work for this alternative. A majority of the site will not  
 22 require site restoration following the clearance activities; however, some restoration may be  
 23 required in beach areas or other sensitive habitat/ecological areas depending on the extent  
 24 of removal activities required.

TABLE 4-1  
 Alternative 3—Work Phases

Operation	Description
Surface MEC clearance	700 acres of would be cleared of surface MEC in the MRA-SIA. This includes the clearing of vegetation to expose the ground surface and subsequent identification and removal of MEC.
Scrap metal segregation, accumulation, and storage	All scrap metal needing to be removed during the MEC clearance would be collected in an accumulation and storage area for off-site disposal. Estimated quantity is 2100 tons.
MPPEH/MD certification and disposal	All MPPEH/MD would be documented, removed, and stockpiled until inspection. When certified free of explosives, the material will be transferred to a certified recycling facility. Estimated quantity is 1800 tons.
MEC consolidated demolition and demilitarization	All UXO found would be documented and appropriate demolition/venting actions conducted. Estimated quantity is 8500 items.
Revegetation	All revegetation (if required) would be accomplished by allowing the site to revegetate naturally.

Notes:  
 MEC = munitions and explosives of concern, MPPEH/MD = Material potentially presenting an explosive hazard/munitions debris, UXO = unexploded ordnance

## 4.2 Analysis of Removal Action Objectives

- 1 Each alternative was evaluated using the effectiveness, implementability, and cost criteria
- 2 set forth in the NCP and the USEPA guidance for conducting EE/CAs (USEPA, 1993). Each
- 3 evaluation criterion is described in Table 4-2 and sections following the table provide a
- 4 discussion of the pertinent evaluation criteria for each alternative.

TABLE 4-2  
Evaluation Criteria

<b>Effectiveness</b>	
Protection of human health and the environment	The assessment describes how the action achieves and maintains protection of human health and the environment and achieves site-specific objectives both during and after implementation.
Compliance with ARARs	An alternative is assessed in terms of its compliance with ARARs, or if a waiver is required, how it is justified.
Short-term effectiveness	An action is assessed in terms of its effectiveness in protecting human health and the environment during the implementation of a remedy before remedial action objectives have been met. The duration of time until the remedial action objectives are met is also factored into this criterion.
Long-term effectiveness and permanence	An action is assessed in terms of its long-term effectiveness in maintaining protection of human health and the environment after remedial action objectives have been met. The magnitude of residual risk and adequacy and reliability of post-remedial site controls are taken into consideration.
Reduction of exposure to explosive hazards	An action is assessed in terms of anticipated performance of the specific remedial technologies it employs. Factors such as volume of MEC removed or destroyed and the degree of expected reductions in exposure to hazards within the remedial area.
<b>Implementability</b>	
Technical feasibility	The ability of the technology to implement the remedy is evaluated.
Administrative feasibility	The administrative feasibility factor evaluates requirements for permits, zoning variances, impacts on adjoining property, and the ability to impose ICs.
Availability of services and materials	The availability of offsite treatment, storage, and disposal capacity, personnel, services and materials, and other resources necessary to implement the alternative will be evaluated.
State and community acceptance	The acceptability of an alternative to the state (commonwealth) agency and the community is evaluated.
<b>Cost</b>	
Direct and indirect capital costs	Includes costs for MEC removal (excavation and site restoration), equipment and materials, munitions storage and services, engineering and design, and permit/licenses.
O&M costs	Includes ongoing monitoring and maintenance for a specific period.

Notes:

ARAR = applicable or relevant and appropriate requirements, IC = institutional control, MEC = munitions and explosives of concern, O&M = operation and maintenance

## 4.2.1 Effectiveness

1 The *effectiveness* of a technology refers to its capability of removing the specific items in the  
2 volumes required, the degree to which the technology achieves the RAO, and the reliability  
3 and performance of the technology over time, including protection of human health and the  
4 environment, compliance with ARARs to the extent practical, long-term effectiveness and  
5 permanence, reduction in explosive safety hazard, and short-term effectiveness.

6 As explained in Section 2, the RAO for the sites is to implement measures that will isolate,  
7 reduce, or eliminate MEC hazards which may contain energetic materials that pose a  
8 potential explosive safety hazard to human health and the environment based on current  
9 and future land use scenarios.

10 Levels of effectiveness were assessed based upon the number of “effectiveness criteria” that  
11 would be satisfied by each alternative. The “effectiveness criteria” are described in Table 4-2.

### Protection of Human Health and the Environment

12 **Alternative 1—No Action.** Alternative 1 provides no additional protection to human health  
13 and the environment. The MEC would remain onsite which would potentially expose  
14 trespassers and authorized personnel/workers to explosive safety hazards associated with  
15 UXO. In addition this alternative would not protect the environment from future releases of  
16 explosive related contaminants. The current concentration of MEC poses a HE safety risk to  
17 human health and the environment; this alternative will not reduce that risk.

18 **Alternative 2—Engineering Controls** Alternative 2 provides a limited level of protection to  
19 human health and the environment in the MRA-SIA. This alternative would reduce the  
20 explosive safety risk to humans by inhibiting access to MEC that would remain in place.  
21 Engineering controls can not eliminate the potential for human exposure because of intended  
22 or unintended breeches of the installed barrier. No potential environmental benefits are  
23 realized from this alternative because munitions items would remain in place.

24 **Alternative 3—Removal of Surface Detected MEC from Select Areas of the MRA-SIA.** Alternative  
25 3 provides the highest level of protection to human health and the environment within the  
26 MRA-SIA. The surface MEC would be removed from the removal action area and disposed of  
27 offsite.

28 An explosive hazard may still exist due to the potential for subsurface MEC and erosion that  
29 would expose subsurface items.

### Protection of Workers During Implementation

30 **Alternative 1—No Action.** Because Alternative 1 is the ‘No Action’ alternative, this criterion is  
31 not applicable.

32 **Alternative 2—Engineering Controls.** As with any MEC site, Alternative 2 does have worker  
33 safety issues to address prior to implementation. The main hazard to workers during  
34 implementation associated with this alternative is working in areas with live munitions. All  
35 personnel working in the area will be lead by UXO personnel who will provide MEC  
36 avoidance. Engineering controls will involve intrusive activities during installation. An  
37 additional hazard to workers during implementation is working in rough terrain in a

1 tropical climate. Worker safety would be a concern for this alternative, but is a normal,  
2 manageable component of MEC related work activities.

3 **Alternative 3—Removal of Surface Detected MEC from Select Areas of the MRA-SIA.** Alternative  
4 3 has worker safety issues to address prior to implementation. The main hazard to workers  
5 during implementation associated with this alternative is working with potentially live  
6 munitions. All personnel involved with the MEC removal will be UXO personnel. All  
7 applicable safety requirements will be followed for handling, storage, and  
8 demolition/demilitarization. All exclusion areas where removal is taking place will be  
9 restricted access exclusion zones for explosive safety purposes. Only authorized personnel  
10 will be allowed in the exclusion zone. An additional hazard to workers during  
11 implementation is working in rough terrain in a tropical climate. Worker safety would be a  
12 concern for this alternative, but is a normal, manageable component of MEC related work  
13 activities.

### Compliance with Chemical, Action and Location Specific ARARs

14 There are no chemical specific ARARs associated with this EE/CA. All action specific and  
15 location specific ARARs are summarized in Appendix A.

### Short-term Effectiveness

16 **Alternative 1—No Action.** Alternative 1 does not provide any short term effectiveness at the  
17 MRA-SIA.

18 **Alternative 2—Engineering Controls.** Alternative 2 has limited effectiveness in the short term  
19 by providing physical barriers and signage for public access to restricted areas, which could  
20 be breeched.

21 **Alternative 3—Removal of Surface Detected MEC from Select Areas of the MRA-SIA.** Alternative  
22 3 is effective in the short term by reducing the explosive safety risk of MEC by permanently  
23 removing the items from the ground surface.

### Long-term Effectiveness and Permanence

24 **Alternative 1—No Action.** Alternative 1 does not provide any long-term effectiveness.

25 **Alternative 2—Engineering Controls.** Alternative 2 provides limited long-term effectiveness.  
26 Engineering Controls can not eliminate the long term risks to human health. Fencing and  
27 signage can be compromised by trespassers, vehicles, and weather, and the public would in  
28 turn have access to restricted areas. Alternative 2 does not include the removal of on-site  
29 MEC, therefore the risk to human health is high if engineering controls are compromised.  
30 Long term and extensive operation and maintenance would be required to maintain fencing  
31 and signs in good repair.

32 **Alternative 3—Removal of Surface Detected MEC from Select Areas of the MRA-SIA.** Alternative  
33 3 is effective in the long-term by removing on-site MEC. Implementation of this alternative  
34 leaves the long-term possibility for circumstances to arise that could affect human health or  
35 the environment (e.g., erosion that reveals subsurface MEC), but this is will likely occur over  
36 extended periods of time. Long-term operation and maintenance would be required (e.g.,

1 signage) and periodic site evaluations would need to be performed to identify MEC that has  
2 migrated to the surface.

## 4.3 Implementability

3 The *ease of implementation* of a technology refers to the availability of commercial services to  
4 support it, the constructability of the technology under specific site conditions, and the  
5 acceptability of the technology to all parties involved (regulators, public, owner, etc.),  
6 including technical feasibility, administrative feasibility, availability of services, support  
7 agency acceptance, and community acceptance. Levels of implementability were assessed  
8 based upon the number of “implementability criteria” satisfied by each alternative  
9 summarized in Table 4-2.

### 4.3.1 Alternative 1—No Action

10 Alternative 1 is the ‘No Action’ alternative; therefore, implementability does not apply.

### 4.3.2 Alternative 2—Engineering Controls

11 Technical feasibility for Alternative 2 is less difficult than Alternative 3. Installation of  
12 fencing and performing MEC avoidance can more easily be implemented. This alternative  
13 would not include many of the MEC related work phases that Alternative 3 requires.

### 4.3.3 Alternative 3—Removal of Surface Detected MEC from Select Areas of the MRA-SIA

14 Alternative 3 is technically more difficult to implement than Alternative 2. This is due to  
15 Alternative 3 requiring additional MEC related work phases. The implementation of many  
16 of the phases requires logistical and equipment considerations due the increased safety  
17 requirements when making intentional contact with MEC.

## 4.4 Cost

18 For the *detailed cost analysis* of alternatives, the expenditures required to complete each  
19 alternative were estimated in terms of capital costs, operation and maintenance (O&M)  
20 costs, long-term monitoring (LTM) costs, and indirect costs. Capital costs include costs to  
21 complete initial remedial activities. O&M costs will be incurred to ensure the integrity of the  
22 engineering controls in Alternative 2. Indirect costs include engineering expenses, license or  
23 permit costs, and contingency allowances. By combining the different costs associated with  
24 each alternative, a present-worth calculation for each alternative can be made for comparison.

25 The costs estimated for this section are provided to an accuracy of +50 percent and -30  
26 percent. The alternative cost estimates are in 2007 dollars and are based on information  
27 published by R. S. Means *Site Work and Landscape Cost Data* and *Environmental Cost,  
28 Handling, Options and Solutions (ECHOS)*. When actual costs or real quotes were available or  
29 when R. S. Means data are not available or not applicable, quotes, previous costs, or  
30 engineering estimates are used for unit pricing. Appendix B contains the preliminary cost  
31 estimate for Alternatives 2 and 3. The assumptions are presented below.

#### 4.4.1 Alternative 1—No Action

1 There are no costs associated with this alternative.

#### 4.4.2 Alternative 2—Engineering Controls

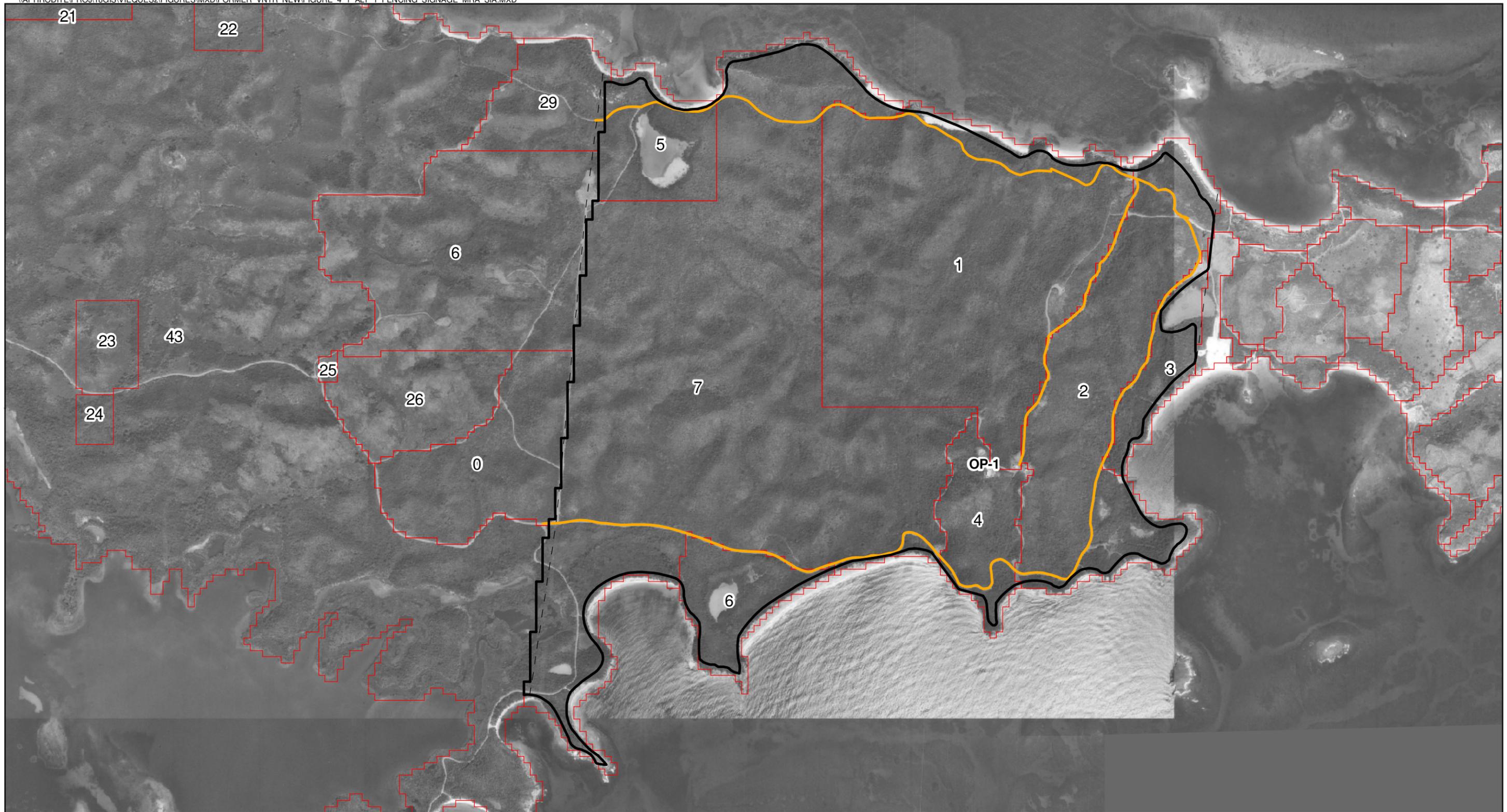
2 The estimated total cost to this alternative is \$18,795,783 Table B-1 in Appendix B contains a  
3 preliminary cost estimate for Alternative 2. Assumptions used for this cost estimate are:

- 4 • The entire initial action can be completed with one mobilization for laborers, UXO  
5 technicians, and required equipment.
- 6 • Two teams will be working concurrently for the duration of the fence installation effort.
- 7 • No MEC removal will be required, avoidance will be sufficient.
- 8 • The work week will consist of five ten-hour days and will be approximately 80 weeks in  
9 duration.
- 10 • Operations and maintenance period of 5 years is assumed.

#### 4.4.3 Alternative 3—Removal of Detected MEC from Select Areas of the MRA-SIA

11 The estimated total cost to complete this alternative is estimated to be \$29,088,446. Table B-2  
12 in Appendix B contains a preliminary cost estimate for Alternative 3. Assumptions used for  
13 this cost estimate are:

- 14 • The entire removal action can be completed with one mobilization for UXO technicians  
15 and required equipment, but will include periodic crew rotations.
- 16 • Three vegetation and surface clearance teams will be working concurrently for the  
17 duration of the clearance effort.
- 18 • The work week will consist of five 10-hour days.
- 19 • The surface clearance rate will be 30 acres per month.



- Legend**
- Fence Location
  - SIA Roads
  - MRS Boundary

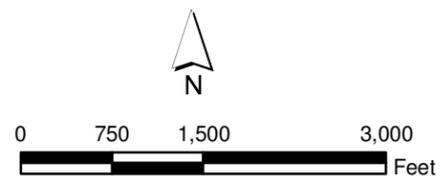
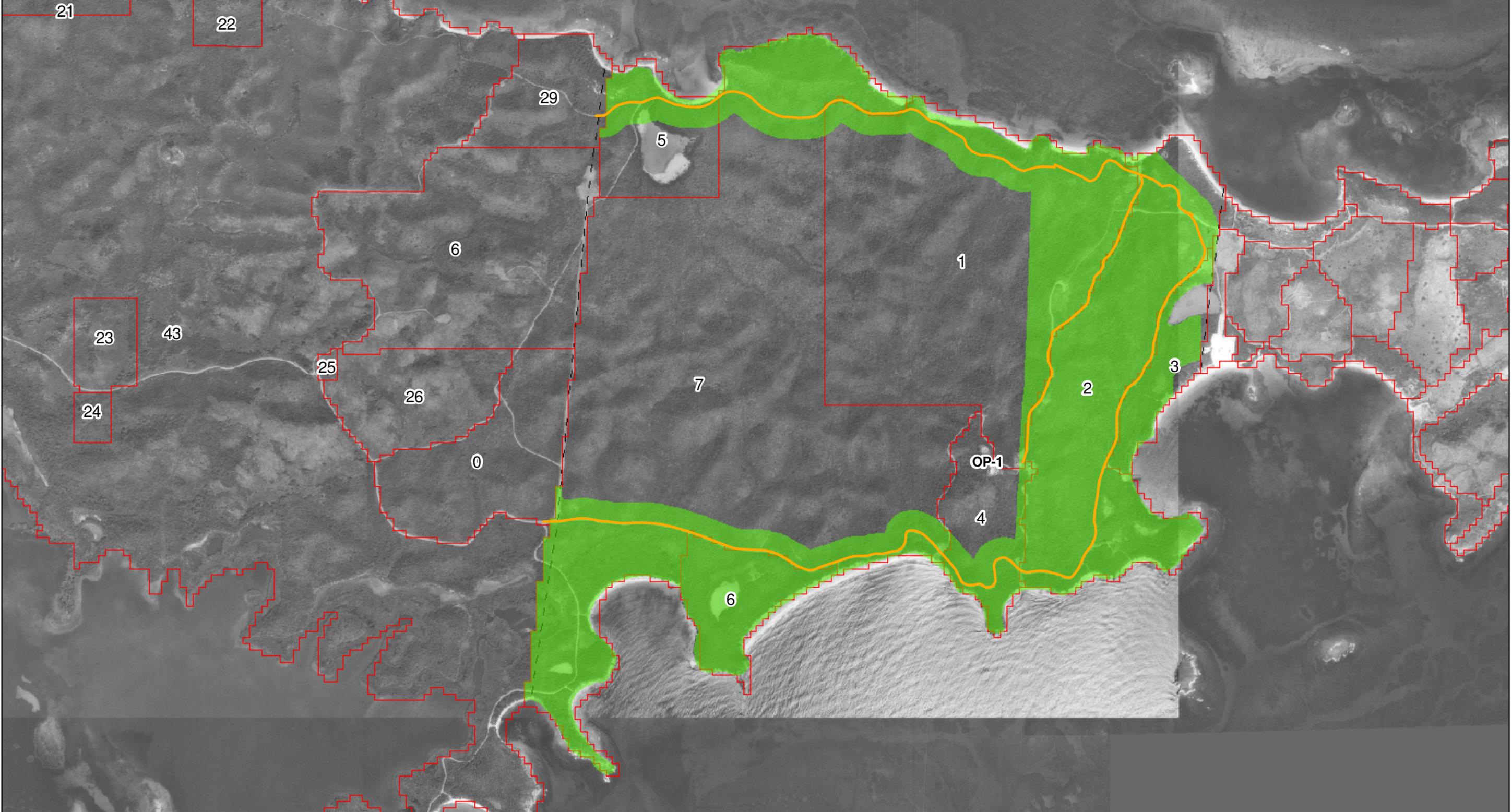


Figure 4-1  
Alternative 2- Engineering Controls (Fencing and Signage)  
for the MRA-SIA  
Former VNTR  
Vieques, Puerto Rico

Note: Signs will be placed every 100 ft along entire fenceline.



- Legend**
- SIA Roads
  - Removal Action Area
  - MRS Boundary

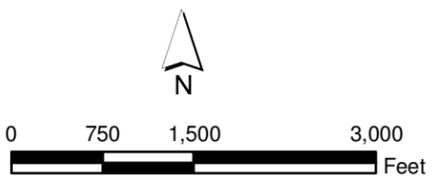


Figure 4-2  
Alternative 3- Surface MEC Removal Action  
Select Areas within MRA-SIA  
Former VNTR  
Vieques, Puerto Rico

# Comparative Analysis of Removal Action Alternatives

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1 This section provides an evaluation of the remedial action alternatives in accordance with  
2 the USEPA guidance document *Guidance on Conducting Non-Time Critical Removal Actions*  
3 *Under CERCLA* (USEPA/540-R-93-057). The remedial action alternatives are evaluated in  
4 terms of effectiveness, implementability, and cost. A summary of the comparative analysis  
5 is provided in Table 5-1.

## 5.1 Effectiveness

6 The overall effectiveness of Alternative 1 is low. The effectiveness of Alternatives 2 is  
7 moderate and 3 is high. These levels of effectiveness were assessed based on the number of  
8 “effectiveness criteria” that would be satisfied by each alternative. The “effectiveness  
9 criteria,” from the USEPA guidance are identified as:

- 10 • Protection of public health
- 11 • Protection of workers during implementation
- 12 • Protection of environment
- 13 • Compliance with ARARs
- 14 • Level of treatment and containment expected
- 15 • Residual effect concerns

16 Alternative 1 does not achieve the RAOs. Alternative 2 and 3 have been developed because  
17 they were able to achieve the identified RAOs discussed in Section 3. If the RAO is achieved,  
18 then public health is protected.

19 Workers can be protected during implementation of both Alternatives 2 and 3 using  
20 standard personal protective equipment and MEC detecting devices and procedures. The  
21 explosive safety risk to the public is significantly reduced through the removal of MEC  
22 contamination, which, if left in place, could also potentially serve as a source of chemical  
23 environmental contaminants. Alternative 3 is more protective of the public health and safety  
24 than Alternative 2 because it removes MEC from the site.

25 Both alternatives can comply with the location-specific and action-specific ARARs, which  
26 apply to the implementation of the alternatives. The removal action will adhere to all  
27 regulations regarding environmentally sensitive locations, excavations, detonations, and  
28 explosives transportation, use, and storage.

29 The level of protectiveness varies among all three alternatives, with Alternative 3 being the  
30 most complete and more permanent solution. However, Alternative 2 will also provide a  
31 level of protection.

## 5.2 Implementability

1 The implementability evaluation of the alternatives varies from easy to difficult. These  
2 levels of implementability were assessed based on the number of “implementability  
3 criteria” satisfied by each alternative. The “implementability criteria,” from the USEPA  
4 guidance document *Guidance on Conducting Non-Time-Critical Removal Actions Under*  
5 *CERCLA* (USEPA/540-R-93-057), are as follows:

- 6 • Construction and operational considerations
- 7 • Demonstrated performance/useful life
- 8 • Adaptable to environment conditions
- 9 • Contributes to remedial performance
- 10 • Can be completed in an acceptable timeframe.
- 11 • Availability of equipment, personnel, and services, outside laboratory testing capacity,  
12 and offsite treatment and disposal capacity
- 13 • Permits required
- 14 • Easements or rights-of-way required
- 15 • Impact on adjoining property
- 16 • Ability to impose institutional controls (ICs)

17 Evaluation of implementability is essentially the evaluation of technical and administrative  
18 feasibility. The technical feasibility consists of items 1 through 6 above, and administrative  
19 feasibility involves items 7 through 10.

20 All of the alternatives are technically feasible. MEC contamination will remain on the  
21 surface utilizing Alternative 1 and 2 as no efforts will be expended to remove it.

## 5.3 Cost

22 The present-worth costs (relative scaling) of each of the alternatives are summarized in  
23 Table 5-1. The cost breakdown for each alternative is provided in Appendix B. Alternative 3  
24 is the most costly and the most complete solution, Alternative 2 is more cost effective but is  
25 less effective with regards to protecting human health and the environment. Alternative 2,  
26 although more costly, will more effectively satisfy the RAO in the relative same time frame  
27 as Alternative 2 and will be more effective in the long-term.

TABLE 5-1  
Relative Remedial Alternative Comparison

Alternative	Effectiveness	Implementation	Cost
<b><i>THE FORMER VNTR</i></b>			
Alternative 1—No Action	Not Effective	Easy	No cost
Alternative 2—Engineering Controls	Moderately Effective	Moderate	Moderate
Alternative 3— Removal of Surface MEC from Select Areas of the MRA-SIA	Effective	Moderate	High

Notes:

MEC = munitions and explosives of concern, VNTR = Vieques Naval Training Range

## Recommended Removal Action Alternative

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1 The EE/CA was performed in accordance with current USEPA and Navy guidance  
2 documents for a NTCRA under CERCLA. Three alternatives were analyzed based on  
3 evaluation of the effectiveness, implementability, and cost. The effectiveness evaluation  
4 included reviewing the protectiveness of the alternative and its ability to meet the RAOs.  
5 Implementability included looking at the technical feasibility, availability, and  
6 administrative feasibility of the alternative. The evaluation of cost included a review of  
7 capital cost, operating cost, and present-worth cost.

8 Alternative 3, Removal of Surface MEC from select areas of the MRA-SIA, is the  
9 recommended alternative. Alternative 3 is recommended because it will achieve the  
10 remedial action objectives with a higher certainty of success. Based on projected future land  
11 use Alternative 3 would be more effective in achieving remedial action needs. Risks from  
12 MEC will not be completely eliminated at the sites due to the potential for subsurface  
13 contamination, but will significantly reduce the hazard. This alternative would minimize the  
14 explosive safety risk to the unauthorized personnel and site workers. Implementation of  
15 Alternative 3 is technically feasible and, under the current projected land use, lends itself to  
16 future remedies. The cost for implementation of Alternative 3 is estimated to have a present  
17 worth of \$29,088,446.

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**Appendix A**  
**Applicable or Relevant and**  
**Appropriate Requirements**

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# Contents

## Tables

- A-1 Federal Location-Specific Applicable or Relevant and Appropriate Requirements
- A-2 Puerto Rico Location-Specific Applicable or Relevant and Appropriate Requirements
- A-3 Puerto Rico Action-Specific Applicable or Relevant and Appropriate Requirements
- A-4 Federal Action-Specific Applicable or Relevant and Appropriate Requirements

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**Table A-1  
Federal Location-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Protection of Floodplain*</b>					
Within floodplain	Actions taken should avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values.	Action that will occur in a floodplain (i.e., lowlands and relatively flat areas adjoining inland and coastal waters and other flood-prone areas).	40 CFR Part 6, Appendix A; excluding Sections 6(a)(2), 6(a)(4), 6(a)(6); 40 CFR 6.302	Applicable	Removal activities may require compliance with this order. Measures required may include erosion control.
<b>Protection of Wetlands*</b>					
Wetland	Action to minimize the destruction, loss, or degradation of wetlands.	Wetland as defined by Executive Order 11990 Section 7.	40 CFR 6, Appendix A; excluding Sections 6(a)(2), 6(a)(4), 6(a)(6); 40 CFR 6.302	Relevant and Appropriate	Federal or Puerto Rico regulated wetlands are present. Nationwide Permit No. 38 allows for activities in wetlands to contain, stabilize, or remove hazardous or toxic materials. "Notification" is required to the District Engineer and the wetlands on the site should be delineated. Activities undertaken entirely on a CERCLA site by authority of CERCLA, as approved or required by EPA, are not required to obtain permits under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act, although the substantive requirements of these permits shall be met. NWP 38 notification will put in place coordination with natural resource and historic resource trustees regarding the potential to adversely affect threatened and endangered species and sites protected under the National Historic Preservation Act.

**Table A-1  
Federal Location-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

<b>Location</b>	<b>Requirement</b>	<b>Prerequisite</b>	<b>Citation</b>	<b>ARAR Determination</b>	<b>Comment</b>
<b>Clean Water Act, Section 404*a</b>					
Wetland	Action to prohibit discharge of dredged or fill material into wetland without permit.	Wetland as defined by Executive Order 11990 Section 7.	40 CFR 230.10; 40 CFR 231 (231.1, 231.2, 231.7, 231.8)	Relevant and Appropriate	Non-time critical removal action may include removal and restoration of wetland sediments. Activities undertaken entirely on a CERCLA site by authority of CERCLA, as approved or required by EPA, are not required to obtain permits under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act, although the substantive requirements of these permits shall be met.
<b>Endangered Species Act of 1978*</b>					
Endangered species	Action to ensure that any action is not likely to jeopardize the continued existence of endangered or threatened species or adversely affect its critical habitat.	Applies to actions that affect endangered or threatened species or their habitat.	16 USC 1531 50 CFR Part 402	Relevant and Appropriate	Multiple federally listed or proposed endangered species are known to exist at the former VNTR. A Consultation with US Fish and Wildlife Service as necessary will be completed under this ARAR.
<b>Federal Fish and Wildlife Conservation Act</b>					
Fish and Wildlife	Requires that activities avoid, minimize, or compensate for impacts to fish and wildlife and their habitats.	Applies to actions that affect fish and wildlife and their habitat.	16 USC §662 et seq.	Relevant and Appropriate	Site Restoration at the former VNTR will provide enhanced habitat for fish and wildlife species.

**Table A-1  
Federal Location-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

<b>Location</b>	<b>Requirement</b>	<b>Prerequisite</b>	<b>Citation</b>	<b>ARAR Determination</b>	<b>Comment</b>
<b>Coastal Zone and Management Act</b>					
Coastal Zone	Requires that activities conducted within a coastal zone be consistent with an approved state management program.	Applies to sites located within a coastal zone.	16 USC §1451 et seq.	Relevant and Appropriate	Parts of the former VNTR and surrounding vicinity are located within the coastal zone. Activities will be conducted in accordance with applicable management program(s).
<b>National Historical Preservation Act (NHPA) of 1966 and Archaeological Resources Protection Act of 1979</b>					
Historical Locations and Archaeological Artifacts	Provides for the recovery and preservation of historical and archaeological significant artifacts. Implementing regulations for NHPA (36 CFR Part 65) establish the National Register of Historic Places and provide for preservation of historic properties and minimization of damage to historic landmarks.	Applies to historical properties and landmarks, and archaeological artifacts.	NHPA: 16 USC §470; 36 CFR Part 65. Archaeological Resources Protection Act.	Relevant and Appropriate	Based upon historical site use and filling activities that were conducted in the vicinity, it is not likely that historical landmarks or artifacts exist in the surrounding vicinity.
<p>* Statutes and policies, and their citations are provided as headings to identify general categories of potential ARARs for the convenience of the reader. Listing the statutes and policies does not indicate that Navy accepts the entire statues or policies as potential ARARs. Specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs.</p> <p>ARARs - Applicable or relevant and appropriate requirements            CFR - Code of Federal Regulations            NWP - Nationwide Permit            USC - United States Code</p>					

**Table A-2  
Puerto Rico Location-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Puerto Rico Water Control Laws and Puerto Rico Wetlands Regulations*</b>					
<b>Coastal Zone Management Act; NOAA Regulations of Federal Consistency with approved State Coastal Zone Management Programs (Natural Patrimony Program Law of Puerto Rico)</b>					
Within coastal zone	Conduct activities within a coastal Management Zone in a manner consistent with local requirements.	Activities conducted at Natural Reserves and Special Areas of Planification	Section 307(c) of 16 USC 1456(c); also see 15 CFR 930 and 923.45	Relevant and Appropriate	Portions of the former VNTR are located in the Coastal Zone, but is not located in areas classified as Natural Reserves or Special Areas of Planification.

\* Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader. Listing the statutes and policies does not indicate that Navy accepts the entire statutes or policies as potential ARARs. Specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs.

ARARs - Applicable or relevant and appropriate requirements

CFR - Code of Federal Regulations

CWA - Clean Water Act

NOAA - National Oceanic and Atmospheric Administration

TBC - To Be Considered

USACE - United States Army Corps of Engineers

VAC - Virginia Administrative Code

VDEQ - Virginia Department of Environmental Quality

**Table A-3  
Puerto Rico Action-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Puerto Rico Environmental Impact Statement Regulations*</b>					
Environmental Impact Statements	Regulations to establish content requirements and administrative procedures for complying with the Environmental Impact Statement (EIS) procedure required by the Environmental Public Policy A	Determination of whether or not actions will have a significant environmental impact in the normal course of their activities	Regulation on Puerto Rico Environmental Impact Statement	Not Applicable	Proposed removal actions do not trigger the requirement to perform an Environmental Impact Statement at the former VNTR.
<b>Puerto Rico Control of Noise</b>					
Noise Control Requirements	These regulations define requirements for the management and control of noise pollution.	Applicable to any activity which may include site preparation, demolition, removal, or disposal, excavation, occurring on premises, right-of-ways, public or private structures or similar property.	Regulation for the Control of Noise Pollution, Puerto Rico Regulation 3418	Applicable	Applicable to management of noise during MEC removal, detonation/demilitarization, and site restoration activities at the former VNTR.

**Table A-3  
Puerto Rico Action-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Puerto Rico Hazardous Waste and Non-Hazardous Solid Waste Regulations</b>					
Hazardous Waste Staging Transport, and Disposal	These regulations and laws define the requirements for the management of hazardous wastes.	Wastes must meet definition of hazardous waste.	Regulation for the Control of Hazardous and Non-Hazardous Solid Waste, Puerto Rico Regulation 2863.	Relevant and Appropriate	Scrap metal and waste excavated during the MEC removal action the former VNTR will be characterized for disposal. Existing data indicate waste will be non-hazardous; however, any identified hazardous waste will be managed accordingly.
Solid Waste Staging Transport, and Disposal	These regulations and laws define the requirements for the management of solid wastes, including the submittal of a Non-Hazardous Solid Waste Operating Plan. Any disposal facility must be properly permitted and in compliance with all operational and monitoring requirements of the permit and regulations.	Wastes must meet definition of solid waste.	Regulation for the Control of Hazardous and Non-Hazardous Solid Waste, Puerto Rico Regulation 2863	Applicable	Applicable to management and staging, transportation, and off-site disposal of any debris classified as a solid waste at the former VNTR.
<b>Puerto Rico Solid Waste Management Regulations</b>					
Solid Waste Staging Transport, and Disposal	These regulations and laws define the requirements for the management of solid wastes. Any disposal facility must be properly permitted and in compliance with all operational and monitoring requirements of the permit and regulations.	Wastes must meet definition of solid waste.	Regulation for the Management of Non-Hazardous Solid Waste, Puerto Rico Regulation 5717	Applicable	Applicable to management and staging, transportation, and off-site disposal of any debris classified as a solid waste.

**Table A-3  
Puerto Rico Action-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Puerto Rico Air Pollution Control Regulations*</b>					
Discharge to air	Puerto Rico Ambient Air Quality Standards - standards for ambient air quality to protect public health and welfare (including standards for particulate matter and lead).	Contamination of air affecting public health and welfare.	Regulation For The Control Of Atmospheric Pollution Of The Commonwealth Of Puerto Rico., Puerto Rico Regulation 5300	Applicable	Applicable for all site removal activities that may generate air discharges. No discharges to air are anticipated other than fugitive dust.
Discharge of visible emissions and fugitive dust	Fugitive dust/emissions may not be discharged to the atmosphere at amounts in excess of standards.	Any source of fugitive dust/emissions.	Regulation For The Control Of Atmospheric Pollution Of The Commonwealth Of Puerto Rico., Puerto Rico Regulation 5300	Applicable	Applicable for any site removal activities that generate fugitive dust.
Discharge of toxic pollutants	Toxic pollutants may not be discharged to the atmosphere at amounts in excess of standards.	Any source of toxic pollutants	Regulation For The Control Of Atmospheric Pollution Of The Commonwealth Of Puerto Rico., Puerto Rico Regulation 5300	Not Applicable	No toxic air pollutants are anticipated as part of this NTCRA.

**Table A-3  
Puerto Rico Action-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Puerto Rico Regulation for the Control of Erosion and Prevention of Sedimentation</b>					
Erosion / Sediment Control	Regulates erosion / sedimentation control practices and management, including a Control of Erosion and Sediment (CES) Plan and a CES Permit.	Land disturbing activities.	Regulation for the Control of Erosion and Prevention of Sedimentation, Puerto Rico Regulation 5754	Applicable	Applicable for any site removal activities resulting in possible erosion and sedimentation. The NTCRA will include meeting the substantive requirements for erosion and sediment control including a CES Plan and CES Permit.
Explosives	Law of Explosives of Puerto Rico		28 June 1969, Law Number 134	Applicable	
<p>* Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs. Specific ARARs are addressed in the table below each general heading.</p> <p>ARAR - Applicable or relevant and appropriate requirement</p> <p>CFR - Code of Federal Regulations</p> <p>NTCRA - Non-time critical removal action</p> <p>TBC - To Be Considered</p>					

**Table A-4  
Federal Action-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

Requirement	Prerequisite	Citation	ARAR Determination	Comment
Explosives and Blasting Agents; Welding and Cutting Activities	Occupational Safety and Health Administration	29 CFR Part 1910 §H.109, and §Q.	Relevant and Appropriate	
Occupational Safety and Health Administration - General Construction Work	Construction work.	29 CFR Part 1926	Applicable	Construction work at the former VNTR will adhere to these regulations.
EPA Final Military Munitions Rule	Remedial actions generate munitions that are subject to RCRA requirements.	40 CFR 260, et al.	Applicable	The remedial actions for the former VNTR will likely generate military munitions waste which may be classified as hazardous.
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980	NCP and Hazardous Waste Handling; Military Munitions	40 CFR Parts 266, 300, 370.	Relevant and Appropriate	
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980	EPA Guidance	42 U.S.C. Section 9601	Applicable	
Superfund Amendments and Reauthorization Act (SARA) of 1986	EPA Guidance	42 U.S.C. Section 11001	Applicable	
Handbook on Management of Unexploded Ordnance at Closed, Transferring, and Transferred Ranges	EPA Guidance	March 2000 (Draft)	Applicable	
Resource Conservation and Recovery Act	EPA Guidance	42 U.S.C. Section 6901	Not Applicable	

**Table A-4  
Federal Action-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

<b>Requirement</b>	<b>Prerequisite</b>	<b>Citation</b>	<b>ARAR Determination</b>	<b>Comment</b>
Hazardous Waste Regulations*	EPA Guidance	Title 126	Applicable	
Emergency Planning & Community Right-to-Know and Contingency Planning Regulations (Reporting Requirements)	EPA Guidance	Title 126		
UXO Technicians and Personnel	Minimum qualifications	DDESB Technical Paper 18	Relevant and Appropriate	
DoD Contractors Safety Manual for Ammunition and Explosives	Department of Defense Guidance	DOD 4145.26M	Applicable	
Defense Demilitarization Manual	Department of Defense Guidance	DOD 4160.21-M-1	Relevant and Appropriate	The former VNTR is not located at a DOD Component. Demilitarization of live ordnance will follow the instructions provided.
Environmental and Explosives Safety Management on Department of Defense Active and Inactive Ranges Within the United States	Department of Defense Guidance	DOD 4715.11	Applicable	
Ammunition and Explosives Safety Standards	Action involves a transfer of DOD lands.	DOD 6055.9-STD	Relevant and Appropriate	Remedial actions for the former VNTR include a transfer of DOD lands.
Safety and Occupational Health Policy for the Department of Defense	Actions taking place on DOD lands.	DOD Directive 1000.3	Relevant and Appropriate	Remedial actions for the former VNTR will adhere to these regulations.
Solid Waste Management – Collection, Disposal, Resource Recovery, and Recycling Program	Actions taking place on DOD lands which include the generation of solid waste.	DOD Directive 4165.6	Relevant and Appropriate	Remedial actions for the former VNTR will adhere to these regulations.

**Table A-4  
Federal Action-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

<b>Requirement</b>	<b>Prerequisite</b>	<b>Citation</b>	<b>ARAR Determination</b>	<b>Comment</b>
Transportation and Traffic Management	Actions taking place on DOD lands which create a significant traffic flow.	DOD Directive 4500.9	Relevant and Appropriate	Remedial actions for the former VNTR will adhere to these regulations during construction.
Natural Resource Management Plan	Actions taking place on DOD lands.	DOD Directive 4700.4	Relevant and Appropriate	Remedial actions for the former VNTR will adhere to these regulations
Archaeological and Historical Resources Management Plan	Actions taking place on DOD lands.	DOD Directive 4710.1	Applicable	An evaluation of the former VNTR will be conducted as necessary to determine any archeological or historical resources
Protection and Enhancement of Environmental Quality	Actions taking place on DOD lands.	DOD Directive 5100.5	Relevant and Appropriate	Remedial actions for the former VNTR will adhere to these regulations
Environmental Effects in the United States of DOD Actions	Actions taking place on DOD lands.	DOD Directive 6050.1	Relevant and Appropriate	Remedial actions for the former VNTR will adhere to these regulations
Safety and Health Requirements for Hazardous, Toxic, and Radioactive Waste and Ordnance and Explosive Waste Activities	Actions which include a HTRW or OE site.	ER 385-1-92	Relevant and Appropriate	The former VNTR is not located on a USACE Command, but the requirements in this regulation for OE safety are relevant to these sites.
Military munitions response program oversight	Department of Defense Guidance	NOSSA 8020.15	Applicable	
Inter-service Responsibilities for Explosive Ordnance Disposal	US Navy and Department of the Army guidance	OPNAVINST 8027.1 AR 75-14	Applicable	
Interim Final Management Principles for Implementing Response Action at Closed, Transferring, and Transferred Ranges	OE Guidance Memoranda	December 19, 2000	Applicable	

**Table A-4  
Federal Action-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

<b>Requirement</b>	<b>Prerequisite</b>	<b>Citation</b>	<b>ARAR Determination</b>	<b>Comment</b>
Application of the Hazardous Waste Operations and Emergency Response Regulation to Ordnance and Explosives Sites	OE Guidance Memoranda	January 20, 1994	Applicable	
Coordination with the Ordnance and Explosives Center of Expertise (OE CX)	OE Guidance Memoranda	May 7, 1997	Applicable	
Ammunition and Explosives Ashore: Safety Regulations for Handling, Storing, Production, Renovation, and Shipping	US Navy Guidance	NAVSEA OP 5 Vol 1	Applicable	
Navy Transportation Safety Handbook for Ammunition, Explosives, and Related Hazardous Materials	US Navy Guidance	NAVSEA OP 2165	Applicable	
Motor Vehicle Driver's Handbook, Ammunition, Explosives, and Related Hazardous Materials	US Navy Guidance	NAVSEA OP 2239	Applicable	
Demilitarization and Disposal of Excess, Surplus, and Foreign Excess Ammunition, Explosives and Other Dangerous Articles and Inert Ordnance Material	US Navy Guidance	NAVSEA 4570.1	Applicable	
DOD Ammunition and Explosives Hazard Classification Procedures Joint Technical Bulletin	US Navy Guidance	NAVSEAINST 8020.1H	Applicable	
Operational Risk Management (ORM)	US Navy Guidance	OPNAVINST 3500.39A	Applicable	

**Table A-4  
Federal Action-Specific ARARs  
For the Former VNTR, Vieques, Puerto Rico**

<b>Requirement</b>	<b>Prerequisite</b>	<b>Citation</b>	<b>ARAR Determination</b>	<b>Comment</b>
Department of the Navy Explosives Safety Policy	US Navy Guidance	OPNAVINST 8020.14	Applicable	
U.S. Navy Explosives Safety Policies, Requirements, and Procedures	US Navy Guidance	OPNAVINST 8023.2	Applicable	
Navy Munitions Disposition Policy	US Navy Guidance	OPNAVINST 8026.2A	Applicable	
Responsibilities for Technical Escort of Dangerous Materials	US Navy Guidance	OPNAVINST 8070.1B	Applicable	
Responsibilities for Issuance and Administration of Waivers and Exemptions from Department of Defense Explosive Safety Standards	US Navy Guidance	SECNAVINST 8023.3C	Applicable	

## Appendix B Cost Estimates

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Table B-1  
Detailed Cost Estimate  
Alternative 2  
Former VNTR SIA EE/CA  
Vieques, Puerto Rico

Item	Quantity	Units	Unit Cost	Adjustment*	Subtotal
<b>1 EXPENSES AND CONSUMABLES</b>					
1.1 Per diem - meals (assuming 14 person team)	582	day	\$57.00	14	\$464,094
1.2 Per diem - lodging	582	day	\$60.00	14	\$488,520
1.3 Transportation	582	day	\$60.00	5	\$174,471
1.4 Schondstet (UXO Support)	4	each	\$1,100.00	1	\$4,400
1.6 Daily Consumables	582	day	\$55.00	1	\$31,986
1.7 Health and Safety Consumables	582	day	\$55.00	1	\$31,986
<b>2 MOBILIZATION/DEMOBILIZATION AND SITE SETUP</b>					
2.1 Mobilization	1	ea	\$65,000.00	1	\$65,000
2.2 Demobilization	1	ea	\$15,000.00	1	\$15,000
2.4 Flora and Avian Habitat Survey	100	ac	\$400.00	1	\$40,000
<b>3 Fencing and Signs</b>					
3.1 10' ft tall fencing (approximately 32,000 linear feet)	48300	foot	\$57.00	1	\$2,753,100
3.2 3 strand barbed wire (approximately 96,000 linear feet)	144900	foot	\$8.00	1	\$1,159,200
3.3 Installation of 30 Road Gates	30	ea	\$2,600.00	1	\$78,000
3.4 Signs	480	ea	\$315.00	1	\$151,200
3.5 Vegetation Clearance	10	ac	\$3,800.00	1	\$38,000
<b>4 UXO Support</b>					
4.1 MEC Avoidance Support	582	day	\$2,300.00	4	\$5,350,457
<b>5 Operations and Maintenance (5 Yr)</b>					
5.1 Per diem - meals (assuming 7 person team)	20	days/yr	\$57.00	35	\$39,900
5.2 Per diem - lodging	20	days/yr	\$60.00	35	\$42,000
5.3 Transportation	20	days/yr	\$60.00	15	\$18,000
5.4 Schondstet (UXO Support)	2	ea/yr	\$1,100.00	5	\$11,000
5.6 Daily Consumables	20	days/yr	\$55.00	5	\$5,500
5.7 Health and Safety Consumables	20	days/yr	\$55.00	5	\$5,500
5.1 Mobilization	1	ea/yr	\$25,000.00	5	\$125,000
5.2 Demobilization	1	ea/yr	\$5,000.00	5	\$25,000
5.1 10' ft tall fencing (approximately 1000 linear feet/year)	1000	ft/yr	\$57.00	5	\$285,000
5.2 3 strand barbed wire (approximately 3000 linear feet/year)	3000	ft/yr	\$8.00	5	\$120,000
5.3 Installation of 5 Road Gates/yr	5	ea/yr	\$2,600.00	5	\$65,000
5.4 Installation of 50 signs/yr	50	ea/yr	\$315.00	5	\$78,750
5.1 MEC Avoidance Support	20	days/yr	\$2,300.00	5	\$230,000
<b>Subtotal</b>					<b>\$11,896,065</b>
<b>Project Management</b>	8%				\$951,685
<b>Remedial Design</b>	15%				\$1,784,410
<b>Construction Management</b>	10%				\$1,189,607
<b>Contingency</b>	25%				\$2,974,016
<b>TOTAL COST</b>					<b>\$ 18,795,783</b>
<b>Upper Limit of Cost Accuracy</b>	150%				\$28,193,675
<b>Lower Limit of Cost Accuracy</b>	70%				\$13,157,048

Table B-2  
Detailed Cost Estimate  
Alternative 3  
Former VNTR SIA EE/CA  
Vieques, Puerto Rico

Item	Quantity	Units	Unit Cost	Adjustment*	Subtotal
<b>1 EXPENSES AND CONSUMABLES</b>					
1.1 Per diem - meals (assuming 10 person team)	467	day	\$57.00	30	\$798,000
1.2 Per diem - lodging	467	day	\$60.00	30	\$840,000
1.3 Transportation	467	day	\$60.00	20	\$560,000
1.4 Equipment	93	wk	\$8,000.00	1	\$746,667
<b>2 MOBILIZATION/DEMobilIZATION AND SITE SETUP</b>					
2.1 Mobilization	1	ea	\$75,000.00	1	\$75,000
2.2 Demobilization	1	ea	\$50,000.00	1	\$50,000
2.3 Crew Rotation	16	ea	\$25,000.00	1	\$400,000
2.4 Flora and Avian Habitat Survey	300	ac	\$400.00	1	\$120,000
<b>3 SURFACE CLEARANCE</b>					
3.1 Surface Clearance	700	ac	\$12,000.00	1	\$8,400,000
3.2 Demilitarization/Venting	49	day	\$9,000.00	1	\$437,143
<b>4 DEMILITARIZATION OF MEC ITEMS</b>					
4.1 MD/RRD Processing	3900	ton	\$1,300.00	1	\$5,070,000
<b>Subtotal</b>					<b>\$17,496,810</b>
<b>Project Management</b>	8%				\$1,399,745
<b>Remedial Design</b>	15%				\$2,624,521
<b>Construction Management</b>	10%				\$1,749,681
<b>Contingency</b>	25%				\$5,817,689
<b>TOTAL COST</b>					<b>\$29,088,446</b>
<b>Upper Limit of Cost Accuracy</b>	150%				<b>\$43,632,669</b>
<b>Lower Limit of Cost Accuracy</b>	70%				<b>\$20,361,912</b>

**Attachment B**  
**Final Non-Time Critical Removal Action Work Plan, Surface**  
**Munitions and Explosives of Concern at Munitions Response**  
**Area-Surface Impact Area, Munitions Response Sites 1 through 7,**  
**Former VNTR, Vieques, Puerto Rico, January 2009**

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Final

**Non-time-critical Removal Action Work Plan  
Surface Munitions and Explosives of Concern  
at Munitions Response Area-Surface Impact Area  
Munitions Response Sites 1 through 7**

**Former Vieques Naval Training Range (VNTR)  
Vieques, Puerto Rico**

**Contract Task Order - 0211**

**January 2009**

Prepared for

**Department of the Navy  
Naval Facilities Engineering Command  
Atlantic Division**

Under the

**NAVFAC CLEAN III Program  
Contract No. N62470-02-D-3052**

Prepared by



**Virginia Beach, Virginia**

# Executive Summary

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The overall objective of the surface munitions and explosives of concern (MEC) interim removal action is to reduce the potential for unauthorized personnel to come in contact with MEC by removing all surface MEC from selected areas within the Munitions Response Area-Surface Impact Area (MRA-SIA). The areas selected for removal are based on the potential for unauthorized personnel to come in contact with MEC. These areas are restricted; however trespassing occurs regularly in these areas. More-specific objectives for this action include the following:

- Hand (manual) removal of vegetation within the areas selected for MEC removal
- Removal of all surface MEC within 100 meters on either side of select roadways in Munitions Response Sites (MRSs) 1 and 3 through 7
- Removal of all surface MEC within 100 meters inland of the SIA shoreline in MRSs 1 and 3 through 7
- Removal of all MEC from the eastern boundary of the SIA westward, to the approximate extent of where high explosives (HEs) containing bombs are expected to be located in MRSs 2 and 3

This Work Plan (WP) has been prepared for the Non-time-critical Removal Action (NTCRA) for the removal of surface MEC from select areas located within the MRA-SIA within the former Vieques Naval Training Range (VNTR). The WP provides sufficient detail of the procedures for detection, selection, and removal of surface MEC to ensure compliance with regulatory requirements. This WP also provides guidance for removal action contractors to develop site specific plans and procedures to ensure consistency with the approaches and procedures given in this WP.

Several of the procedures for the surface MEC removal action are provided in the MEC Master WP (MWP; CH2M HILL, 2006d). Therefore, the MWP is referenced throughout this WP, where applicable, to avoid duplication of information.

To reduce explosive hazards, a magnetometer assisted visual survey will be performed to locate all surface MEC within select removal areas, followed by the removal of all identified MEC. Selected removal areas include select roadways and the SIA shoreline in MRSs 1, and 3 through 7. In addition, MEC will be located and removed from the eastern boundary of the SIA westward to the approximate extent of where high explosives (HEs) containing bombs are expected to be located in MRSs 2 and 3. All MEC within 100 meters on either side of the roadways and within 100 meters inland of the shoreline will also be identified and removed. No sampling and analysis will be conducted as part of this removal action.

The actions performed and data/information collected during this interim removal action will be presented in a construction completion report following completion of the work.

# Resumen Ejecutivo

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El objetivo general de la acción de remoción superficial interina de municiones y explosivos de preocupación (MEC, por sus siglas en inglés), es reducir el potencial a personas no autorizadas de que entren en contacto con (MEC) removiendo todos los MEC superficiales de áreas seleccionadas dentro de la Respuesta de Municiones del Área de Impacto de Superficie (MRA-SIA, por sus siglas en inglés). Las áreas seleccionadas para la limpieza están basadas en el potencial de que personas no autorizadas entren en contacto con MEC. Estas áreas están restringidas; sin embargo, el ingreso no autorizado ocurre regularmente.

Los siguientes son los objetivos específicos para esta acción:

- Remoción manual (a mano) de la vegetación dentro de las áreas seleccionadas para la remoción de MEC
- Remoción de todos los MEC dentro de 100 metros a cada lado de las carreteras seleccionadas en los sitios de Respuesta de Municiones (MRSs, por sus siglas en inglés) 1 y 3 hasta el 7
- Remoción de los MEC de toda la superficie dentro de 100 metros tierra adentro desde la costa de los MRSs 1 y 3 hasta el 7 en el SIA y
- Remoción de todos los MEC del límite este del SIA hacia el lado oeste, aproximadamente hasta donde se espera se encuentren bombas que contengan explosivos altos (HEs, por sus siglas en inglés) en MRSs 2 y 3

Este Plan de Trabajo (WP, por sus siglas en inglés) ha sido preparado para la Acción de Remoción de Tiempo No crítico (NTCRA, por sus siglas en inglés) para la eliminación superficial de MEC de áreas seleccionadas dentro del MRA-SIA dentro del antiguo Campo de Adiestramiento Naval de Vieques (VNTR, por sus siglas en inglés). Este WP presenta suficientes detalles sobre los procedimientos de detección, selección y remoción de MEC para garantizar el cumplimiento de los requisitos reglamentarios. Este WP también presenta orientación para los contratistas de remoción para que puedan desarrollar planes específicos para el sitio y los procedimientos para así asegurar consistencia con los acercamientos y procedimientos de este WP.

Varios de los procedimientos para la acción de remoción de MEC superficiales se presentan en el WP Maestro ara MEC (MWP; CH2M HILL, 2006d). Por lo tanto, se hace referencia al MWP en este WP, donde sea aplicable, para evitar la duplicación de la información.

Para reducir el riesgo de explosión, se realizará una inspección visual con la ayuda de un magnetómetro para poder ubicar todos las MEC superficiales dentro de las áreas de remoción seleccionadas, seguida por la remoción de todos los MEC identificados. Estas áreas de remoción incluyen carreteras seleccionadas y la línea costera de SIA en MRSs 1, y 3 hasta 7. Además, se localizarán y removerán los MEC del límite este del SIA hacia el lado oeste hasta aproximadamente donde se espera se encuentren bombas que contengan explosivos altos (HEs) en MRSs 2 y 3. También se identificarán y removerán todos la MEC

dentro de 100 metros a cada lado de la carretera, y 100 metros tierra adentro desde la costa. No se realizarán muestreos ni análisis como parte de esta Acción de Remoción.

Las acciones realizadas y los datos o información recopilada durante esta acción de remoción se presentarán en un informe de terminación de la construcción luego que el trabajo sea finalizado.

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# Acronyms and Abbreviations

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AFWTF	Atlantic Fleet Weapons Training Facility
AHA	activity hazard analyses
amsl	above mean sea level
ARAR	Applicable or Relevant and Appropriate Requirement
ASR	Archive Search Report
ATF	Bureau of Alcohol, Tobacco, Firearms, and Explosives
ATG	air-to-ground
BD	base detonating
BIP	blow-in-place
BRAC	Base Realignment and Closure
CAD	computer-aided design
CAR	Corrective Action Request
CEHNC	United States Army Corps of Engineers Engineering and Support Center
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-term Environmental Action—Navy
CWM	chemical warfare materiel
°F	degrees Fahrenheit
DDESB	Department of Defense Explosives Safety Board
DERP	Defense Environmental Restoration Program
DFOW	definable features of work
DGM	digital geophysical mapping
DID	data item description
DoD	Department of Defense
ECA	Eastern Conservation Area
EIS	Environmental Impact Statement
EMA	Eastern Maneuver Area
EOD	Explosive Ordnance Disposal
ERA	Expanded Range Assessment
ESS	Explosives Safety Submission
EZ	Exclusion Zone
FAA	Federal Aviation Administration
FM	Field Manual
FMFLANT	Fleet Marine Force, Atlantic
FMS	Facility Management Standards
ft	feet/foot
FUDS	Formerly Used Defense Sites

GIS	geographical information system
GPS	global positioning system
HAZWOPER	hazardous waste operations training
HD	Hazard Division
HE	high explosives
HTRW	hazardous, toxic, and radioactive waste
IDW	investigation-derived waste
IDWMP	Investigation-derived Waste Management Plan
LIA	Live Impact Area
M&TE	measuring and testing equipment
MD	munitions debris
MDAS	material documented as safe
MEC	munitions and explosives of concern
m	meter
mm	millimeter
MOA	Memorandum of Agreement
MOV	Municipality of Vieques
MPPEH	material potentially presenting an explosive hazard
MR	munitions response
MRA	Munitions Response Area
MRP	Munitions Response Program
MRS	Munitions Response Site
NASD	Naval Ammunition Support Detachment
NATO	North Atlantic Treaty Organization
NAVEODTECHDIV	Naval Explosives Ordnance Disposal Technical Division
NAVFAC	Naval Facilities Engineering Command
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEW	net explosive weight
NGFS	Naval Gunfire Support
NOSSA	Naval Ordnance Safety and Security Activity
NOTAM	Notice to Airmen
NTCRA	Non-time critical Removal Action
OB/OD	open burn/open detonation
OE	ordnance explosives
OP	observation point
OSHA	Occupational Safety and Health Administration
PDF	Adobe Acrobat Portable Document Format
PM	Project Manager
PPE	personal protective equipment
PRASA	Puerto Rico Aqueduct and Sewer Authority
PREQB	Puerto Rican Environmental Quality Board
PZ	piezoelectric

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QA	quality assurance
QC	quality control
QCP	Quality Control Plan
RCWM	recovered chemical warfare materiel
ROICC	Resident Officer in Charge of Construction
SARA	Superfund Amendments and Reauthorization Act
SDS	Spatial Data Standards
SI	Site Inspection
SIA	Surface Impact Area
SOP	standard operating procedure
SSHPP	Site Specific Health Plan
SUXOS	Senior UXO Supervisor
TAG	Technical Advisory Group
TSDS	Tri-spatial Data Standards
ttn	Topologically Triangulated Network
U.S.	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UXO	unexploded ordnance
UXOQCS	UXO Quality Control Specialist
UXOSO	UXO Safety Officer
VL	verification level
VNTR	Vieques Naval Training Range
WP	white phosphorous

# Introduction

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## 1.1 Introduction

This Non-time-critical Removal Action (NTCRA) Work Plan for the removal of surface munitions and explosives of concern (MEC) from select areas located within the Munitions Response Area-Surface Impact Area (MRA-SIA) at the former Vieques Naval Training Range (VNTR), Vieques Island, Puerto Rico (Figure 1-1), has been prepared as part of the ongoing Munitions Response Program (MRP) in order to reduce risks to human health and the environment. The areas identified for surface clearance of MEC in this document have the potential for unauthorized public access and therefore present an explosive risk. The purpose of this document is to present the approaches that will be utilized during this interim remedial action for the removal of surface MEC that exist at the sites. Reducing risks to human health will be accomplished by minimizing the potential for human contact. This interim action will reduce the potential for unauthorized personnel to come into contact with MEC. CH2M HILL prepared this work plan for the Naval Facilities Engineering Command (NAVFAC) Atlantic to meet current Department of Defense (DoD) guidelines for the investigation and clean-up of MEC.

The NTCRA will include the removal of all surface MEC from selected areas within the MRA-SIA (Figure 1-2). Selected areas include the roadways, shoreline, and eastern boundary of the SIA westward. The removal action areas are identified on Figure 1-3. The objective of the NTCRA is to reduce risks at Munitions Response Sites (MRSs) identified as posing an explosive hazard due to MEC present on the ground surface. The primary risk is posed to unauthorized personnel accessing the areas identified on Figure 1-3. Access to the areas identified for removal is currently restricted; however, trespassing occurs regularly in these areas. The restrictions to these areas are currently not anticipated to be lifted. The objectives will be met by removing all MEC present on the ground surface or exposed at the ground surface. The bullets below present the areas of MEC removal within the MRA-SIA.

- The roadways plus 100 meters (m) each side. Because of the steep terrain and dense vegetation in the SIA it is unlikely that unauthorized users will access the central portion of the SIA. Therefore, a 100-m clearance area along each side of the roads is expected to significantly reduce the explosive risk in areas off the roadways that could reasonably be accessed by unauthorized personnel/recreational user.
- The shoreline inland 100-m. Because of the steep terrain and dense vegetation in the central portion of the SIA, it is unlikely that unauthorized users will access this area. However, several recreational boaters have been documented to trespass in the SIA from the shoreline. Therefore, a 100-m clearance inland from the shoreline is expected to significantly reduce the explosive risk in areas off the beaches that could reasonably be accessed by unauthorized personnel/recreational users.

- From the eastern boundary of the SIA westward to the approximate extent of where high explosives (HEs) containing bombs are expected to be located based on the Expanded Range Assessment (ERA)/Site Inspection (SI) data. The eastern portion of the MRA SIA transects show a mix of MEC items that are similar to that found in the MRA-Live Impact Area (LIA), specifically HE bombs. Therefore, this entire area will be surface cleared to reduce risk. There are also a number of access routes through this area (e.g., road to Observation Point [OP]-1) that present access points for unauthorized personnel.

The total land area of the removal action area is approximately 700 acres; however, areas inundated by water or areas with standing water will not be addressed as part of this removal action

This NTCRA is administered and managed by NAVFAC Atlantic with quality assurance (QA) support from the Naval Explosives Ordnance Disposal Technical Division (NAVEODTECHDIV). The Title II Services contractor will support NAVFAC Atlantic by providing site management, QA support to the NAVEODTECHDIV, contract administration, and data management. The removal action will be performed by a removal action contractor who is contracted directly by NAVFAC Atlantic. The removal action contractor will perform all MEC removal action operations, implement safety processes, perform quality control (QC), and will subcontract all support personnel as needed to carry out the removal action.

This Work Plan is intended to comply with the guidance for conducting NTCRAs under the Comprehensive Environmental Restoration, Compensation, and Liability Act (CERCLA) and was prepared by CH2M HILL under Navy Contract N62470-02-D-3052, Navy Comprehensive Long-term Environmental Action – Navy (CLEAN), District III, Contract Task Order 0211.

## 1.2 Site History

The Navy has owned portions of Vieques since 1941, when land was purchased for use as ammunitions storage facility in support of World War II training requirements. Although the Island of Culebra was the focal point for naval gunfire in the 1960s and early 1970s, VNTR, formerly known as the Atlantic Fleet Weapons Training Facility (AFWTF), began developing facilities on the eastern end of Vieques in 1964, when it established a gunnery range in the LIA. In 1965, the Navy established the LIA, also known as the Air Impact Area, and began construction of OP-1 on Cerro Matias.

By the 1970s, the LIA maintained several targets for aerial bombing including old tanks and vehicles used as mock-ups, two bulls-eye targets, and a strafing target. Additionally, several point and area targets for ships to practice naval gunfire support (NGFS) were established in the LIA. The locations of these targets are shown on Figure 1-4.

The Environmental Impact Statement (EIS) for Vieques (Tippetts et al., 1979) provides a detailed discussion on the development of training facilities in the VNTR leading up to 1979. The VNTR provided logistics support, scheduling assistance, and facilities for NGFS and air-to-ground (ATG) ordnance delivery training for Atlantic Fleet ships, North Atlantic Treaty Organization (NATO) ships, air wings, and smaller air units from other allied nations and the Puerto Rican National Guard. The Fleet Marine Force, Atlantic (FMFLANT),

conducted training for Marine amphibious units, battalion landing teams, and combat engineering units in the Eastern Maneuver Area (EMA). Occasionally, naval units of allied nations having a presence in the Caribbean and the Puerto Rican National Guard also utilized the EMA.

Adjacent to and west of the SIA, the 10,673-acre EMA provided maneuvering space and ranges for the training of marine amphibious units and battalion landing teams in exercises of amphibious landings, small-arms fire, artillery and tank fire, shore fire control, and combat engineering tasks. The EMA was first established in 1947. It is demarcated by the western property line east to the western front friendly-fire line where the SIA begins. Marine artillery was fired from gun positions in the EMA and SIA toward targets in the LIA and SIA. Figure 1-4 presents a map showing the locations of the primary target areas, artillery gun positions and ranges established by the 1970s.

Portions of the training areas within the VNTR were in continuous use since World War II, when the Navy acquired title to the land, until 2003. The Atlantic Fleet's ships, aircraft, and Marine forces carried out training in all aspects of NGFS, ATG ordnance delivery, air-to-surface mine delivery, amphibious landings, small-arms fire, artillery and tank fire, and combat engineering. As part of normal operations, unexploded ordnance (UXO) was cleared periodically from the LIA and treated onsite by detonation. The Navy also operated a waste munitions open burn and open detonation (OB/OD) facility under a United States (U.S.) Environmental Protection Agency (USEPA) interim status Subpart X permit within the LIA.

## 1.3 Site Location

### 1.3.1 Former Vieques Naval Training Range

Vieques is located in the Caribbean Sea approximately 7 miles southeast of the eastern tip of the island of Puerto Rico and 20 miles southwest of St. Thomas, U.S. Virgin Islands. Vieques is the largest offshore island of the Commonwealth of Puerto Rico. It is approximately 20 miles long and 4.5 miles wide, and has an area of approximately 33,088 acres (51 square miles). Figure 1-1 shows the location of Vieques with respect to the island of Puerto Rico.

The former VNTR is situated in the eastern half of the Island of Vieques, and is bordered on the west by the community of Isabel Segunda, to the north by Vieques Sound, and to the south by the Caribbean Sea. The former VNTR consist of approximately 14,500 acres and is divided operationally into four MRAs that (from west to east) include: the EMA, an area approximately 10,673 acres; the SIA, approximately 2,500 acres; the 900-acre LIA and the 200-acre Eastern Conservation Area (ECA) on the easternmost tip of Vieques. Figure 1-4 presents a site map of VNTR.

### 1.3.2 Munitions Response Area—Surface Impact Area

The SIA was established in the 1950s, when several Marine targets were constructed there. Marine artillery ranging from 76 millimeter (mm) to 175mm were directed toward these targets from artillery gun positions within the SIA and EMA. During 1969, the construction of Bulls-eye Targets 1 and 2, used for inert bombing, established the eastern and western boundaries of the SIA. At that time, a permanent observation post with a helicopter pad was also constructed on Cerro Matias. In 1971, a strafing target was installed adjacent to one of

the targets. The aerial photo analysis identified numerous craters within the eastern two-thirds of the SIA that were caused by mortar and artillery fire, naval gunfire, and aerial bombing. The craters were most visible on the 1962 aerial photographs. In addition, the aerial photo analysis identified several artillery gun positions and OPs within the SIA that may have been used for artillery fire (CH2M HILL, 2006b).

Sandy beach areas are intermix with rocky beaches along the south marine boundary and predominate along the northern marine boundary of the SIA. Yellow Beach lies within the SIA along its southern coast.

### **1.3.3 Area for Performance of Non-Time Critical Removal Action**

A NTCRA will be carried out along select roadways, shorelines, and “intermediate” areas in MRA-SIA MRSS 1 and 3 through 7, and along the eastern boundary of the SIA westward in MRSS 2 and 3. These areas are identified on Figure 1-2. These MRSS have been selected based on the HE hazards associated with the munitions identified at these locations and the trespassing of recreational boaters, horseback riders, and other unauthorized persons in these areas from the north and south of the MRSS. Table 1-1 lists the MRSS where the NTCRA will be performed and past use. Numerous different munitions items have been identified at these sites and are presented in Table 1-2. The items in Table 1-2 list only those items identified from investigations to date; therefore, munitions items may be present at the clearance areas that are not identified in the table.

## **1.4 Topography, Climate and Weather, Vegetation, Geology, and Hydrology**

### **1.4.1 Topography**

The topography of Vieques is characterized by gentle to steep rolling hills and valleys throughout the island, with the eastern side exhibiting a more rugged terrain. Figure 1-5 illustrates the topography of the VNTR. The SIA highly variable terrain predominated by steep slopes in the central portion to lagoons and beaches along the south and north boundaries. Elevations range from 0- to approximately 50-ft above mean sea level (amsl). Cerro Matias, located within the SIA as OP-1 (Figure 1-5) is the highest point on VNTR, at approximately 420 ft amsl. The average elevation across Vieques is approximately 246 ft amsl. The coastal area is relatively narrow; however, the southern coast exhibits wider expanses of beach.

TABLE 1-1  
MRA-SIA MRS's Included in the NTCRA

Site Designation	MRA	Parcel	MRS	MEC Area Type	Description of Site	Status
PI 1	SIA	B-2	2	Strafing target	Within LIA. Interviews and records indicate former location of an aircraft-strafting target and water production well for residents prior to Navy activities. No evidence of hazardous waste or hazardous material or petroleum storage or disposal was observed. Non-explosive munitions were observed throughout the site (NAVFACENGCOCOM, 2003).	Site will be assessed during ongoing ERA/ Phase II SI
PI 17	SIA	B-5	6	Target	Interviews and records indicate area was historically used for landing exercises and might have been used as a target area or munitions storage area. No evidence of human disturbance was observed at this site (NAVFACENGCOCOM, 2003).	Site will be assessed during the ongoing ERA/ Phase II SI
PI 22	SIA	B-2	2	Potential Target Area	Interviews, site features, and records indicate this area was formerly used for loading and unloading of range support materials and for landing exercises. Adjacent to the LIA (NAVFACENGCOCOM, 2003)	Site will be assessed during ERA/ Phase II SI
Surface Impact Target Area (SWMU 11)	SIA	B-1, 2, 3, 4	1 - 7	Artillery/ Bombing Targets	Established in the 1950s for marine exercises; aerial photos indicate munitions craters covered over 1,800 acres; since 1974 over 100,000 rounds (over 2100 tons) of marine artillery fired at SIA.	The site will be further evaluated under the MRP Phase II SI
OP-5	SIA	B-1	1	Gun Position	Field reconnaissance detected bomb fragments, projectile fragments, small arms; was approved for firing of up to 300 rounds of 155mm per day.	The site will be further evaluated under the MRP Phase II SI
G-21	SIA	B-3	2	Photo-identified Gun Position	Aerial photos identified mortar at G-21.	The site will be further evaluated under the MRP Phase II SI

TABLE 1-2

Munitions Items Reported to Have Been Fired at MRA-SIA, Former VNTR

105mm Projectiles (Practice/HE/Illumination/Smoke/ White Phosphorus)  
106mm Projectiles (Practice/HE)  
107mm Mortars (HE /White Phosphorus)  
155mm Projectiles (Practice/HE/Illumination/Smoke//White Phosphorus)  
175mm Projectiles (HE)  
2.75" Rocket (Practice/HE)  
20mm Projectiles(Practice/HE)  
3"/50 Projectiles (MK-27, MK-29. MK-33) (Practice/HE)  
3.5" Rocket (Practice/HE/White Phosphorus )  
30mm Projectiles (HE/Practice)  
4.5 "(UK) Projectiles (HE/Practice)  
40mm Projected Grenade (Practice/HE/Smoke))  
5" Projectiles/ (Practice/HE/White Phosphorus/Illumination))  
5" Rocket (HE/Practice)  
60mm /Mortars (Practice/HE/White Phosphorous/Illumination)  
75mm Projectiles (HE/Practice)  
8" Projectiles (HE)  
81mm Mortar (Practice/HE/Illumination//White Phosphorus)  
90mm Projectiles (Practice/HE)  
LAW (M72 66mm) Rocket  
M47 Dragon Missile  
MK-106 (5lb) Practice Bomb  
BDU-48 (10lb) Practice Bomb  
MK-24 Aircraft Flare  
MK-45 Aircraft Flare  
MK-76/BDU-33 (25lb) Practice Bomb  
MK-77 Firebomb  
MK-81 (250lb) Bomb  
MK 82 (500lb) Bomb

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## 1.4.2 Climate and Weather

The climate of Vieques is tropical-marine. Temperatures are nearly constant, with an annual average of approximately 79 degrees Fahrenheit (°F). August is the warmest month (82°F) and February is the coolest (76°F). Vieques lies directly in the path of the prevailing easterly

trade winds that regulate the climate of Puerto Rico and result in a rainfall pattern characterized by a dry season from December through July and a rainy season from August through November. Heavy precipitation may be induced by tropical storms from June to November. The eastern half of Vieques and annual rainfall averages 25 inches per year.

### 1.4.3 Vegetation

Vegetative cover on the eastern third of Vieques consists of thick vegetation dominating most available land space. The canopy consists primarily of deciduous trees, with the non-native mesquite dominating the species distribution. A number of tree species are thorny, and low-lying brush is present throughout. Tall grasses also populate the landscape in areas where the thorny tree and brush species have not populated. Most of the former VNTR's vegetation tends to form a complete ground cover. Leaves are mostly small and sclerophyllous (hard and dry).

Vegetation on the island's eastern side is slightly less dense than on the western side, with a larger percentage of thorny species, especially young to mid-age mesquite trees. Lower precipitation levels on the island's eastern end contribute to the thornier, rugged terrain observed there. The hillsides are densely vegetated, similar to the western side of the island.

The coastal areas in the island's eastern side contain level terrain made up primarily of lagoons and mangrove swamps. Coastal dunes and associated vegetation, including sea oats, are present throughout open beach areas on both the northern and southern sides of the EMA and SIA.

### 1.4.4 Geology

The geology of Vieques is characterized by volcanic rocks generally overlain by alluvial deposits and patches of limestone. The upland areas contain three rock types consisting of sedimentary rocks composed of limestone and volcanic rocks composed of granodiorite and diorite.

The Upper Cretaceous volcanic rocks in the upland areas appear to be the oldest exposed rocks on Vieques, and are believed to have been in a marine environment, as were rocks of the same age on the island of Puerto Rico. Limestone of Upper Tertiary age is found on peninsulas extending into the sea from the southern and eastern coasts. Limestone of the Tertiary-Miocene age is also found along these coasts, and is referred to as the "Puerto Ferro" limestone. Quaternary age deposits are found in the valleys and coastal areas and include beach, swamp, and alluvial deposits. Deposits of sand, swamp, and salt mud occur in the coastal areas and floodplains.

Limestone occurs in sectors of the island's northern, southern, and eastern parts. The most extensive areas of limestone are found on the southern coastal peninsulas. The limestone is generally soft, yellowish, and well-indurated where exposed to the atmosphere. The sedimentary deposits consist of a mixture of sand, silt, and clay.

Alluvial deposits are found in the valleys and coastal areas and include beach, swamp, and alluvial deposits. Deposits of sand, swamp, and salt mud occur in the coastal areas and floodplains. A recent investigation of the eastern end of Vieques indicated that the alluvial deposits there range from 5-ft to 50-ft thick (Baker, 1999).

Soils on Vieques Island are primarily residual, due to both climatic and subsurface rock conditions. They typically are classified into five groups and range from rock land soils where bedrock is exposed to deep, well-drained soils within the alluvial deposits to shallow soils (USDA, 1977).

### 1.4.5 Hydrology

The streambeds found on Vieques flow either northerly or southerly until they reach the Caribbean Sea or Atlantic Ocean. Vieques does not have any perennial surface drainage, and receives an average of 36 inches of rainfall per year, of which approximately 90 percent is lost to evaporation, based on statistics from the U.S. Virgin Islands. Of the remaining 10 percent, approximately 5 percent infiltrates into the groundwater system and 5 percent becomes surface runoff. (USGS, 1989).

### 1.4.6 Surface Water

Surface water deposits in the VNTR occur primarily in coastal lagoons and intermittent streams, known locally as *arroyos* and *quebradas* that channel water downward from hills during rain events. Some of these *arroyos* and *quebradas* have standing water year-round, especially in areas abutting the coastline where terrain has leveled sufficiently to allow for standing water. Several mid- to large-sized lagoons are present near the Purple Beach area just east of Puerto Negro and to the south within the Ensanada Honda area, the Bahía de la Chiva area, and the South Coast Bays area.

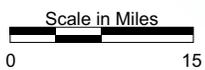
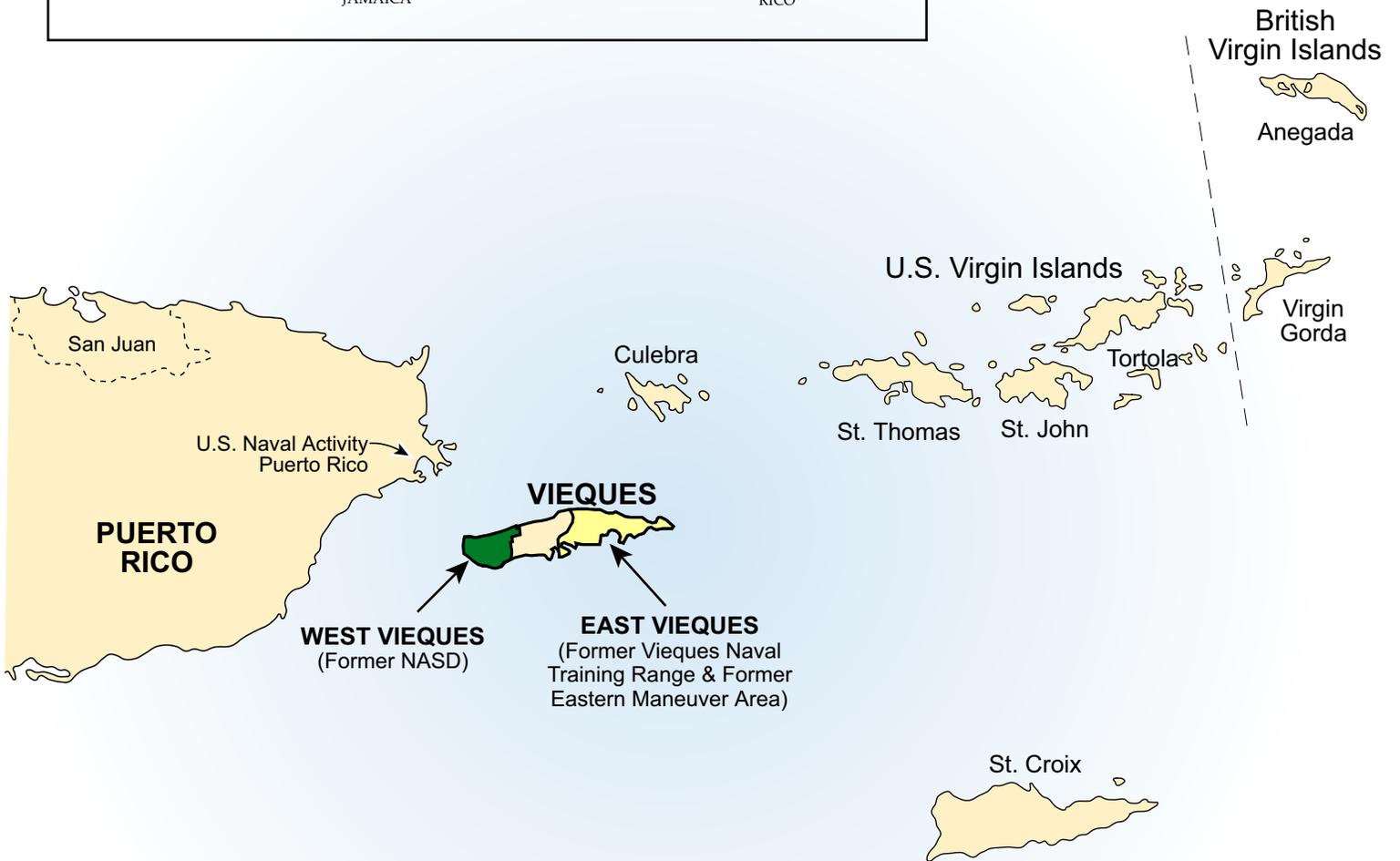
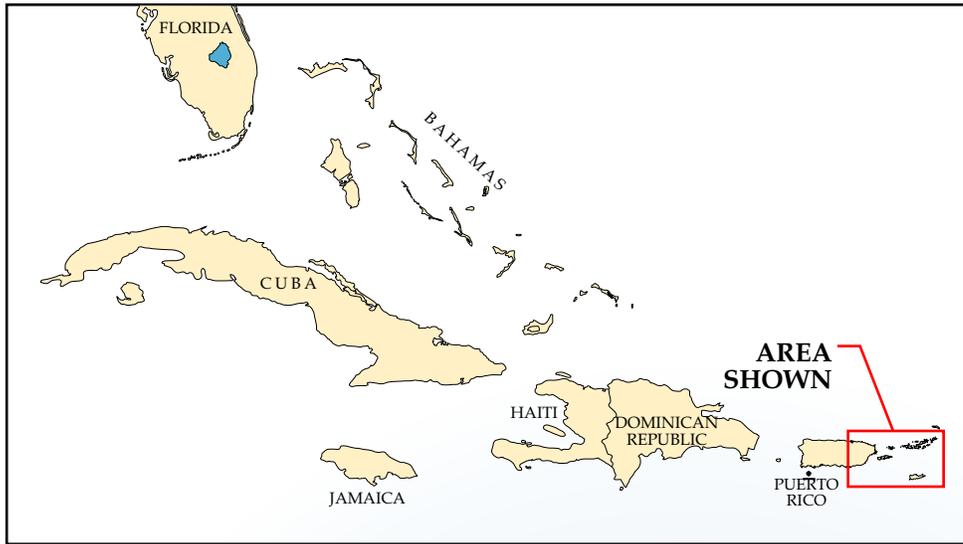
Surface water features are less prominent on the island's eastern side than they are on the western side, and exist primarily very close to the coast as lagoons. Some rainwater does pool for some time in low-lying areas following storm events, but these features dissipate within a few days.

### 1.4.7 Groundwater

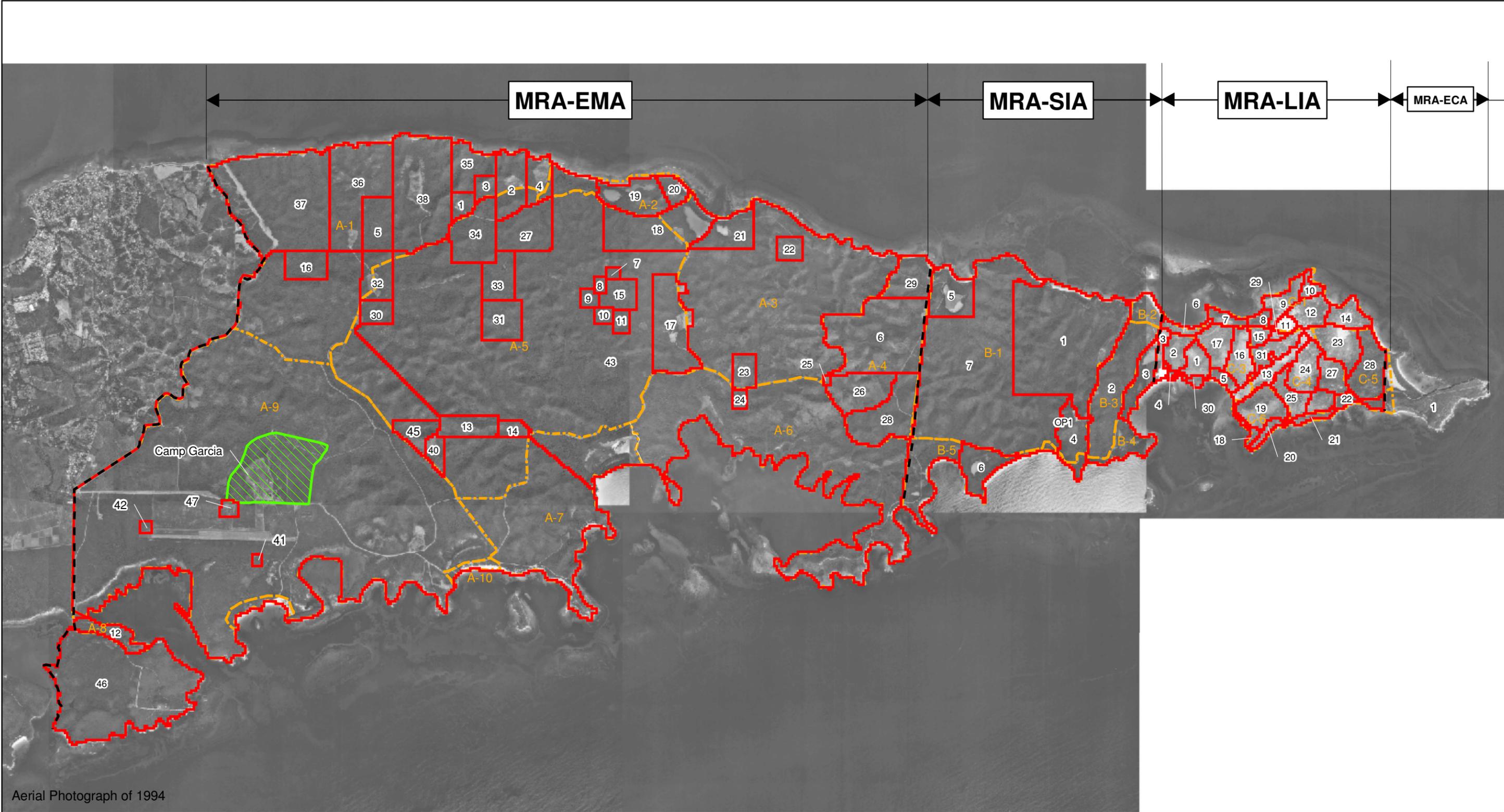
The groundwater on Vieques is derived from rainfall. The water flows downhill as intermittent stream runoff or seeps into the soil and underlying deposits. Water in pore space, cracks, and fractures in bedrock eventually flows into alluvial deposits or to the ocean. Yearly variations in island-wide rainfall influence groundwater levels locally. Groundwater levels also exhibit fluctuations near the coastline because of tidal influences.

The groundwater on the island is broken up into two aquifers: the Valle de Resolución, located beneath the island's western portion (the only known groundwater aquifer on the former Naval Ammunition Support Detachment (NASD) property that contains potentially potable water), and the Valle de Esperanza located beneath the island's southern portion near Camp Garcia. As discussed above, approximately 5 percent of the annual precipitation infiltrates through the ground and supplies the aquifers. The Valle de Esperanza is the more productive of the two aquifers and, therefore, was used as a source of potable water by the Navy. The Puerto Rico Aqueduct and Sewer Authority (PRASA) managed a series of 16 wells which pumped approximately 450,000 gallons of water per day, although these wells are no longer active because of the installation of a water line from the island of Puerto Rico to Vieques in 1978.

The U.S. Geological Survey (USGS) performed a groundwater study on Vieques, including tests on the wells near Esperanza. The results indicated that the groundwater contained high concentrations of sodium bicarbonate. Because of its high sodium content, the groundwater on Vieques is not suitable for extended use for irrigation or other potable water use. The high levels of sodium result from sea spray infiltrating into the ground and saltwater entering the groundwater supply through excessive groundwater withdrawal (USGS, 1995).



**Figure 1-1**  
**Regional Location Map**  
*Vieques, Puerto Rico*



Aerial Photograph of 1994

- Legend**
- MRA-LIA-MRS1
  - Camp Garcia
  - Parcel Boundary and Designation

Notes :

- MRS Numbers Do Not Signify Priority
- EMA-MRS 43 and SIA-MRS 7 include all terrestrial area within the range fan(s) not designated as other MRSs.

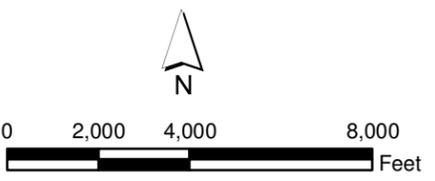
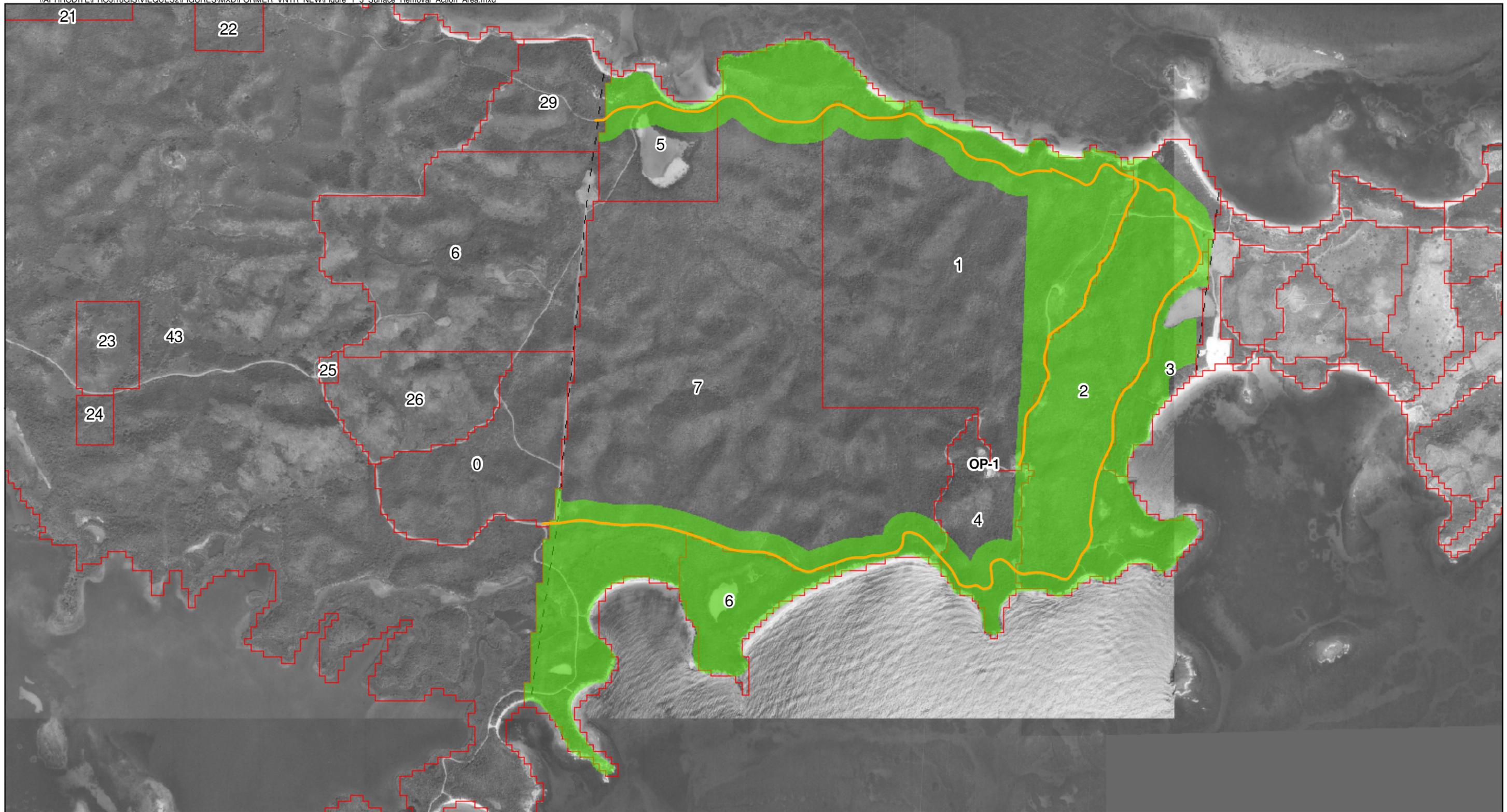


Figure 1-2  
Former VNTR Site Map  
Former VNTR  
Vieques, Puerto Rico



- Legend**
- SIA Roads
  - Removal Action Area
  - MRS Boundary

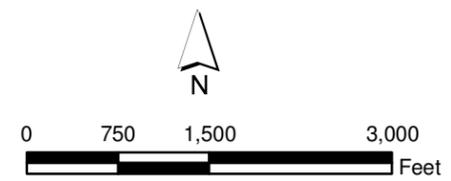
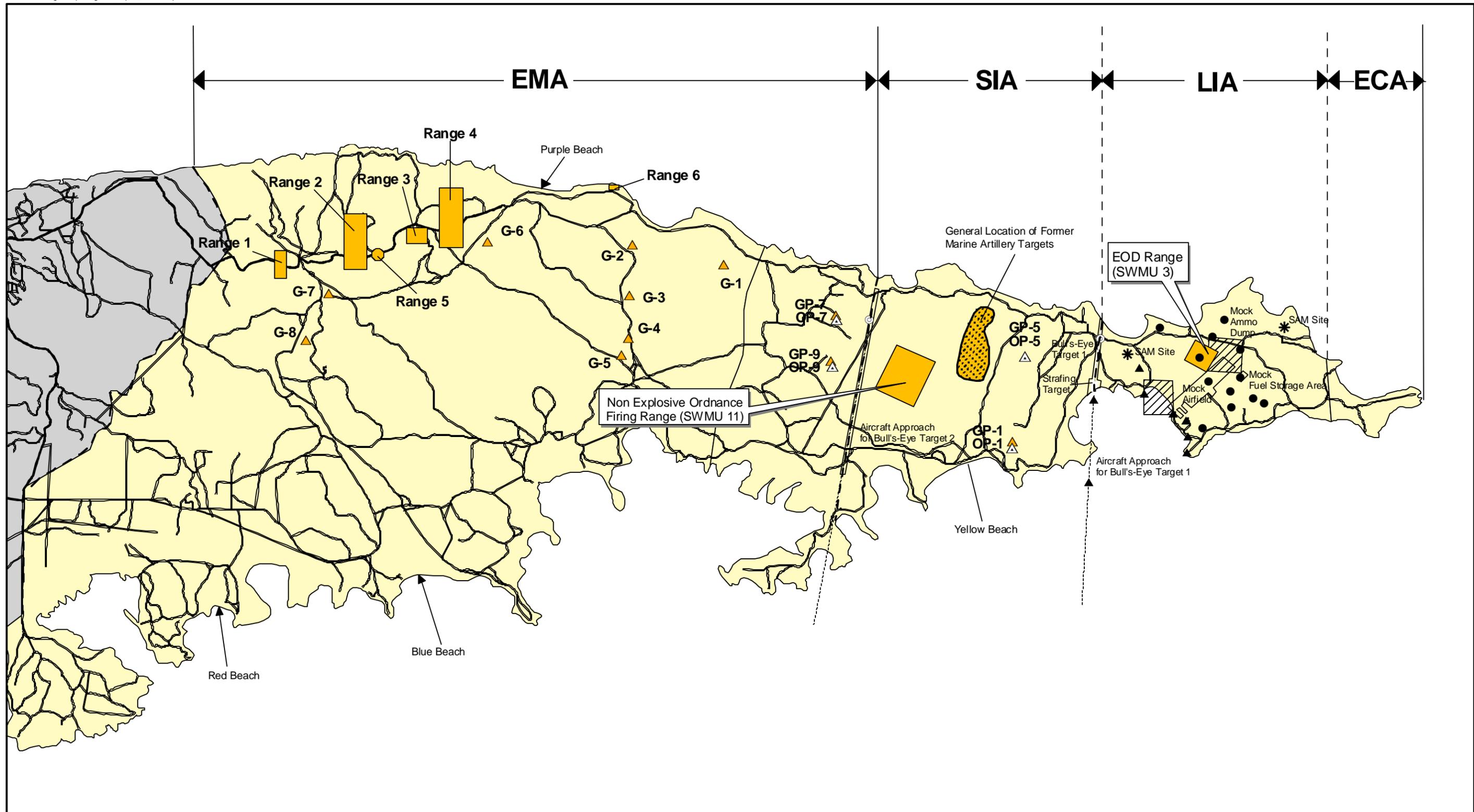


Figure 1-3  
Surface Removal Action Area  
MRA-SIA MRSs 1-7  
Former VNTR  
Vieques, Puerto Rico



**LEGEND**

- |  |  |
|--|--|
| Naval Gunfire Support (NGFS) Area Target | Property Line                                |
| Navy Property                            | Small Arms/Artillery Ranges                  |
| Non-Navy Property                        | General Location of Marine Artillery Targets |
| Air-To-Ground (ATG) Target               | Observation Point                            |
| Naval Gunfire Support (NGFS) Target      | Gun Position                                 |

ECA - Eastern Conservation Area  
 LIA - Live Impact Area  
 SIA - Surface Impact Area

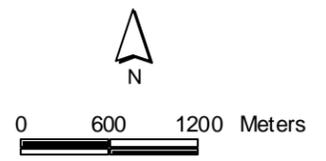
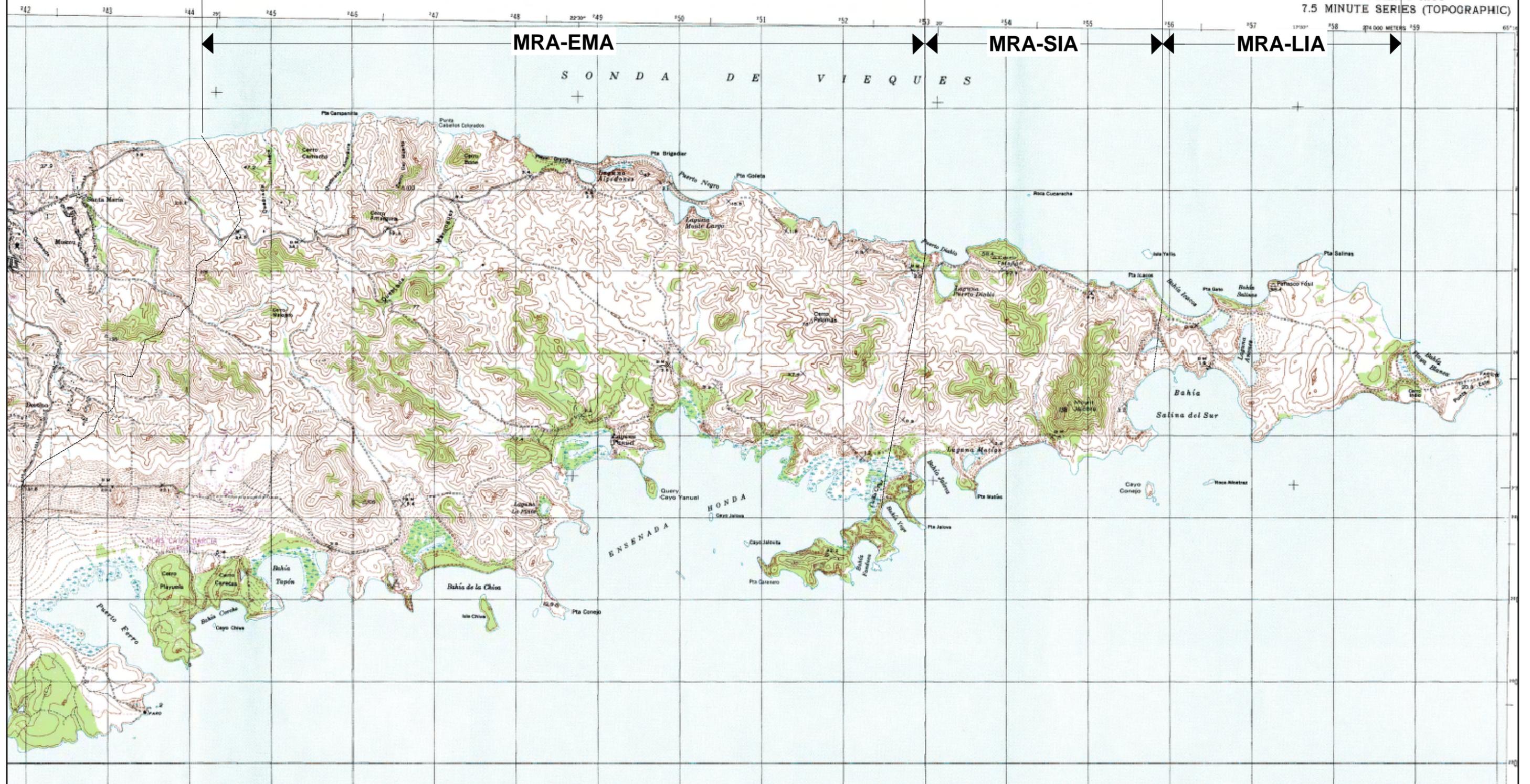


Figure 1-4  
 Map of Range Related Site Features  
 Expanded Range Assessment/Site Inspection  
 Former VNTR, Vieques Island, Puerto Rico



MRAs - Munitions Response Areas  
EMA - Eastern Maneuver Area  
LIA - Live Impact Area  
SIA - Surface Impact Area

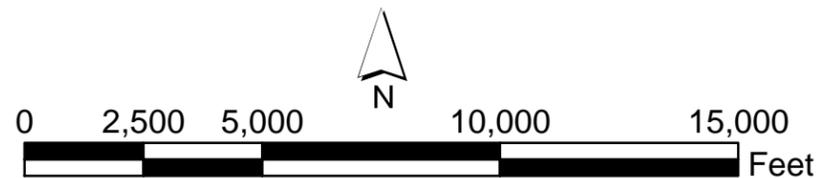


Figure 1-5  
Topographic Map  
Former VNTR,  
Vieques, Puerto Rico

# Technical Management Plan

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## 2.1 General

This section of the work plan addresses specific field-level approach and procedures to execute the tasks required for the NTCRA in the SIA. Proposed changes to this work plan will be documented and forwarded to NAVFAC and the Title II Services Contractor and these changes will be provided to the U.S. Fish and Wildlife Service (USFWS), Naval Ordnance Safety and Security Activity (NOSSA), USEPA, and the Puerto Rican Environmental Quality Board (PREQB) for review and comment.

## 2.2 Guidance, Regulations, and Policy

Table 2-1 lists the MEC guidance, regulations, and policy that are applicable or potentially applicable during MEC assessment, recovery, and removal operations on the VNTR.

TABLE 2-1  
Potentially Applicable or Relevant and Appropriate Requirements (ARARs) and Guidance To Be Considered

Reference	Title
<b>Federal Requirements</b>	
27 CFR Part 55	Commerce in Explosives
29 CFR Part 1910	Occupational Safety and Health Standards
29 CFR Part, Subpart T, 1910.401	Commercial Diving Operations
29 CFR Part 1926	Safety and Health Regulations for Construction
40 CFR Part 300	National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (CERCLA Process)
40 CFR Parts 260-279	Hazardous Waste Management (RCRA ARARs)*Military Munitions Rule
40 CFR Parts 355, 370, and 372	Emergency Planning & Community Right-to-Know (Inventories and Release Reporting)
40 CFR Parts 50-73	Clean Air Act (Release Limits)
49 CFR Parts 100-199	Department of Transportation (Truck Transportation on Public Roads)
Bureau of Alcohol, Tobacco, Firearms and Explosives P 5400.7 (11/07)	Federal Explosives Law and Regulations 2007
<b>DoD</b>	
DoD 4160.21-M	Defense Reutilization and Marketing Manual
DoD 4160.21-M-1	Defense Demilitarization Manual
DoD 6055.9-STD	Ammunition and Explosives Safety Standards
<b>Commonwealth of Puerto Rico <sup>1</sup></b>	
Law 134	Law of Explosives of Puerto Rico, 28 June 1969
Law Chapter XVIII	Guidance for the Administration, Application and Oversight of Puerto Rico Explosive's Law
<b>U.S. Army Corps of Engineers</b>	
EM 385-1-1	Safety and Health Requirements Manual

TABLE 2-1  
Potentially Applicable or Relevant and Appropriate Requirements (ARARs) and Guidance To Be Considered

Reference	Title
EM 1110-1-4009	Ordnance and Explosives Response
EP 75-1-2	Unexploded Ordnance Support for Hazardous, Toxic and radioactive Waste and Construction Support Activities
EP 385-1-95a	Basic Safety Concepts and Considerations for Ordnance Explosive Operations
EP 1110-1-17	Establishing a Temporary Open Burn/ Open detonation Site for Conventional Ordnance and Explosives Projects
EP 1110-1-18	Ordnance and Explosives Response
EP 1110-1-24	Establishing and Maintaining Institutional Controls for Ordnance and Explosives Projects
ER 5-1-11	Program and Project Management
ER 385-1-92	Safety and Occupational Health Document Requirements for Hazardous, Toxic, and Radioactive Waste and Ordnance and Explosive Activities
ER 415-1-10	Contractor Submittal Procedures
ER 715-1-19	Service and Supply Contractor Performance Evaluations
ER 1110-1-12	Quality Management
ER 1110-1-8153	Engineering and Design Ordnance Explosives Response
ER 1110-1-8158	Corps Wide centers of Expertise Program
<b>U.S. Army Corps of Engineers Engineering and Support Center (CEHNC), Huntsville</b>	
<b>Interim Guidance Documents</b>	
IGD 98-04	Reportable Material at Ordnance Explosives Response Sites
IGD 99-02	Small Arms Determination
<b>Procedural Documents and Plans</b>	
March 2000	Procedures for Demolition of Multiple Rounds (Consolidated Shots) on Ordnance and Explosives Sites
August 10, 1999	Procedures for Establishment of Anomaly Review Boards Site/Grid Statistical Sampling Based Methodology (SiteStats/GridStats) Documentation
<b>Memoranda of Agreement (MOA)</b>	
MOA (July18, 1997)	U.S. Army 52nd Ordnance Group and U.S. Army Engineering and Support Center, Huntsville
MOA (June 13, 1995)	Chemical Support Division, U.S. Army Edgewood Research, Development and Engineering Center and (then) U.S. Army Engineer Division, Huntsville
<b>OE Guidance Memoranda</b>	
	OE Mentoring Plan
December 19, 2000	Interim Final Management Principles for Implementing Response Action at Closed, Transferring, and Transferred Ranges
January 20, 1994	Application of the Hazardous Waste Operations and Emergency Response Regulation to Ordnance and Explosives Sites
November 27, 1996	Base Realignment and Closure (BRAC) Ordnance and Explosives (OE) Response Projects
May 7, 1997	Coordination with the Ordnance and Explosives Center of Expertise (OE CX)
July 6, 1994	OE Center of Expertise Technical Advisory Group (TAG) for Archive Search Reports (ASRs) Permit Equivalency Process for CERCLA Onsite Actions

TABLE 2-1  
Potentially Applicable or Relevant and Appropriate Requirements (ARARs) and Guidance To Be Considered

Reference	Title
	Sample Land Owner Notification Letters to be used in Support of Defense Environmental Restoration Program (DERP) Formerly Used Defense Sites (FUDS)
NAVSEA OP 5 Vol 1	Ammunition and Explosives Ashore: Safety Regulations for Handling, Storing, Production, Renovation, and Shipping
NAVSEA OP 2165	Navy Transportation Safety Handbook for Ammunition, Explosives, and Related Hazardous Materials
NAVSEA OP 2239	Motor Vehicle Driver's Handbook, Ammunition, Explosives, and Related Hazardous Materials
NAVSEA 4570.1	Demilitarization and Disposal of Excess, Surplus, and Foreign Excess Ammunition, Explosives and Other Dangerous Articles and Inert Ordnance Material
NAVSEA 8020.9	Non-Nuclear Ordnance AND Explosives Handling Qualification and Certification Program
NAVSEAINST 8020.1H	DoD Ammunition and Explosives Hazard Classification Procedures Joint Technical Bulletin
OPNAVINST 5090.1	Environmental and Natural Resources Protection Manual
OPNAVINST 5100.23E	Navy Occupational Safety and Health Program
OPNAVINST 5102.1C	Mishap Investigation and Reporting
OPNAVINST 5530.13	Department of the Navy Physical Security Instruction for Sensitive Conventional Arms, Ammunition, and Explosives
OPNAVINST 8020.14	Department of the Navy Explosives Safety Policy
OPNAVINST 8023.2	U.S. Navy Explosives Safety Policies, Requirements, and Procedures
OPNAVINST 8026.2	Assignment for the Responsibility for Management of the Navy Munitions Disposition Program
OPNAVINST 8026.2A	Navy Munitions Disposition Policy
OPNAVINST 8027.1	Inter-service Responsibilities for Explosive Ordnance Disposal
OPNAVINST 8027.6E	Naval Responsibilities for Explosive Ordnance Disposal
OPNAVINST 8070.1B	Responsibilities for Technical Escort of Dangerous Materials
SECNAVINST 8023.3C	Responsibilities for Issuance and Administration of Waivers and Exemptions from Department of Defense Explosive Safety Standards
SWO60-AA-MMA-010	Demolition Materials
<b>U.S. Marine Corps</b>	
MCO P3570.1B	Policies and Procedures for Firing Ammunition for Training, Target Practice, and Combat
MCO P3570.2	Regulations for Firing Guided Missiles, and Heavy Rockets for Training, Target Practice, and Combat
MCO 3571.2	Explosive Ordnance Disposal Program
MCO 8020.1	Handling, Transportation, Storage, Reclassification and Disposal of Class V (W) Material
MCO 8020.10	Ammunition and Explosives Safety Policies, Programs, Requirements, and Procedures for Class V Material
MCO P8020.11	Department of the Navy Explosives Safety Policy
MCO 8023	Qualification and Certification Program for Class V Munitions and Explosive Devices
MCO 8027.1	Inter-service Responsibilities for Explosive Ordnance Disposal

TABLE 2-1  
Potentially Applicable or Relevant and Appropriate Requirements (ARARs) and Guidance To Be Considered

Reference	Title
<b>USEPA</b>	
July 26, 2000 (Draft)	USEPA FUDS Policy
42 U.S.C. Section 9601	CERCLA of 1980
42 U.S.C. Section 11001	Superfund Amendments and Reauthorization Act (SARA) of 1986
March 2000 (Draft)	Handbook on Management of Unexploded Ordnance at Closed, Transferring, and Transferred Ranges
42 U.S.C. Section 6901	Resource Conservation and Recovery Act
Title 126	Hazardous Waste Regulations*
Title 126	Emergency Planning & Community Right-to-Know and Contingency Planning Regulations (Reporting Requirements)
Title 129	Air Quality Regulations (Release Limits)

CFR = Code of Federal Regulations

RCRA = Resource Conservation and Recovery Act

\* denotes substantive requirements of this regulation only

<sup>1</sup> NAVFAC Atlantic discussions regarding the requirements for security at explosives storage magazines with the PR State Police Explosives Division of Humaco determined that the process of having site workers check magazines during working hours throughout the work day meets the intent of the Puerto Rico Law.

## 2.3 Project Organization and Personnel

This NTCRA is administered and managed by NAVFAC Atlantic with QA support from NAVEODTECHDIV. The Title II Services contractor will support NAVFAC Atlantic by providing site management, QA support to the Resident Officer in Charge of Construction (ROICC), contract administration, and data management. The removal action will be performed by a removal action contractor who is contracted directly by NAVFAC Atlantic. The removal action contractor will perform all MEC removal action operations, implement safety processes, perform QC, and will subcontract support personnel as needed to carry out the removal action. Figure 2-1 gives the general areas of responsibility for each entity described above.

**The Title II Services Contractor Munitions Response (MR) Manager** will support QA services performed by the Navy and ensure that the work is completed in accordance with the requirements of the work plans and DoD/Navy Guidance.

**The Removal Action Contractor Project Manager** is responsible for ensuring all activities performed are conducted in accordance with contractual specifications and approved Work Plans. The MRP Contactor Project Manager (PM) is responsible for management of all operations conducted for the project. He will ensure all personnel assigned to the project, including subcontractors, have reviewed the technical plans before any task associated with the project begins. The PM will monitor the budget and schedule to ensure availability of necessary personnel, equipment, subcontractors, and services. He will participate in the development of the field program, evaluation of data, and reporting.

Section 2.3.13 of the Vieques MEC Master Work Plan (CH2M HILL, 2006b) provides the roles, responsibilities and qualifications for UXO personnel.

### 2.3.1 Composition and Management of Removal Teams

Section 2.3.14 of the Vieques MEC Master Work Plan (CH2M HILL, 2006b) provides the removal team composition guidelines.

## 2.4 Technical Scope

### 2.4.1 Mobilization

Prior to mobilization, the following actions require advance planning in preparation for mobilization:

- Finalize procurement actions for items and services needed during the mobilization
- Coordinate with the Federal Aviation Administration (FAA) for release of “Notice to Airmen” (NOTAM) if regular detonations are expected
- Coordinate with the U.S. Coast Guard for the release of a “Notice to Mariners” if regular detonations are expected
- Coordinate with USFWS representatives on Vieques Island

A mobilization period is necessary to organize and train project staff; inventory and test equipment. Mobilization will include the following activities:

- Transport and assembly of the work force
- Conduct site-specific training on the work plan, Site Specific Health Plan (SSHP), and MEC procedures and hazards.
- Ship and inventory project equipment (e.g., hand tools and supplies, portable toilets, backhoes, vegetation clearance equipment)
- Coordinate with local agencies including police, hospital, and fire department as appropriate.
- Organize support facilities and test communication equipment.
- Test and inspect equipment.

### 2.4.2 Field Office

The former Camp Garcia field office will be utilized for the project described in this plan. The field office is the central command location for MEC activities. Personnel will report to this location at the beginning of each work day for the daily health and safety briefing. The field office is the central point of communications for the project. The office will be equipped with one or more phones, facsimile machine, and radio base station for radio communication with the field crew(s). Health and safety records will also be maintained in the field office.

### 2.4.3 Project Site Layout

The area identified for removal of surface munitions is approximately 700 acres in area and is described in Section 1 and shown on Figures 1-2 and 1-3. The survey to establish the

project site layout includes the actions performed to identify the operating area boundaries, install grid corner stakes, and develop a project base map.

Following an initial reconnaissance of the work area, the survey team will locate and mark the site boundaries with stakes and establish ground controls in accordance with the location, surveying, and mapping plan. The spatial coordinates collected during the establishment of the survey monuments, operating area boundary, and individual grids will be used to develop a project base map.

The final product of this operation is the generation of a spatially-referenced site drawing that accurately depicts the location operating area boundaries and grid boundaries. Throughout operations, this map will be continually updated to reflect project performance and contamination encountered. Upon project completion, the data contained on this map will be an integral part of the final report.

The locations of all stakes will be checked for the presence of MEC using an appropriate geophysical instrument prior to driving the stake.

The project site will be divided into grids measuring 30 m × 30 m.

#### **2.4.4 Site Preparation**

All site preparation activities will be monitored by the appropriate UXO personnel described in this section.

A survey team will perform initial reconnaissance of the site upon mobilization. During the initial reconnaissance, the survey team will examine the site to determine the amount of vegetative material that must be removed to accomplish the scope of work and determine the amount of MEC and range/munitions debris (MD) on the surface of the site. The survey team will document the site reconnaissance. Photographs will be taken of the overall site vegetation, MEC, debris found on the surface, and any other notable features.

The survey team's observation, documentation, and analysis of the density of the vegetation and the presence of surface MEC will be used to determine the amount and method of vegetation removal. Possible appropriate vegetation removal scenarios include none, (if the area is free of vegetation that interferes with subsequent required work) or removal by hand cutting.

#### **Vegetation Removal**

It is estimated that vegetation removal will be required for most of the 700 acres identified for removal of surface munitions, roadways and beach areas may not require vegetation removal. Vegetation removal will be conducted by hand (manual) utilizing hand carried tools (e.g., weed eaters). Unless it is absolutely necessary, cutting trees larger than 3 inches in diameter will be prohibited. Trees will be felled into an area that has already been surface swept for MEC. The vegetation will typically be cut to a height of approximately 6 inches above ground surface to eliminate interference with MEC detection or survey activities. All cut vegetation will be accumulated onsite and left in place.

As the first step, the UXO Technicians will inspect all areas of the grid ahead of the vegetation removal crews with the aid of handheld magnetometers. The UXO Technicians will mark any MEC or other hazards by encircling the hazard with flagging tape.

The vegetation removal will be supervised by UXO Technician III and a UXO Technician II. The laborers will use hand tools that are appropriate for the vegetation being cut, such as chain saws, power string trimmers, and machetes to cut the vegetation.

Trees will be trimmed or removed on a case-by-case basis and only as required to accomplish the project tasks. If removal is required, the tree will be cut using chain saws or other hand held equipment. The tree will be sectioned, if necessary, to remove it from the immediate area, so it does not interfere with MEC detection or survey activities.

### MEC Investigation Operations and Removal Actions

All removal activities will be monitored by the appropriate UXO personnel described in this section.

A magnetometer assisted visual survey will be performed to locate all surface MEC. All metallic items present at ground surface or partially exposed at the surface will be removed.

Magnetometer sweeps will be employed (“mag and flag”) for identification and clearance of all metallic items at the surface. UXO technicians will work individual search lanes approximately 3-ft to 5-ft wide and will search each lane using a hand held magnetometer (e.g., Schonstedt Model GA-52Cx), or similar approach to accomplish 100 percent coverage. UXO technicians will start at one end of each lane and move forward toward the opposing base line. During the forward movement the technician will move the magnetometer back and forth from one side of the lane to the other. Both forward movement and the swing of the magnetometer will be performed at a pace, which ensures the entire lane is searched and that the instrument is able to appropriately respond to anomalies. Whenever a metallic surface object is encountered the technician will halt and investigate the anomaly real-time. Throughout this operation the UXO Technician III will closely monitor individual performance to ensure these procedures are being performed with due diligence and attention to detail. If field teams determine an area is inaccessible or unsafe to work utilizing the work approaches prescribed, they will record the following data, which will be included in the report for that action:

- Reason(s) area was determined inaccessible or unsafe to work (e.g., water, steep slope)
- If area is inaccessible or unsafe to work due to slope, the percent slope
- Record the boundary using global positioning system (GPS) units
- Grid(s) location or MRS location
- Date and time
- Contractor team leader name
- Government representative verification of conditions

Section 2.9.4 describes the minimum information that will be collected for each surface item located. Munitions items that are safe to move will be removed by hand. MEC items which are safe to move may be consolidated for disposal/demilitarization within a grid, or several adjacent grids.

MEC items that are not safe to move will be clearly marked and all information will be gathered for the item as described in Section 2.9.4. Additionally, the accessibility, explosive hazard, location, and other factors will be assessed to determine if additional safety measures should be put in place. The item will then be demilitarized during a scheduled demolition event.

Non-MEC metallic items will be removed from the grid and will be consolidated onsite in a designated and established holding area. These metallic items will be thoroughly screened for MEC. Large items, such as target vehicles, will require additional screening for environmental pollutants (e.g., petroleum products, coolants, batteries). These items may also require onsite disassembly to facilitate removal.

## 2.5 MEC Procedures

### 2.5.1 MEC Safety

- In general, a projectile containing a base detonating (BD) fuze is to be considered armed if the projectile has been fired.
- Arming wires and pop-out pins on unarmed fuzes should be secured by taping in place prior to movement.
- Do not rely on the color-coding of MEC for positive identification.
- Avoid the area in front of MEC items until it can be determined the item does not contain a shaped charge. The explosive jet can be fatal at great distances forward of the longitudinal axis of the item. Assume any shaped charge munitions to contain a piezoelectric (PZ) fuze until the fuzing is positively identified. A PZ fuze is extremely sensitive, can function at the slightest physical change, and may remain hazardous for an indefinite period of time.
- Examine all projectile rotating bands for fired/unfired condition. Also examine projectiles for the presence/absence of an unfired tracer.
- Assume practice/training MEC contains a live charge until it can be determined otherwise. Expended pyrotechnic/practice devices may contain red/white phosphorus (WP) residue. Due to incomplete combustion, phosphorus may be present and re-ignite spontaneously if the crust is broken and the contents exposed to air (USACE, 2004). Additionally, red phosphorous is sensitive to shock/friction.
- Do not approach smoking WP MEC. Burning WP may detonate the burster or dispersal explosive charge at any time.

## 2.5.2 MEC Identification

The UXO Technician will carefully remove enough soil, without disturbing the MEC, to facilitate positive identification or to obtain its identification features. UXO Technicians will make every effort to identify MEC through visual examination of the item for markings and other identifying features such as shape, size, and external fittings.

Items will not be moved during the inspection/identification until the fuze condition can be ascertained. If the condition is questionable, consider the fuze to be armed. The fuze is considered the most hazardous component of a UXO, regardless of type or condition. The Senior UXO Supervisor (SUXOS) make final determination of identification of the item and the disposition of the item prior to implementing any disposal operations.

## 2.5.3 MEC Transportation

Transportation of MEC may be a consideration if safe to do and there is a compelling reason. Guidelines to determine whether to transport and procedures for transport are discussed below.

### Determination to Transport MEC

Recovered military munitions or MEC will not be moved by personnel unless it is safe to do so. Movement of MEC by hand is authorized only after positive identification and a determination by the UXO Technician III and either the SUXOS or UXO Safety Officer (UXOSO) that the MEC is safe to move. A conservative approach to MEC transportation will be taken and only considered when the item is positively identified as safe to move.

### Procedures for Transportation of MEC

If onsite movement of MEC for disposal or venting is approved, move the MEC in the position found. Movement over short distances for onsite consolidation will be done by hand-carrying the MEC in the position found.

Movement of greater distances (e.g., to another grid for disposal or venting) may be done in a specially-equipped pickup truck. The truck must have the appropriate placards and a non-sparking bed liner and tie-down points. The MEC will be stabilized with sandbags or placed in a wooden box filled with sand and securely tied down. The driver of the transport vehicle will be followed by another similar vehicle and driver to assist him in loading and unloading the MEC, and in the event of mechanical trouble.

## 2.5.4 MEC Safe Holding Areas

Depending on condition and quantity of MEC encountered, one of the two courses of action will be taken:

- MEC left in place pending disposal
- MEC transported to onsite consolidation point pending disposal

MEC items left in place pending disposal will have geographic coordinates and item information gathered. The specific location of the item will be evaluated to determine any security or access concerns. Finally, the next planned demolition event for the site will be considered to determine if additional measures will be necessary to maintain control/

security of the item. Additionally, activities that may result in increased trespassing or attempts to access the work areas will be evaluated to determine if additional measures should be taken to discourage access, prevent access, or minimize potential encounters with UXO. USFWS, USEPA, and PREQB will be notified if the site personnel are made aware of the possibility of increased trespassing, so they can provide notification to the appropriate enforcement agencies for both waterway access and land access.

### **2.5.5 Procedures when MEC Cannot be Destroyed Onsite or Cannot be Identified**

MEC items encountered at the surface will be destroyed onsite. This will be accomplished through blow-in-place (BIP) or in-grid consolidation shots. Considering the remote location of the work site it is unlikely an MEC item will be encountered which cannot be safely destroyed onsite. However, in the event one or more MEC items are encountered which cannot be destroyed onsite, a suitable treatment site will be located at one of the nearby MRSs. The geographic coordinates for all consolidated shot locations will be recorded.

Military munitions will not be moved by any project personnel unless safe to do so. Movement of military munitions by hand is authorized only after positive identification and the determination is made by the UXO Technician III and SUXOS that the military munitions are safe to be moved.

Unidentified military munitions will not be handled or moved for the purpose of identification. All available data will be collected for the unknown MEC item (e.g., dimensions, external features, markings, color-code) and photos will be taken.

Assistance in identifying unknown UXO and MEC is available from the U.S. Army Corps of Engineers (USACE) Military Munitions Center of Excellence and the Navy's Explosive Ordnance Disposal (EOD) Technology Division. The contact information for the support centers are given below.

USACE Military Munitions Center of Excellence

(256) 895-1200

U.S. Navy EOD Technology Division

(301) 744-4069  
or (877) 363-4636

### **2.5.6 Recovered Chemical Warfare Materiel**

Recovered Chemical Warfare Materiel (RCWM) is not expected to be encountered at the VNTR based on range usage archival searches and previous investigations. If suspected RCWM is encountered the following procedures will be followed:

- Person discovering suspected RCWM will immediately notify the SUXOS.
- SUXOS will immediately direct the work team to stop work and evacuate the site in an upwind direction. The initial exclusion zone (EZ) for RCWM is 450 ft upwind per Field Manual (FM)-9-15 (U.S. Army, 1996).
- SUXOS should note the location of the suspected RCWM to help with its identification and reacquisition.

- SUXOS will designate a minimum of two UXO-qualified individuals to position themselves upwind as far as possible to prevent unauthorized personnel from accidental exposure.
- SUXOS will immediately contact the NAVFAC RPM and local Department of Interior (DoI) USFWS representatives to request military assistance.

**Note:** Assistance for RCWM will be requested through the U.S. Army's 52nd Ordnance Group at Fort Gillem, GA (404) 469-3333. Should the 52nd Ordnance Group at Fort Gillem be non-responsive, the Chemical Warfare Design Center will be contacted at (296) 895-1180.

- SUXOS will account for all personnel and notify the Title II Services Contractor PM.
- SUXOS will ensure the area is secured until relieved by proper authorities. The SUXOS will direct Title II Services Contractor personnel to support response units as appropriate.
- USEPA Region II, PREQB, and NOSSA will be notified if RCWM is discovered during removal action operations. The contact information for these agencies is given in given below.

USEPA Region II	(787) 741-5201
PREQB	(787) 365-8573
NOSSA	(301) 744-4450

Before work resumes, site plans will be reviewed for adequacy in consideration of this newly discovered hazard.

### 2.5.7 MEC Operations in Populated/Sensitive Areas

Due to the remote location of the work site, no operations will be conducted near populated areas.

### 2.5.8 Demolition Procedures

Prior to carrying out demolition activities, the U.S. Coast Guard and Federal Aviation administration will be contacted and the appropriate notices made for watercraft and aircraft safety (e.g., notice to mariners, NOTAM). Additionally the following will be notified prior to demolition activities; NAVFAC Atlantic, Title II Services Contractor, USEPA Region II, PREQB, USFWS, and the Municipality of Vieques (MOV).

During demolition activities, the SUXOS will have overall control of the Site. An EZ will be established around the demolition site according to the Explosive Operations Site Approval and Explosives Safety Submission (ESS). Only the SUXOS, UXO Team, and UXO-qualified safety personnel will be allowed within the EZ once the disposal operations have begun. The UXOSO will ensure safe work practices are observed, and the UXO Technician III will perform the necessary steps to safely dispose of the MEC. The following general procedures will be followed for all disposals by detonation:

- The UXO Team, comprised of the UXO Technician III and a UXO Technician II, will inspect the location, condition, and net explosive weight (NEW) of the MEC selected for disposal.
- The UXO Technician III will ensure that permission to detonate explosives has been obtained from the SUXOS and coordinated with the appropriate outside agencies.
- It is the responsibility of the SUXOS to schedule the detonations and to ensure that all project personnel are accounted for before disposal operations begin.
- The UXO Team will then prepare enough explosive charges to perform the planned detonations. The transportation vehicle will then be loaded with the properly containerized explosives and initiators, and other equipment required.
- Initiators will always be transported in a separate container from the main-charge explosives.
- A minimum separation distance of 25 feet will be observed for initiators and main-charge explosives while at the disposal site.
- If several MEC items are located in close proximity to each other, a mainline/branchline shot may be used to destroy these MEC simultaneously. Ensure the total NEW of the MEC to be destroyed does not increase the EZ minimum separation distance.
- All detonations will be dual-primed. The firing wire and initiators will be tested for continuity and the UXO Technician III will observe the UXO Technician II position the explosive charge against the MEC. The disposal shot may be tamped, however, initiators will never be buried.
- The initiators will then be connected to the firing wire and secured to the end of the detonating cord or placed into the main charge.
- The UXO Technician III will then inspect the disposal shot and return to the safe firing point.
- Prior to initiation, the UXO Technician III will ensure that guards are stationed at the roadblocks, scan the EZ for personnel, sound three distinct blasts on an air or vehicle horn, and then scan the area again and initiate the demolition charge if all is clear.
- In the event of a misfire, a 30-minute wait time for electric misfires or a 60-minute wait time for non-electric misfires will be observed. Then a new dual-primed initiator will be prepared and used to initiate the charges.
- All waterways, roadways, and other access routes will be monitored for non-essential personnel during all phases of demolition operations.

### 2.5.9 Post-Demolition Operations

After successful initiation of the explosive charge, the UXO Team will conduct an inspection of the disposal site and surrounding area to ensure complete destruction of the MEC. After verifying no more detonations will be required, an “all clear” notification will be issued.

The UXO Team will collect for disposal all large MEC fragments and other debris, and generally clean and restore the area.

## 2.6 Engineering Controls

Due to the remote location of the work site the need for engineering controls is not anticipated.

## 2.7 Management of MPPEH

The procedures for managing material potentially presenting an explosive hazard (MPPEH) and MD are given in Appendix A.

## 2.8 Field Documentation

Field documentation will be performed during the removal action. All observations and measurements of sites and any associated items collected during the removal action will be recorded digitally in the field, through the use of notebook computers, digital cameras, or video cameras, or recorded in the appropriate hard copy form such as log books or investigation forms. All investigation data, whether recorded digitally or by hand, will be given to the onsite data manager as soon as possible. After the onsite data manager has created backup and management copies of all the information, the data will be given to the Project QC staff to conduct checks on accuracy and methodology.

## 2.9 Data Management

### 2.9.1 Data Collection and Processing

Data will be collected from the field, processed, and used to generate project status reports and information that will be used for the project report and a subsequent risk assessment and feasibility study, if needed.

Data collected during the site clearance will consist primarily of field observations and measurements of the munitions items found. This data will be digitally recorded in the field on handheld electronic data collectors and written (backup) on data forms. Photographs of munitions items will be collected as deemed necessary (i.e., single photographs of like items may be taken). At a minimum the data parameters listed in Section 2.9.4 will be collected.

### 2.9.2 Database Management and Integration with Geographical Information System

The objective of data management plan is to integrate all related project data into a single, comprehensive project database. The database will store and manage tabular data, geo-referenced map information, and photographic images. Tabular data will consist of location data and data describing munitions items (at a minimum the data parameters given in Section 2.9.4 will be recorded). Geo-referenced map information will include existing maps of the study area, survey control information. Photographic images will include electronic

photographs of items recovered by UXO personnel, photographs of known ordnance types, and images of the Site or physical features within the Site.

The field data will be entered from the electronic data collectors and electronic data files generated on a daily basis. Database queries and reports will be written to verify data loading, perform data QC functions, map weekly progress, and provide investigators with access to the data.

Verified data will be uploaded into the project database and made accessible within the geographical information system (GIS) Data Management System.

### 2.9.3 Military Munitions-related Items Identification

Military munitions related items found during surface clearance activities will be assigned unique identification numbers when electronic field data is imported into the Vieques Munitions Database. The munitions item IDs will be assigned an auto number. These items are normally surface finds that are not associated with subsurface geophysical anomalies.

### 2.9.4 MEC Data Records

Field data collection is conducted using a GPS-enabled ruggedized Trimble Geo-XT unit with CartoPac GIS software installed. The GeoXT unit is a handheld mobile GIS and data collection system. Using standardized collection forms and drop down selection lists, the field team will document discovered MEC items, surface clearance progress and destruction/removal actions (to name a few). The information gathered in the handheld unit each day is transferred into a desktop computer application. Once the information has been transferred to the desktop computer, the handheld can be pre-loaded with information for next-day field operations. Attributes collected for surface items are listed below.

Field Name	Description
ITEM ID	Item found Identification Number
ITGROUP	Group
ITCLASS	Class
ITCATEGORY	Category
ITTYPE	Type/Filler
ITDESCRIP	Description/Fuze
QUANTITY	Quantity
DEPTH	Depth
WEIGHT	Weight
FRAG	Frag
DEMOREQ	Demo Required
ITEMCMNT	Item Comment
DSLOC	Location
ITMFNDDATE	Date Found
ITMGRDCELL	Grid
ACTIONTKN	Action Taken
ITMovedTO	Item Moved To
X_COORD	X Geographic Coordinate
Y_COORD	Y Geographic Coordinate
ITTEAM	Team
ITEMISOCQA	Item Found During QC/QA?
DEMOCMPDAT	Demo Complete Date

Project Team QC personnel will perform QC evaluations as described in the QC section of this work plan (Section 10) and will provide forms to data management personnel for entry into the project database. All records, forms, and logs resulting from the field investigation will become part of the permanent project files upon completion of field activities.

### 2.9.5 Record Keeping/Accountability

The SUXOS has overall responsibility for the accountability of all recovered MEC material and government or commercially procured explosive demolition materials. The electronic data collection system records the type, quantity, and condition of MEC from discovery to disposal. The SUXOS will also maintain the Scrap Residue Certification Form (Form 2-2), which certifies when MEC-related materials are explosively safe.

## 2.10 Site Safety and Communications

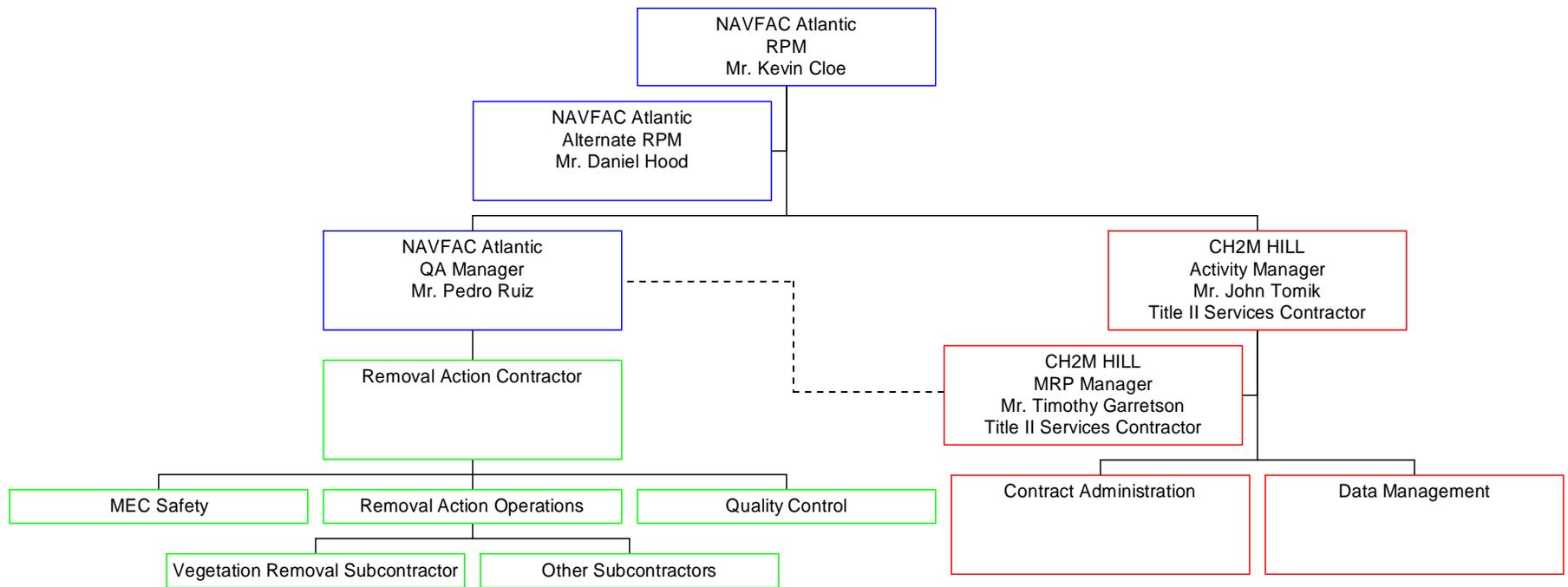
Safety is the primary concern during efforts to locate and dispose of MEC. All personnel engaged in these efforts will adhere to the SSHP and any additional safety requirements. Personnel will also comply with guidelines provided in DoD 4145.26-M (March, 2008), Contractor Explosive Safety for Ammunition and Explosives. All contractors must develop Health and Safety Plans that address the hazards associated with their scope of work and site conditions.

In the event that sealed drums, contaminated soils, or other suspect materials or conditions are encountered during the removal action that would indicate a potential health or safety hazard, work efforts will temporarily cease pending an evaluation by the SUXOS and UXOSO. Operations will continue only when it has been determined it is safe to proceed.

All health and safety issues will be communicated to both the removal action contractor and Title II Services Contractor UXOSO. The appropriate actions for health and safety issues will be determined and the UXOSOs will communicate the information to all site personnel.

Hand-held radios will be used for any required communications between the UXO Teams and project command center/project office. The project office will relay all required communication with other station activities using established radio links or telephones (when available) as a secondary means of communication.

In the event that a suspected MEC item is discovered onsite, but outside the designated area of investigation, UXO personnel will respond to the site and examine the suspect item to confirm whether it is MEC. If the item is MEC, then notification will be made to the SUXOS (if not already involved), the PM, and the Navy Remedial PM (RPM) to coordinate the necessary response to the item. Upon request from installation and program management personnel, the item will be addressed in accordance with the MEC procedures presented in this document. Recommendations and identification information given for the item will be recorded in the Site logbook.



**Figure 2-1**  
**NTCRA Management, Contractor, and**  
**Organizational Chart**  
**Vieques, Puerto Rico**

# Explosives Management Plan

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## 3.1 General

This section of the Site-Specific work plan addresses specific field-level explosive management practices required to support the NTCRA in the MRA-SIA. An ESS (CH2M HILL, 2006a) was submitted to NOSSA and Department of Defense Explosives Safety Board (DDESB) and approved (March 2008) as an independent document for investigation and removal of surface MEC (*Draft Final Explosives Safety Submission/Site Approval Request Former VNTR, Vieques, Puerto Rico, Revision 3, December 2006*).

## 3.2 Licenses and Permits

The project Munitions Removal Contractor should be prepared to acquire commercial explosives from a local vendor who will deliver the materials to the project site. The UXO contractor will maintain a valid ATF User of HE Permit. Explosives vendors cannot supply explosives without the required valid dealer ATF license. A copy of this dealer license will be maintained at the project office, and upon request, will be made available to any local, state, or federal authority.

## 3.3 Procedures

### 3.3.1 Acquisition

The types and estimated quantities of explosives and their intended use during the project may be revised as work progresses, but typically the following explosives will be used during explosive disposal of MEC:

- 1,000 lbs. high-explosive donor charge such as TNT, Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazine (HMX), or binary explosives that detonate at high velocities will be used to detonate MEC.
- 100 each Jet Perforators, or similar prepackaged shaped charges will be used to explosively vent hard-cased munitions.
- 5,000 feet detonating cord will be used to construct mainline-branch line shots, to link multiple shots together, or to transmit the explosive train to the main charge explosive when the main charge is buried (tamped), underwater, or otherwise inaccessible.
- 500 each electric and/or non-electric blasting caps will be used as initiators.
- 20,000 feet NONEL (shock-tube) will be used to transmit the explosive train from the igniter to the demolition devices. Shock-tube priming of explosives offers the instantaneous action of electric detonation without the risk of accidental initiation of the

blasting cap (and the charge) by radio transmitters in the area, or by static electricity discharge. The explosion of the shock-tube is totally contained within the plastic tubing.

All explosives are expected to be purchased through commercial suppliers in Puerto Rico. Military explosives are not expected to be requested/issued for this project.

### 3.3.2 Initial Receipt

Explosive shipments will normally originate from the island of Puerto Rico. The mode of delivery to Vieques may vary based upon the DOT Hazard Classification of the explosives being delivered. Binary explosives, NONEL, and certain initiators may be delivered by commercial air carrier to the Vieques Airport. HE main charges, Jet Perforators, detonating cord, and certain initiators may be delivered by special chartered aircraft or delivered to Vieques Island via watercraft.

Regardless of delivery mode, all incoming shipments will be met by project personnel qualified to transport explosives such as the SUXOS and/or USOSO and taken directly to explosive storage magazines near OP1 (buildings 4710A and 4710B).

Explosives in unsealed boxes containing partial lots will be opened, and the contents counted. Any discrepancies between the actual type and quantity of explosives received and the shipping documentation will be noted on the shipping documentation with the signatures of both the delivery driver and the individual authorized to receive the explosives. A legible copy will be filed onsite. The authorized individual receiving the explosives will immediately inform the SUXOS of the discrepancy, who will in turn notify the Title II Services Contractor Munitions Response Manager. Project personnel will take the appropriate action as described below.

#### Establishment of Explosives Storage Facilities

Explosives items will be stored in accordance with its Hazard Division (HD) and the storage compatibility group criteria listed in DoD 6055.9-STD and NAVSEA OP 5 Volume 1.

Permanent explosives storage magazines are available onsite; however, if temporary explosives magazines are required, they will be Type 2 magazines as described in Section 555.208 of ATF P 5400.7, Alcohol, Tobacco, and Firearms Explosives Law and Regulations, will be used. If a portable magazine is used, DDESB site approval will be obtained. The maximum NEW to be stored in each temporary magazine is 50 pounds. This explosives storage area will meet the requirements of:

- ATF P 5400.7 – Alcohol, Tobacco, Firearms, and Explosives Laws and Regulations;
- DoD 6055.9-STD – DoD Ammunition and Explosives Safety Standards, and
- NAVSEA OP 5 Volume 1, Ammunition and Explosives Ashore: Safety Regulations for Handling, Storing, Production, Renovation, and Shipping

### 3.3.3 Quantity Distance

For building 4710B, storage of 2,000 pounds NEW of HD 1.1 explosives, the IBD is 1,250 ft, the PTR distance is 60 percent of the IBD, or 750 ft. For building 4710A, storage of 100 pounds NEW of HD 1.4 explosives the IBD is 75 feet and the PTR distance is 75 feet.

## Physical Security

Each explosive storage magazine (buildings 4710A and 4710B) is surrounded by a chain-link security fence with a lockable gate. The magazine doors are fitted with tamper-resistant hardware which has two independent padlock hasps. The gate keys will be issued to the SUXOS and the magazine keys will be issued to the UXOSO. Keys will be secured in the project office or by the contractor storing explosives when not in use.

If temporary magazines are required, locks will meet the standards for ATF Type 2 magazines, as specified in Section 55.208(a)(4), ATF P 5400.7. Each magazine will have two locks. The SUXOS will hold a key to one of the locks, and the UXOSO will hold the key to the other. Access to the explosives will require both individuals. Keys will be secured in the project office when not in use.

A guard will check the security of the magazines every 2 hours during non-working hours when explosives are stored in building 4710A and 4710B. The guard will have reliable communications to notify Fish and Wildlife Services and local law enforcement in case of emergency. During working hours site personnel will verify the security of the magazines.

## Placards

Explosive storage magazines will be clearly marked with DoD fire symbols and NFPA 704 markers. Signs stating “EXPLOSIVES” and “NO SMOKING” will be posted on the outside of the magazines.

## Lightning Protection System

Buildings 4710A and 4710B have installed lightning protection systems that comply with the specification given in the *Draft Final Explosives Operations Site Approval, Former VNTR, Vieques, Puerto Rico, October 2004*.

## Fire Protection

Fire extinguishers of 10 pounds and type BC will be located in the magazine area. Smoking, matches, open flames, spark producing devices, and firearms will not be permitted within 50 feet of the magazines. The area surrounding the magazines will be kept clear of all combustible materials for a distance of at least 50 feet.

## Stocking Procedures

When explosives are stored onsite to meet project requirements, the containers of explosive materials are to be stored so that markings are visible. Stocks of explosive materials are to be stored so that they can easily be counted and checked upon inspection.

Except for fiberboard and other non-metal packages, containers of explosive materials are not to be unpacked or repacked inside a magazine or within 50 feet of a magazine, and must not be unpacked or repacked close to other explosive materials. Containers of explosive materials must be closed while in storage.

Tools used for opening and closing containers of explosive materials are to be of non-sparking materials, except that metal box-cutters may be used for opening fiberboard containers. A wood wedge and a fiber, rubber or wooden mallet is to be used for opening

and closing wood containers of explosive materials. Metal tools other than non-sparking transfer conveyors are not to be stored in any magazine containing explosives.

### 3.3.4 Transportation

This section presents the vehicle requirements and onsite transportation procedures of explosives.

#### Onsite Transportation Procedures

Explosives will be delivered to the magazines by a licensed and permitted commercial explosives transporter. When explosives are required at the work site, the UXO team will transport the explosives in an appropriately placarded vehicle following the procedures stated in this section.

Procedures for transporting explosives from the storage facility to the demolition site include the following rules:

- The driver of any explosive-laden vehicle will ensure that the load is properly braced and that the initiators are carried separately from main charge explosives.
- The UXO Technician in charge of the explosives movement will ensure the driver and any passengers are not carrying any smoking products or flame producing devices. Smoking is strictly forbidden by all personnel involved in the handling or transportation of explosives.
- Drivers transporting explosives on roads that are not controlled by the U.S. Government must possess a valid commercial driver's license with a hazardous materials endorsement.
- The amount of explosives issued and transported will be limited to the amount needed to perform the day's demolition operations and any quantity limitations imposed by transportation regulations.
- WP munitions will not be transported unless immersed in water, mud, or wet sand.
- If loose pyrotechnic, tracer, flare, and similar mixtures are transported, they shall be placed in #10 mineral oil or equivalent to minimize fire and explosion hazards.
- If an unfired rocket motor must be transported, it shall be positioned in such a manner as to offer the maximum protection to personnel in the event of an accident.
- If base-ejection type projectiles must be transported to a disposal area or collection point, the base will be oriented to the rear of the vehicle and the projectile secured in the event the ejection charge functions in route.
- If a UXO with exposed hazardous filler (HE, etc.) has to be moved to a disposal area, the item shall be placed in an appropriate container with packing materials to prevent migration of the hazardous filler. Padding should also be added to protect the exposed filler from heat, shock, and friction.

## Vehicle Requirements

Vehicles transporting explosives on the Site will comply with the following requirements:

- Vehicles transporting explosives will be properly placarded.
- All vehicles transporting explosives will be equipped with reliable communications, a first aid kit, and two 10-pound BC fire extinguishers.
- Vehicles transporting explosives will be inspected daily when in use and the inspections will be documented in a Motor Vehicle Inspection Form (Form 3-1).
- The vehicle used to transport the explosives will have a non-sparking bed liner, and all explosive loads will be covered prior to departure.

### 3.3.5 Receipt Procedures

This section describes the procedures the UXO Team will use to maintain records of explosives inventories.

#### Inventory Control and Records Management

If storage of explosives onsite is required, an accurate running inventory of all explosives will be maintained on the Magazine Data Card. One copy of the Magazine Data Card will be kept with the specific lot of explosives, and one copy, which mirrors the original, will be kept in the field office.

At the time of explosives delivery, and at the time of explosives issue, the SUXOS will ensure all additions and subtractions from the inventory of a magazine are recorded on the Magazine Data Card. If issued explosives are not used, they will be added back in to the inventory and recorded on the Magazine Data Card.

Explosives will be tracked by lot number on the Magazine Data Card. All explosives inventory records generated will be archived by Title II Services Contractor for a period of at least 5 years in accordance with ATF regulations.

#### Authorized Individuals

Written authorization for individuals who can purchase, store, or use explosives must be included in the site specific work plans.

The SUXOS will be responsible for the proper receipt of explosives from the explosives vendor. Only personnel designated in writing may conduct the receipt and initial inventory of the explosives. Individuals authorized to receive explosives will be at least a UXO Technician III.

#### End-User Certification

The UXO Technician III or SUXOS, as the end-user of explosives, will certify in writing that the explosives were used for their intended purpose.

#### Reconciling Discrepancies

In the event there is a discrepancy following daily deliveries or onsite storage between the explosives on hand and the explosives inventory recorded on the Magazine Data Card, the

SUXOS will be notified. The SUXOS, together with the UXOSO, will review documentation to determine whether the discrepancy is a paperwork error or whether explosives have been lost or stolen. If it is concluded explosives are lost or stolen, the procedures listed below will be followed.

### **3.3.6 Inventory**

If explosives are stored onsite, each Magazine Data Card will be audited weekly by project staff, such as the Title II Services Contractor PM or UXOSO, on a rotating basis. The SUXOS will ensure that the contents of each magazine are inventoried on a weekly basis and that the quantities of explosives on hand match the quantities listed in the Magazine Data Cards. During this inventory, the numbers of each item stored in the magazine will be determined by inspection and counting. Sealed containers will be left unopened and counted as full. Discrepancies discovered at any time will be handled as described in the following section.

### **3.3.7 Lost, Stolen, or Unauthorized Use of Explosives**

If explosives are discovered to be lost, stolen, or used without authorization, the incident will be immediately reported to the SUXOS, who in turn will inform the Title II Services Contractor PM. The PM shall immediately notify the NAVFAC RMP.

The Federal licensee is required by law (27 CFR 55.30) to report the theft or loss of explosives to the ATF within 24 hours. In the event of such an occurrence, the following procedures will be followed:

- The magazine will be secured, and the area will be sealed until the appropriate authorities complete their investigation.
- Notify the ATF [(800) 424-9555] and the local law enforcement authorities.
- The Federal licensee is responsible for completing and forwarding ATF Form 5400.5. This form will be completed by the SUXOS, and a copy will be provided to the RPM.
- Puerto Rico State Police will be notified [(787)-723-3221] of any lost or stolen explosives

### **3.3.8 Return of Unused Explosives**

If explosives are being stored onsite and a situation arises where explosives have been issued to the Project Team MEC staff but not used during the course of the workday, the unused explosives will be returned to the magazine prior to that shift ending. All unused explosives will be returned to the magazine that they came from, and the Magazine Data Cards will be annotated.

### **3.3.9 Disposal of Explosives**

If explosives were being stored onsite and some quantity remains at the end of the project, the PM will consult with NAVFAC and contracting representative to determine the appropriate disposition. A detailed accounting of remaining explosives and an economic analysis of possible alternatives. Consideration will be given to transfer the remaining explosives to another project via a licensed and permitted commercial explosives carrier. If economically advantageous transfer opportunities cannot be identified, the explosives will be detonated consistent with procedures contained in this work plan.

#### SECTION 4

# Explosives Siting Plan

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A Draft Final Explosives Operations Site Approval was submitted to NOSSA and DDESB and received approval December 29, 2004 (Draft Final Explosives Operations Site Approval, Former Vieques Naval Training Range [VNTR], Vieques, Puerto Rico, Naval Facilities Engineering Command Atlantic, October 2004). If clearance operations require explosives currently stored in magazines 4710 A/B, explosives may have to be temporarily relocated until the operations have been completed or suspended for the day. If relocation is required, the explosives will be transported to a location a sufficient distance away, to allow clearance operations to continue. Personnel will remain with the explosives at all times at the temporary location. When the clearance operation that required the relocation is completed or suspended for the day, the explosives will be returned to magazines 4710 A/B. The Explosives Operations Site Approval will be maintained on the Project Site along with the approved NTCRA Work Plan.

SECTION 5

# Geophysical Investigation Plan

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No subsurface digital geophysical mapping (DGM) will be performed as part of this Non-Time Critical Removal Action.

SECTION 6

# Site Safety and Health Plan

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All contractors must develop a site specific health and safety plan that addresses hazards associated with their scope of work and the site conditions and will be maintained in project files and onsite during the performance of all removal action activities.

# Location Surveys and Mapping Plan

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Survey and mapping tasks are key components of the MEC investigations for identifying the location of each MEC component in the field, reporting the locations of these components on maps and in spatial queries conducted in the GIS, and assisting with disposition of MEC components. This Location Surveys and Mapping Plan describes the methods, equipment, and accuracy requirements for location surveys and mapping for the removal action, MEC survey, and anomaly reacquisition described in this work plan.

## 7.1 Surveying

Surveying for this scope of work will be conducted by a professional land surveyor or the Remedial Action Contractor using GPS, USRADS, or other suitable navigation systems.

## 7.2 Mapping

All control points and their corresponding location, identification, coordinates, and elevations will be stored digitally and will be reproducible for accurate plotting on maps. Each map will include a north arrow (grid, true, and magnetic) with the differences between them posted in minutes and seconds. Grid lines or tic marks posted at systematic intervals with their corresponding grid values will be shown on the edges of the maps. The legend will include standard symbols and a map index showing the relationship of the map to the overall project or site boundary. The state plane coordinates will be established for the corners of each grid area investigated.

GPS technology may be used to locate MEC components if this technology is readily available on the project and protocols are in place for recording, documenting, and integrating the location and MEC attributes with the MEC data management system.

### 7.2.1 Digital Data

The survey information collected will be sufficient to accurately relocate the position of the target component in the field and accurately plot the position of each component on a computer-aided design (CAD) map, in the GIS, or for use in statistical applications and tabular reports.

An overall planimetric design file will be created and digitized into a Microstation. DGN file at an elevation of zero. For contours and spot elevations, all associated data will be digitized into a second Microstation 3-D design file with each element at its correct elevation; topologically triangulated network (ttn) files will be created to model the topographic surface. The ttn file will be created using elements of the topographic file, and the appropriate spot elevations, contours, and breaklines necessary to create the ttn files will be used. The ttn files will be set up so they can be used with INROADS to create contours at their exact locations.

Each map sheet will be a standard metric A-1 size drawing (33.1 x 23.4 inches). Each sheet will include a standard border, revision block, title block, complete index sheet layout, bar scale, legend, grid minutes and seconds, and shall be plotted at the horizontal scale required.

The cell library, digital data, and all other supporting files or information will be provided. Production work files will be documented, tabulated, and described in the data manual. The manual will include the necessary information for a third party to recreate the products. The manual will be included as a "readme.txt" file with all distributed digital data.

Digital data will comply and be compatible with U.S. Navy requirements.

## 7.2.2 Digital Format

All data will conform to the Tri-Spatial Data Standards (TSDS) or CAD/GIS Technology Center Spatial Data Standards (SDS) and as outlined in the specific task order. Any and all deviations from these standards will be done only at the request of the U.S. Navy.

All location survey data and digital maps are transportable and can be copied to portable media for archiving or transfer to other team members. Available formats include CD (the preferred method), digital tape, or DVD. The media used is dictated in part by the size of the files. All survey coordinates will be stored as part of the site-wide relational database.

## 7.3 Deliverables

The following deliverable items and data will be maintained as part of this scope of work:

- After Action Report.
- Field Survey – Original copies of field books, layout sheets, computation sheets, and computer printouts. These items will be suitably bound, marked, and packaged for delivery.
- Location Survey Points – Tabulated list of all surveyed control points showing the adjusted coordinates and elevations that were established for the specific MEC project.
- MEC Inventory – Tabular list of all MEC components with associated location and descriptions.
- All survey coordinates and MEC-related digital information will be stored as part of the site-wide relational database. These digital data will be backed up on the same schedule as the site-wide database.
- All unique items created or used to generate the deliverables, as requested in each task order.
- Drawings and Data – All maps and associated data will be provided.

# Work, Data, and Cost Management Plan

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## 8.1 Introduction

This Work, Data, and Cost Management Plan outlines how the project work will be managed and accomplished. Items pertaining to cost control are in general terms for tasks awarded under NAVFAC Atlantic to the Removal Action Contractor. Data will be managed by the Removal Action Contractor and will be transferred daily to Title II Services Contractor and will be compiled as part of the complete Vieques data management system (see Section 2.9).

## 8.2 Project Tasks

This project will be executed through a series of tasks, which are outlined in the Scope of Work for the Task Order awarded to the removal action contractor. The general task categories are given below and unless indicated otherwise will be carried out by the Removal Action Contractor. The general roles of the various contractors who will be carrying out work associated with this TCRA are shown in Figure 2-1.

- **Site Visit** (Removal Action Contractor and Title II Services Contractor)
- **Technical Project Planning** (Removal Action Contractor and Title II Services Contractor)
- **Removal Action Work Plan** (Title II Services Contractor)
- **Vegetation Clearance** (Removal Action Contractor)
- **Location Surveying and Mapping** (Removal Action Contractor and Title II Services Contractor)
- **Establishment and Management of GIS** (Title II Services Contractor)
- **ESS** – developed and submitted as independent document by Title II Services Contractor
- **Munitions Removal** (Removal Action Contractor)
- **Site Specific Report** (Title II Services Contractor)
- **Project Management** (Removal Action Contractor)
- **Site Management** (Title II Services Contractor)

## 8.3 Schedule

Table 8-1 gives the projected schedule for performing the NTCRA.

TABLE 8-1  
Projected NTCRA Schedule  
*Former VNTR, Vieques, Puerto Rico*

Work Phase	Date
Final NTCRA Work Plan	November 2008
Initial mobilization for removal action (UXO avoidance personnel and equipment)	December 2008
Initiate vegetation clearance and boundary survey	December 2008
Mobilization of removal action UXO crews and initiation of removal action activities	December 2008
Removal action operations	December 2008 - May 2011
Demobilization of equipment and site personnel	June 2011

## 8.4 Communications

Project management communications for this project will generally be conducted as:

### **Field Investigation Tasks**

Removal Action Contractor PM will communicate field investigation/removal action information to the Title II Services Contractor Site Manager. The Title II Services Contractor Site Manager or UXO Quality Control Specialist (UXOQCS) will communicate information to the Title II Services Contractor PM. The NAVFAC Atlantic Coordinator will be informed of all field related activities by the Title II Services Contractor or other Program Management staff.

### **Removal Action Contractor Task Order Management**

The Removal Action Contractor PM or other staff will address all task order management information (e.g., budgetary issues, change orders) directly to the NAVFAC Atlantic RPM and Contracts Administrator. If necessary the NAVFAC Atlantic Coordinator will communicate information to the Title II Services Contractor.

## 8.5 Records Management

Hard copies of primary records for the site will be retained by the Removal Action Contractor and Title II Services Contractor. Upon completion of phases of work prescribed under each task order, all files pertinent to the Vieques project will be compiled by Title II Services Contractor and will be maintained by the Title II Services Contractor Vieques

Program Manager at the Virginia Beach Office of CH2M HILL, Virginia Beach, Virginia. The records will include, but are not limited to:

- Correspondence
- Draft document submittals
- Responses to comments
- Final document submittals

During field investigations, records will be maintained in the respective contractor field offices and originals and/or copies of all files will be maintained by Title II Services Contractor. Following completion of definable phases of work all files will be transferred to the Title II Services Contractor Program Management office. These files will include, but are not limited to:

- Daily summary sheets
- Field logs/notes
- Daily logs
- Health and safety records

## 8.6 Format and Content of Investigation Reports

All investigation reports will follow the formats and will contain the information given the scope of work for the task order under which the report is funded.

SECTION 9

# Sampling and Analysis Plan

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No sampling and analysis will be conducted as part of the work described in this work plan. However, sampling and analysis procedures for projects at the Former VNTR are documented in the Final Master Work Plan, Atlantic Fleet Weapons Training Facility, Vieques Island, Puerto Rico (CH2M HILL, 2003).

# Quality Control Plan

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This Quality Control Plan (QCP) details the approach, methods, and operational procedures to be employed by the Removal Contractor to perform quality control during MEC removal actions at the Former VNTR. This plan was developed in accordance with NOSSAINST 8020.15, NAVSEA OP 5 VOL I (Revision 7), DDESB TP 18, ANSI/ASQC Q10011-1994, ANSI 14010-1996, and OE MCX DID OE-005-11.01, and where applicable, USACE ER 1180-1-6: Construction Quality Management (1995); USACE ER 1110-1-12: Engineering and Design Quality Management (1993); and USACE ER 415-1-10: Contractor Submittal Procedures (1997). Additionally, local and state laws and regulations, ATF P 5400.7, DoD 6055.9-STD, DOT regulations, and OPNAVINST 5530.13: Dept. of Navy Physical Security Instructions for Sensitive Conventional Arms, Ammunition and Explosives.

## 10.1 Introduction

This QCP, and the requirements and systems established herein, are relevant and applicable to project work performed by the Removal Contractor and its subcontractors and suppliers.

The objectives of this QCP are to anticipate the specific operating requirements of the project, and to establish procedures to ensure that achieved quality meets technical design specifications and conforms to the requirements of the Task Order. Specifically, this plan:

- Identifies the project QC organization and defines each individual's respective authority, responsibilities, and qualifications.
- Defines project communication, documentation, and record keeping procedures.
- Establishes QC procedures, including the necessary supervision and tests, to ensure that work meets applicable specifications and drawings.

### 10.1.1 Project Background

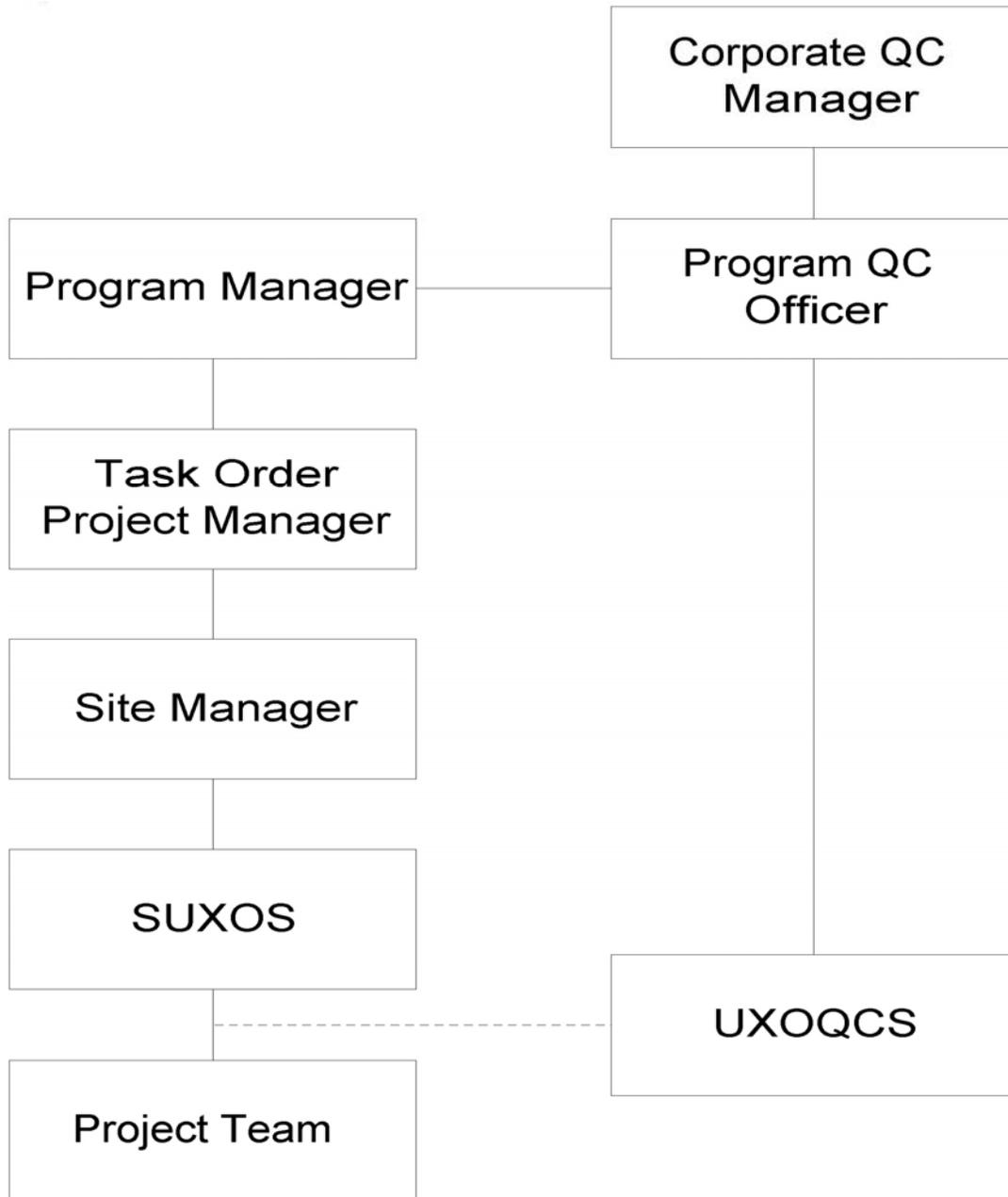
A detailed discussion of the project background was presented in Section 1 of this Work Plan.

### 10.1.2 Project Scope of Work

The project scope of work and detailed approach for completion was presented in Sections 1 and 2 of this work plan.

## 10.2 QC Personnel Organization and Responsibilities

The overall project organization and reporting structure is presented in this QCP and illustrated in the figure below. Quality Control personnel, organization, qualifications, and responsibilities are addressed in more detail in this section. Additional details of the QC personnel will be presented in the removal action contractor site specific work plans.



### 10.2.1 QC Personnel Qualifications and Training

Project staff members will be qualified to perform their assigned jobs in accordance with terms outlined by the scope of work. Resumes for proposed key personnel will be included in Removal Contractor SSWPs. All site personnel must have the appropriate safety training, which includes the Occupational Safety and Health Administration (OSHA) 40-hour hazardous waste operator (HAZWOPER) training and annual 8-hour refresher (29 CFR 1910.120).

## 10.2.2 Documentation of Qualification and Training

The review and verification of personnel qualifications are to be documented on Form 10-1, provided at the end of this section. The UXOQCS will maintain records documenting the required qualifications and training for each site worker. The UXOQCS will monitor expiration dates to provide advance warning to the PM of when employees will require refresher training or other requirements. The UXOQCS will maintain records of site specific and routine training for personnel and visitors, as required by this Work Plan. These records will be maintained onsite for audit purposes.

## 10.2.3 Project Manager

The primary responsibility of the PM is the overall direction of the project and accountability for work activities undertaken as part of this project. As such, the PM will provide the managerial administrative skills to ensure that resource allocation, planning, execution, and reporting meet Contract and TO requirements. The global quality-related responsibilities of the PM may include, but are not limited to, the following:

- Organizing project staff and assigning responsibilities.
- Understanding the Contract and scope of work for the specific project.
- Ensuring that submittals are completed and submitted as required in the TO PWS.
- Communicating to the project staff regarding client requirements and QC practices.
- Identifying, providing documentation, and notifying the client and project team of changes in the scope of work, project documentation, and activities.
- Supervising the preparation and approval of project-specific procedures, work plans, and QC project plans.
- Approving project documents.
- Approving project execution methodologies.
- Disseminating project-related information from the client.
- Serving as liaison for communications with the client and subcontractors.
- Serving as liaison between the project staff and other internal groups.
- Deciding whether project documents require independent review.
- Investigating nonconformance and implementation of corrective actions.
- Evaluating the effect of nonconformance on the project and the appropriateness of reporting such items to the client.
- Providing appropriate documentation of nonconformance when reporting to the client.
- Serving as final reviewer prior to release of project information.
- Approving and signing outgoing correspondence.

- The PM may assign a portion of these responsibilities to the Site Manager and SUXOS, who will remain onsite throughout the project field activities.

### 10.2.4 Site Manager

The Site Manager is responsible for efficiently applying the resources of the project team to execute the field phase of this project. In addition, the Site Manager is responsible for local client interface regarding details of the project and the project team while assigned to the site. The Site Manager will assist the PM in maintaining sufficient resource allocations to meet the project schedule and budget and will provide daily feedback to the PM on project progress, issues requiring resolution, and other project-specific issues, as required. The quality-related responsibilities of the Site Manager include, but are not limited to, the following:

- Notifying the PM if problems arise with the schedule.
- Providing scheduling and integration of subcontractor services in support of the SUXOS.
- Serving as liaison for communications with project staff and subcontractors, as well as with the onsite client and regulatory agency representatives.
- Providing logistical support for field operations.
- Continuously monitoring work progress and adherence to authorized work scopes, budgets, and schedules.
- Aiding in the preparation of submittals.
- Leading weekly onsite status meetings.
- Reviewing the project work plans regularly.
- Interfacing daily with the subcontractors.

### 10.2.5 UXO Quality Control Specialist

The designated UXOQCS will be specified in the Removal Contractor's Site Specific Work Plan. The UXOQCS has authority to enforce the procedures defined in this QCP. In alignment with this authority, the UXOQCS has the authority to stop work in order to ensure that project activities comply with specifications of this QCP, the contract, and the Task Order. This authority applies equally to all project activities, whether performed by the Contractor or its subcontractors and suppliers.

The UXOQCS is responsible for planning and executing QC oversight of project operations, and ensuring compliance with specified QC requirements. Specifically, the UXOQCS is responsible for:

- Developing, assessing the effectiveness of, and maintaining this QCP and related procedures.
- Reviewing and approving the qualifications of technical staff and subcontractors.

- Planning and ensuring the performance of preparatory, initial, follow-up, and completion inspections for each definable feature of work (DFOW).
- Identifying quality problems and verifying that appropriate corrective actions are implemented.
- Ensuring that the requisite QC records including submittals are generated and retained as prescribed in this QCP.
- Notifying the Title II Services Contractor 48 hours prior to beginning any required action of the preparatory and initial phases. At a minimum, the UXOQCS will use weekly QC Reports for the purposes of this notification.

The UXOQCS is to be physically onsite whenever project-related fieldwork is in progress. If the UXOQCS is to be absent from the site, with client approval, an alternative UXOQCS will be designated and will be given equivalent responsibilities and authority.

### 10.2.6 Program QC Manager

The Program QC Manager is responsible for developing, maintaining, and ensuring implementation of the quality program. This responsibility includes overseeing activities under the guidance of this QC plan, performing periodic reviews of the processes being implemented, evaluating any recommendations made by the project team over the course of the program regarding use of these processes, and implementing continuous improvement evaluations of the quality program. The Program QC Manager reports directly to the Corporate Quality/HS&E Manager. Specific responsibilities of the Program QC Manager include:

- Developing program-level QC program consistent with corporate guidance and requirements for MR projects.
- Approving project-level QC plans.
- Performing reviews to ensure that sound professional engineering and other technical and regulatory capabilities are applied during planning and execution of MEC operations.
- Monitoring results of site audits.
- Conducting project audits.
- Ensuring that corrective actions are implemented promptly and fully.
- Developing lessons-learned for team distribution.
- Conducting quality training for UXOQCS.
- Evaluating the qualifications of the quality team.

## 10.3 Definable Features of Work and the Three-Phase Control Process

Quality control on the VNTR project will be monitored through all of the DFOWs using a three-phase control process. The DFOWs and the three-phase control process are discussed in the following subsections.

### 10.3.1 Definable Features of Work

The DFOW for this task order are divided into activities related to planning, field operations and final project reports and close-out:

#### Planning

- Pre-Mobilization Activities: System set-up for GIS, document management and control, data management and subcontracting
- Technical Project Planning: Technical and operational approach
- Removal Contractor Site Specific Work Plan and Standard Operating Procedure's (SOP): Preparation and obtaining approval.

#### Field Operations

- Site Preparation: Mobilization, survey, vegetation removal, surface clearance
- MEC investigation and removal
- MPPEH/MD management (inspection, demilitarization, certification, verification, disposition)
- Demilitarization of MEC
- Site Restoration and Demobilization

#### Final Project Reports and Close-Out

- Site-Specific Final Report: Preparation and obtaining approval
- Proposed Plan and Decision Documents: Preparation and obtaining approval
- Obtain MEC Response Complete Acceptance
- Data Archiving and Project Closeout

### 10.3.2 Mobilization

This DFOW includes all required activities associated with mobilizing at the start of the project.

### 10.3.3 Location Surveying and Mapping

This DFOW includes all activities relating to grid layout activities.

### 10.3.4 Vegetation Removal

This DFOW includes all activities relating to the removal of vegetation. This feature may need to be subdivided as needed, especially if a more involved phased approach is used such as prescribed burning followed by manual clearance.

### 10.3.5 MEC Surface Removal

This DFOW includes all activities relating to MEC sweeps to ensure that no surface MEC is present.

### 10.3.6 MEC Disposal

This DFOW includes all required activities associated with disposing of MEC or explosively venting items.

### 10.3.7 Scrap Disposal

This DFOW includes all required activities associated with managing and disposing of scrap metal recovered during MEC operations.

### 10.3.8 Site Restoration

This DFOW includes all required activities associated with restoring the site to acceptable condition.

### 10.3.9 Demobilization

This DFOW includes all required activities associated with demobilizing at the completion of the project.

### 10.3.10 Three Phases of Control

The UXOQCS is to ensure that the three-phase control process, including the Preparatory Phase, Initial Phase and Follow-Up Phase, is implemented for each DFOW listed in this QCP. Each control phase is important for obtaining a quality product and meeting the project objectives; however, the preparatory and initial audits are particularly valuable in preventing problems. Production work is not to be performed on a DFOW until a successful preparatory and initial phase has been completed.

#### Preparatory Phase

The preparatory phase culminates with the planning and design process leading up to actual field activities. Successful completion of the Preparatory Phase verifies that the project delivery, QC, and safety plans have been completed and are ready to be implemented. The following actions will be performed as applicable for each DFOW:

1. Confirm that the appropriate technical procedures are incorporated into the project work plan and review procedures.
2. Confirm that adequate testing is called for to assure quality delivery.

3. Confirm definition of preliminary work required at the work site and examine the work area to confirm required preliminary work has been properly completed.
4. Confirm availability of required materials and equipment. Examine materials and equipment to confirm compliance with approved submittals and procedures. Ensure equipment testing procedures are in place, with control limits and frequency.
5. Confirm qualifications of personnel and that roles/ responsibilities are well-defined and communicated.
6. Confirm with the UXOSO that the site health and safety plan and activity hazard analyses (AHA) adequately address the work operations and that applicable safety requirements have been incorporated into the plan.
7. Discuss methods to be employed during the field activities.
8. Confirm any required permits and other regulatory requirements are met.
9. Verify that lessons learned during previous similar work have been incorporated as appropriate into the project procedures to prevent recurrence of past problems.

Project staff must correct or resolve discrepancies between existing conditions and the approved plans/procedures identified by the UXOQCS and the team during the Preparatory Phase. The UXOQCS or designee must then verify that unsatisfactory and nonconforming conditions have been corrected prior to granting approval to begin work.

Results of the activity are to be documented in the Preparatory Inspection Checklist (Form 10-2) specific for the DFOW and summarized in the Weekly QC Report.

### Initial Phase

The initial phase occurs at the startup of field activities that are associated with a specific DFOW. The initial phase confirms that the Project QCP, other applicable work plan sections, and procedures are being effectively implemented and the desired results are being achieved.

During the initial phase, the initial segment of the DFOW is observed and inspected to ensure that the work complies with contract and work plan requirements. The initial phase should be repeated when acceptable levels of specified quality are not being met.

The following shall be performed for each DFOW:

1. Establish the quality of work required to properly deliver the TO in accordance with contract requirements. The UXOQCS ensures that supervision has made the work crews aware of expectations associated with the field methods established under the preparatory phase.
2. Resolve conflicts. Should conflicts arise in establishing the baseline quality for the DFOW, the responsibility to resolve the conflict falls to the PM. Should the conflict not be resolved in a manner that satisfies the project requirements, the UXOQCS must elevate the conflict to the program level (Program QC Manager) and issue a non-conformance report. The UXOQCS may direct a cessation of work activity, with the

concurrence of the Program QC Manager, should the issue jeopardize the results of the DFOW, or put the project at risk of non-compliant performance.

3. Verify with the UXOSO that the site health and safety plan and activity hazard analyses were developed to ensure that the identified hazards adequately addressed field conditions. Confirm that applicable safety requirements are being implemented during field activities.

Upon completion of the initial phase activities, results are to be documented in the Initial Phase Inspection Checklist (Form 10-3), the QC logbook and summarized in the Weekly QC Report. Should results be unsatisfactory, the initial phase will be rescheduled and performed again.

### Follow-up Phase

Completion of the initial phase of QC activity then leads directly into the follow-up phase, which addresses the routine day-to-day activities on the field site. Inspection/audit activities associated with each DFOW are addressed in Section 10.4. Specific concerns associated with the follow-up include:

1. Inspection of the work activity to ensure work is in compliance with the contract and work plans.
2. Evaluation and confirmation that the quality of work is being maintained at a level no less than that established during the initial phase.
3. Evaluation and confirmation that required testing is being performed in accordance with procedures established during the preparatory phase and confirmed during the initial phase.
4. Confirmation that non-conforming work is being corrected promptly and in accordance with the direction provided by the UXOQCS.

To conduct and document these inspections, the UXOQCS is to generate the Follow-up Phase Inspection Checklist (Form 10-4). The follow-up phase inspections will be performed daily, or as otherwise identified in this QCP until the completion of each DFOW.

The UXOQCS is responsible for onsite monitoring of the practices and operations taking place and verifying continued compliance with the specifications and requirements of the contract, TO, and approved project plans and procedures. He is also responsible for verifying that a daily Health and Safety Inspection is performed and documented as prescribed in the project SSHP. Discrepancies between site practices and approved plans/procedures are to be resolved and corrective actions for unsatisfactory and nonconforming conditions or practices are to be verified by the UXOQCS or a designee prior to granting approval to continue work. Follow-up inspection results are to be documented in the QC logbook and summarized in the Weekly QC Report.

### Additional Audits

Additional audits performed on the same DFOW may be required at the discretion of the Program QC Officer or the UXOQCS. Additional preparatory and initial audits are generally warranted under any of the following conditions: unsatisfactory work, changes in key

personnel, resumption of work after a substantial period of inactivity (e.g., 2 weeks or more), or changes to the project scope of work/specifications.

### **Final Acceptance Audit**

The Final Acceptance Inspection is performed, upon conclusion of the DFW and prior to closeout, to verify that project requirements relevant to the work are satisfied. Outstanding and nonconforming items are to be identified and documented on the Final Inspection Checklist (Form 10-5). As each item is resolved, it is to be noted on the checklist.

## **10.4 Inspection/Audit Procedures**

The UXOQCS is responsible for verifying compliance with this QCP through audits and surveillance. The UXOQCS or a designee is to inspect/audit the quality of work being performed for the DFW. The UXOQCS or a designee is to verify that procedures used conform to applicable specifications stated in this Work Plan or other applicable guidance. Identified deficiencies are to be communicated to the responsible individual and documented in the QC log and Weekly QC Report. Corrective actions are to be verified by the UXOQCS and recorded in the Weekly QC Report.

The specific QC audit procedures for the DFWs, including the phase during which it is performed, the frequency of performance, the pass/fail criteria and actions to take if failure occurs, are presented in Table 10-1.

The Inspection Schedule and Tracking Form (Form 10-6) is to be used by the UXOQCS for planning, scheduling and tracking the progress of audits for this project. The information on the form is to be kept up to date and reviewed by the UXOQCS for planning purposes. Audit records are to be maintained as part of the project QC file.

## **10.5 QC Testing**

QC testing will be performed to ensure that MEC removal is being performed according to the project Definable Quality Objective and prior to submitting to the Navy Technical Representative and Title II Services Contractor for QA testing.

### **10.5.1 Testing Procedures**

The UXOQCS will inspect each grid to determine whether or not the grid has been cleared IAW performance requirements presented in the QC Section of the Removal Action Contractor's Work Plan. The UXOQCS will re-sweep this portion of the grid using the same geophysical instrument. The results of the QC inspections, both passing and failing, will be recorded in the QC log. For any grid that fails a QC inspection, the grid will be completely reworked and re-QC'd before submitting the grid for QA inspection.

TABLE 10-1  
Definable Features of Work Auditing Procedures

Activity	DFOW with Auditable Function	Audit Procedure	QC Phase	Frequency of Audit	Pass/Fail Criteria	Action if Failure Occurs
Planning	GIS Setup ( <i>Pre-Mobilization Activities</i> )	Verify GIS system has been set up and is ready for site data	PP	Once	GIS system has been set up and is ready for site data	Do not proceed with field activities until criterion is passed
Planning	Document management and control ( <i>Pre-Mobilization Activities</i> )	Verify appropriate measures are in place to manage and control project documents	PP	Once	Appropriate measures are in place to manage and control project documents	Do not proceed with field activities until criterion is passed
Planning	Data Management ( <i>Pre-Mobilization Activities</i> )	Verify appropriate measures are in place to manage and control project data	PP	Once	Appropriate measures are in place to manage and control project data	Do not proceed with field activities until criterion is passed
Planning	Subcontracting ( <i>Pre-Mobilization Activities</i> )	Verify Subcontractor qualifications, training, licenses	PP/IP	Once	Subcontractors' qualifications, training, and licenses are up to date and acceptable	Ensure subcontractor provides the qualifications, training, and licenses or change subcontractor
Planning	Technical approach ( <i>Technical Project Planning</i> )	Verify that technical approach has been agreed on by project team	PP/IP	Once	Technical approach has been agreed on by project team	Do not proceed with field activities until criterion is passed
Planning	Operational approach ( <i>Technical Project Planning</i> )	Verify that operational approach has been agreed on by project team	PP/IP	Once	Operational approach has been agreed on by project team	Do not proceed with field activities until criterion is passed
Planning	Work Plan preparation and approval ( <i>Technical Project Planning</i> )	Verify that Work Plan has been prepared and approved	PP/IP	Once	Work Plan has been prepared and approved	Do not proceed with field activities until criterion is passed
Field Operations	Site preparation (including mobilization)	Verify all project plans are approved	PP/IP	Once	All project plans are approved	Do not proceed with field activities until criterion is passed
Field Operations	Site preparation (including mobilization)	Verify local agencies are coordinated	PP/IP	Once	Local agencies are coordinated	Do not proceed with field activities until criterion is passed
Field Operations	Site preparation (including mobilization)	Verify equipment and services are procured	PP/IP	Once	Equipment and services are procured	Proceed only with activities for which equipment has been procured  Procure remaining equipment
Field Operations	Site preparation (including mobilization)	Verify communications and other logistical support are coordinated	PP/IP	Once	Communications and other logistical support are coordinated	Do not proceed with field activities until criterion is passed
Field Operations	Site preparation (including mobilization)	Verify Emergency Services are coordinated	PP/IP	Once	Emergency Services are coordinated	Do not proceed with field activities until criterion is passed

TABLE 10-1  
Definable Features of Work Auditing Procedures

Activity	DFOW with Auditable Function	Audit Procedure	QC Phase	Frequency of Audit	Pass/Fail Criteria	Action if Failure Occurs
Field Operations	Site preparation (including mobilization)	Verify operating schedules are finalized	PP/IP	Once	Operating schedules are finalized	Proceed only with those operations with finalized operating schedules
Field Operations	Site preparation (including mobilization)	Verify explosive storage and MEC debris/scrap storage areas are established	PP/IP	Once	Explosive storage and MEC debris/scrap storage areas are established	Do not proceed with field activities until criterion is passed
Field Operations	Site preparation (including mobilization)	Verify site-specific training is performed and acknowledged	PP/IP	Once	Site-specific training is performed and acknowledged	Do not proceed with field activities until criterion is passed
Field Operations	Site preparation (including mobilization)	Verify project plans are reviewed and acknowledged	PP/IP	Once	Project plans are reviewed and acknowledged	Do not proceed with field activities until criterion is passed
Field Operations	Site survey	Verify Surveyor Qualifications	PP/IP	Once	Surveyor's qualifications are up to date and acceptable	Ensure surveyor provides the qualifications change surveyor
Field Operations	Site survey	Verify Surveyor Licenses	PP/IP	Once	Surveyor's licenses are up to date and acceptable	Ensure surveyor provides the licenses or change surveyor
Field Operations	Site survey	Verify benchmarks for survey are established and documented	PP/IP	Once	Benchmarks for survey are established and documented	Ensure benchmarks for survey are established and documented prior to performing survey
Field Operations	Site survey	Verify site boundaries have been established	PP/IP	Once	Site boundaries have been established	Do not proceed with dependent field activities until criterion is passed
Field Operations	Site survey	Verify proper marker type, material and placement method	PP/IP	Once	Proper marker type, material and placement method were used	Replace markers as necessary to comply with requirement
Field Operations	Site survey	Verify Surveyor notes are legible, accurate and complete	IP	Once	Surveyor notes are legible, accurate and complete	Ensure surveyor replaces deficient notes with legible, accurate and complete notes
Field Operations	Site survey	Verify Stake Alignment and spacing intervals	IP	Once	Stake Alignment and spacing intervals are as specified in Work Plan	Replace stakes not aligned as specified
Field Operations	Vegetation removal	Verify personnel qualifications and training	PP/IP	Once	Personnel qualifications and training are appropriate	Ensure subcontractor provides appropriately trained and qualified personnel or replace subcontractor

TABLE 10-1  
Definable Features of Work Auditing Procedures

Activity	DFOW with Auditable Function	Audit Procedure	QC Phase	Frequency of Audit	Pass/Fail Criteria	Action if Failure Occurs
Field Operations	Vegetation removal	Verify environmental controls are correct and functional	IP/FP	Once	Environmental controls are correct and functional	Ensure that appropriate environmental controls are in place prior to proceeding with vegetation removal
Field Operations	Vegetation removal	Verify vegetation removal conducted IAW WP Technical Management Plan	FP	Daily	Vegetation removal conducted IAW WP Technical Management Plan	Stop vegetation removal activities until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary
Field Operations	Surface Clearance	Verify equipment testing	IP/FP	Once/Daily	Equipment passes daily function test in equipment check area	Repair or replace instrument
Field Operations	Surface Clearance	Verify area/boundary	PP/IP	Once	Area/boundary is correct	Stop activities until area/boundary can be verified
Field Operations	Surface Clearance	Verify work methods	IP/FP	Daily	Work methods are being performed IAW the WP and SOPs	Stop activities until WP and SOPs are being followed and any activities not performed within compliance are re-evaluated and re-performed if necessary
Field Operations	Surface Clearance	Verify Team separation distance	IP/FP	Daily	Team separation distance is appropriate for work being performed	Stop activities until appropriate separation distance is being followed
Field Operations	Surface Clearance	Verify clearance conducted IAW WP Technical Management Plan	IP/FP	Daily	Clearance conducted IAW WP Technical Management Plan	Stop activities until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary
Field Operations	Surface Clearance	Check a portion of each grid/lot to insure Acceptance Criteria are met as defined in the RAC Work Plan.	FP	Each Occurrence	See Section 10.8	See Section 10.8
Field Operations	Inspection (MPPEH Management)	Verify personnel qualifications	IP/FP	Once	Personnel are qualified	Replace unqualified personnel with qualified personnel

TABLE 10-1  
Definable Features of Work Auditing Procedures

Activity	DFOW with Auditable Function	Audit Procedure	QC Phase	Frequency of Audit	Pass/Fail Criteria	Action if Failure Occurs
Field Operations	Certification (MPPEH Management)	Verify Inspection conducted IAW MPPEH Management Plan	IP/FP	Daily/Each Occurrence	Inspection being conducted IAW WP MPPEH Management Plan	Stop activity until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary
Field Operations	Certification (MPPEH Management)	Verify personnel qualifications	IP/FP	Once	Personnel are qualified	Replace unqualified personnel with qualified personnel
Field Operations	Certification (MPPEH Management)	Verify Certification is conducted IAW WP MPPEH Management Plan	IP/FP	Daily/Each Occurrence	Certification is conducted IAW WP MPPEH Management Plan	Stop activity until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary
Field Operations	Disposal (MPPEH Management)	Verify Disposal is conducted IAW WP MPPEH Management Plan	IP/FP	Daily/Each Occurrence	Disposal is conducted IAW WP MPPEH Management Plan	Stop activity until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary
Field Operations	Demilitarization of UXO	Verify personnel qualifications	IP/FP	Once	Personnel are qualified	Replace unqualified personnel with qualified personnel
Field Operations	Demilitarization of UXO	Verify operations conducted IAW contractor SOP	IP/FP	Each Occurrence	Operations conducted IAW Subcontractor SOP	Stop activity until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary
Field Operations	Demobilization	Verify that all equipment is inspected, packaged, and shipped to appropriate location.	FP	Once	All equipment is inspected, packaged, and shipped to appropriate location.	Ensure equipment is inspected, packaged, and shipped to appropriate location
Field Operations	Demobilization	Verify facilities-support infrastructures are dismantled and shipped to appropriate location.	FP	Once	Facilities-support infrastructures are dismantled and shipped to appropriate location.	Ensure facilities-support infrastructures are dismantled and shipped to appropriate location

TABLE 10-1  
Definable Features of Work Auditing Procedures

Activity	DFOW with Auditable Function	Audit Procedure	QC Phase	Frequency of Audit	Pass/Fail Criteria	Action if Failure Occurs
Final Project Reports and Close-out	Site Specific Final Report preparation and approval	Verify field site is returned to original condition	FP	Once	Field site is returned to original condition	Ensure field site is returned to original condition
Final Project Reports and Close-out	Site Specific Final Report preparation and approval	Verify tabulation of all MEC, MD, and other material recovered during the removal actions are accurate and complete	IP	Once	Tabulation of all MEC, MD, and other material recovered during the removal actions are accurate and complete	Ensure tabulation of all MEC, MD, and other material recovered during the removal actions are accurate and complete
Final Project Reports and Close-out	Decision Document preparation and approval	Verify reviews performed by project, senior technical and program teams	FP	Once	Reviews performed by project, senior technical and program teams	Ensure reviews performed by project, senior technical and program teams
Final Project Reports and Close-out	MEC Response Completion Acceptance	Verify Final Report, Proposed Plan and Decision Document has been approved	IP	Once	Final Report, Proposed Plan and Decision Document has been approved	Take appropriate actions to ensure document get approved
Final Project Reports and Close-out	Archiving	Verify data back-up systems are in place	IP	Once	Data back-up systems are in place	Ensure data back-up systems are in place
Final Project Reports and Close-out	Project Closeout	Verify purchase orders have been closed out	IP	Once	Purchase orders have been closed out	Ensure purchase orders are closed out
Final Project Reports and Close-out	Project Closeout	Verify invoices completed and approved	IP	Once	Invoices completed and approved	Ensure invoices are completed and approved

## Pass/Fail Criteria

Grid failure will result if:

- More than two munitions items which have a shape, size, or mass greater than or equal to a 20mm and less than a 30mm projectile is not removed from a grid
- More than one munitions item which has a shape, size, or mass greater than or equal to a 30mm and less than a 40mm projectile is not removed from the grid
- Any munitions items, which have a shape, size, or mass equal to or greater than a 40mm projectile is not removed from the grid

If grid failure occurs the entire grid will be reworked.

## Level of QC Inspection

The Mil-Std-1916 (DoD, 1996) (and accompanying Mil-Hdbk-1916 (DoD, 1999)) will be implemented for performing QC as part of this TCRA for inspection of cleared grids. The Mil-Std-1916 will be used to determine the level of QC using the following:

- Initial Verification Level (VL) will be IV (100 percent) for attributes sampling plan
- The switching method will be used as given in the Mil-Hdbk-1916 to determine decreases or increases in QC level
- A lot will be comprised of 80 lanes, which are defined as 1.5m wide by 30m long. This is the equivalent number of lanes for 4-30m × 30m grids and approximates 0.9 acre in area

## 10.5.2 Documentation of Testing

Test results are to be documented by the individual performing the test. Calibration and maintenance records associated with the measuring and testing equipment (M&TE) are to be generated by the individual performing the activity. Documentation for calibration and maintenance of M&TE is to be made available to the COR upon request.

The UXOQCS is responsible for ensuring that the tests are performed and that the results are summarized in and provided with the Weekly QC Report. Any failing test will be noted on the deficiency log so it can be tracked until such time as rework and re-testing can be performed and corrective action is verified.

## 10.6 Calibration and Maintenance

Calibration and maintenance of geophysical instruments, radios, cell phones, vehicles, machinery, air monitoring equipment (if present), etc., will be performed per manufacturer's specifications. Geophysical detection equipment will be tested daily. Records of these activities are to be generated by the individual performing the activity with copies provided to the UXOQCS for retention in the project QC file.

## 10.7 Government QA Activities

Although the government QA procedures will be subject to change depending on revisions to Navy procedures, the following QA procedures can be expected as a minimum.

### 10.7.1 MEC Surface Removal or Investigations

Utilizing the same geophysical detection equipment as the Removal Contractor, The Navy Technical Representative and/or the Title II Services Contractor will perform a QA inspection on a portion, as determined by the Navy's QA Plan, of a grid that has passed the Removal Contractor's QC process. If a grid fails as defined by the Navy's QA Plan, then the Navy Technical Representative and/or the Title II Services Contractor will implement corrective actions, which may include more stringent QA standards.

## 10.8 QA Pass/Fail Criteria

A grid will be considered a QA failure if:

- More than two munitions items which have a shape, size, or mass greater than or equal to a 20mm and less than a 30mm projectile is not removed from a grid
- More than one munitions item which has a shape, size, or mass greater than or equal to a 30mm and less than a 40mm projectile is not removed from the grid
- Any munitions items, which have a shape, size, or mass equal to or greater than a 40mm projectile is not removed from the grid

## 10.9 Deficiency Management

This section includes provisions for preventing quality problems and facilitating process improvements as well as for identifying, documenting, and tracking deficiencies until corrective action has been verified. Deficiency notices and corrective action requests will be provided to USEPA, PREQB, NOSSA, and USFWS during project status meetings or in project status documentation.

### 10.9.1 Continual Improvement

Project staff at all levels are to be encouraged to provide recommendations for improvements in established work processes and techniques. The intent is to identify activities that are compliant but can be performed in a more efficient or cost-effective manner. Typical quality improvement recommendations include identifying an existing practice that should be improved (e.g., a bottleneck in production) and/or recommending an alternative practice that provides a benefit without compromising prescribed standards of quality. Project staff are to bring their recommendations to the attention of project management or the QC staff through verbal or written means. However, deviations from established protocols are not to be implemented without prior written approval by the PM and concurrence of the UXOQCS. Where a staff-initiated recommendation results in a tangible benefit to the project, public acknowledgment is to be given by the PM.

### 10.9.2 Deficiency Identification and Resolution

While deficiency identification and resolution occurs primarily at the operational level, QC inspections provide a backup mechanism to address problems that either are not identified or cannot be resolved at the operational level. Through implementation of the inspection program, the QC staff is responsible for verifying that deficiencies are identified,

documented, and corrected in a timely manner. If the UXOQCS determines that a specific action can be taken to prevent the cause or similar cause for failure, the action will be implemented. An attempt to identify additional potential causes of failure will also be made (e.g., weather event, site condition change, other activities that would result in items being introduced to a worked grid).

### 10.9.3 Corrective Action Request

A Corrective Action Request (CAR) (Form 10-8) can be issued by any member of the project staff, including the Contractor and subcontractor employees. If the individual issuing the CAR is also responsible for correcting the problem, then he or she should do so and document the results on Part B of the CAR. Otherwise, the CAR should be forwarded to the PM, who is then responsible for evaluating the validity of the request, formulating a resolution and prevention strategy, assigning personnel and resources, and specifying and enforcing a schedule for corrective actions. Once a corrective action has been completed, the CAR and supporting information are to be forwarded to the UXOQCS for closure.

In addition to observing actual work operations, CARs are to be reviewed during follow-up QC inspections. The purposes of this review are: to ensure that established protocols are implemented properly; to verify that corrective action commitments are met; to ensure that corrective actions are effective in resolving problems; to identify trends within and among similar work units; and to facilitate system root cause analysis of larger problems. Particular attention is to be given by the QC staff to work units that generate either an unusually large or unusually small number of CARs.

The UXOQCS will determine whether a written Corrective Action Plan (CAP) (Form 10-9) is necessary, based on whether or not any of the following are met: the CAR priority is high; deficiency requires a rigorous corrective action planning process to identify similar work product or activities affected by the deficiency; or deficiency requires extensive resources and planning to correct the deficiency and to prevent recurrence. The CAP is developed by a PM designee and approved and signed by the PM. The CAP is to indicate whether it is submitted for informational purposes or for review and approval. In either event, operational staff are to be encouraged to discuss the corrective action strategy with the QC staff throughout the process.

### 10.9.4 Deficiency and Corrective Action Tracking

Each CAR is to be given a unique identification number and tracked by the appropriate line manager until corrective actions have been taken and documented in Part B of the form, and the CAR is submitted to the UXOQCS or a designee for verification and closure.

### 10.9.5 Documentation

The lessons learned through the deficiency management process are documented on CARs and CAPs. To share the lessons learned with the Title II Services Contractor and the Government, these documents are submitted to the Title II Services Contractor through the Weekly QC Report.

CARs should be cited in the Weekly QC Report. Minor deficiencies that are identified during a QC inspection but can be readily corrected and verified in the field are to be

documented in the QC log and Weekly QC Report without initiating a CAR. Deficiencies identified in a QC inspection but that cannot be readily corrected are to be documented by the QC staff on a CAR and in the Weekly QC Report. Copies of CARs are to be referenced in and attached to the Weekly QC Report. CAPs will also be attached to Weekly QC Reports to document the final outcome of the deficiency. Similar or related deficiencies may be addressed on a single CAP. All CARs and CAPs will be maintained onsite with the project files and will be subject to audit.

## 10.10 Reports

The UXOQCS is responsible for the preparation and submittal of the Weekly QC Report to the NTR, the Project Superintendent for the project file, and providing concurrent courtesy copies to the PM. The original and one copy of the Weekly QC Report with attachments are to be submitted to the Title II Services Contractor on the first work day following the date covered by the report. All calendar days, including weekends and holidays, are to be accounted for throughout this project. As a minimum, one report is to be prepared and submitted for every continuous 7 days of no work.

The Weekly QC Report is to provide an overview of QC activities performed each day, including those performed for subcontractor and supplier activities. The QC reports are to present an accurate and complete picture of QC activities. They are to report both conforming and deficient conditions, and should be precise, factual, legible, and objective. Copies of supporting documentation, such as checklists and surveillance reports, are to be attached.

A field QC log is to be maintained by the UXOQCS and assigned to each member of the QC staff for use in documenting details of field activities during QC monitoring activities. At the end of each day, copies of the log entries are to be attached to the Weekly QC Report. The information in the QC log provides backup information and is intended to serve as a phone log and memory aid in the preparation of the Weekly QC Report and in addressing follow-up questions that may arise.

QC and Health and Safety staff input for the Weekly QC Report is to be provided in writing to the UXOQCS at a previously agreed upon time and place, generally no later than about 1 hour before normal close of business. For the sake of simplicity and completeness, the format for QC staff input should follow the same as for the Weekly QC Report with only the relevant sections completed.

Each Weekly QC Report is to be assigned and tracked by a unique number comprised of the Delivery Order number followed by the date expressed as "DDMMYY". In the case of "no work day" reports, the report number is to comprise the Delivery Order, the last date covered, the number of days covered, and the initials "NW." For example, DO #XXXX-041104 is the report for site work performed on 11 April 2004, and DO #XXXX-052904-3NW is the report for the three no work days from 27 May 2004 through 29 May 2004. Copies of Weekly QC Reports with attachments and QC logs no longer in use are to be maintained in the project QC file. Upon project closeout, all QC logs are to be included in the project QC file.

## 10.11 Submittal Management

The UXOQCS is responsible for ensuring, through detailed review, that submittals as well as the materials and the work they represent, are in full compliance with applicable contract specifications. The UXOQCS is also responsible for ensuring that a project file is established and maintained, and that accountable project documents are retained and controlled appropriately.

### 10.11.1 Project Records

The Removal Action Contractor PM is to establish and maintain an onsite project file in accordance with contract requirements and NAVFAC Atlantic policies for document control. The PM is responsible for controlling access to the project file to ensure that records are not lost or misplaced. The purpose of this file is to maintain a complete set of all documents, reports, certifications, and other records that provide information on project plans, contract agreements, and project activities. The initial file will be structured to include a record copy of the following documents:

- Schedule and progress reports
- Technical specifications, including addenda and modifications thereof
- Change orders and other contract modifications
- Engineer Field Orders
- Manufacturer's certificates
- Survey Records
- Daily work activity summary reports, which may include:
  - Weekly QC Report
  - Daily Health and Safety Report
  - Reports on any emergency response actions
  - Test records
  - Records of site work
  - Chain-of-custody records
  - Reports on any spill incidents
  - Truck load tickets and shipping papers
- Other items as required by the Contracting Officer Representative:
  - Conversation logs
  - Meeting minutes and agenda
  - Inspection logs and schedules
  - Photo documentation
  - Site maps
  - As built drawings

As the project activities progress, the Removal Action Contractor PM will monitor usefulness of the project filing system for information retrieval. If he or she finds that additional file sections are needed, he or she will expand this initial filing structure to include additional sections.

### **10.11.2 Transmittal to the Title II Services Contractor**

Submittals to the Title II Services Contractor are to be accompanied by a completed submittal form. This form is to be used for submittals requiring the Title II Services Contractor response and for information-only submittals in accordance with the instructions on the reverse side of the form. This form is to be properly completed by filling out the heading blank spaces and identifying each item submitted. Care is to be exercised to ensure proper listing of the Task Order, specification paragraph, and/or sheet number of the plans pertinent to the data submitted for each item.

### **10.11.3 Documentation**

In addition to the documentation requirements specified above, the following requirements apply to this project. The QC file is to be maintained by the UXOQCS and is to be controlled as an integral component of the project files. Shop drawings, work orders, and change orders issued are to be provided to the UXOQCS. It is the responsibility of the UXOQCS to maintain this technical information and keep it current and recorded as it is revised. Technical information is not to be replaced or revised without receipt of a properly authorized change order or revision. Copies of purchase orders or subcontracts requiring inspection are to be provided to the UXOQCS for receiving and recording purposes. Copies of required certifications received are to be maintained in the QC file and are to be submitted to the Title II Services Contractor in accordance with agreements made at the coordination meeting. Changes in submittal progress and QC activities related to submittals are to be summarized in the Weekly QC Report.

## SECTION 11

# Environmental Protection Plan

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Section 10 of the MEC Master Work Plan (CH2M HILL, 2006b) presents the Environmental Protection Plan. Additionally, the recommendations presented in the Biological Assessment for the LIA (GMI, 2006a), Amendment 1 to the Biological Assessment for the LIA (GMI, 2007), and the *Final Methods and Approach for Threatened and Endangered Species and Habitat Surveys within the ECA, SIA, and EMA on Vieques, Puerto Rico* (GMI, 2006b) will be implemented for all areas to avoid impacts to threatened/ endangered species. Concurrence from the USFWS will be obtained prior to finalizing any amendments or other documents of findings and mitigation measures.

# Investigation-derived Waste Plan

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This Investigation-derived Waste (IDW) Management Plan (IDWMP) describes the handling of materials during MEC removal and hazardous, toxic, and radioactive waste (HTRW) activities, and was developed in accordance with NAVSEA OP5, Ammunition and Explosives Ashore: Safety Regulations for Handling, Storing, Production, Renovation, and Shipping and DoD 4160.21-M, Defense Reutilization and Marketing Manual. General IDW procedures for environmental investigations at Former VNTR were addressed in the *Final Master Work Plan Atlantic Fleet Weapons Training Facility, Vieques Island, Puerto Rico* (CH2M HILL, 2003).

## 12.1 Objective

The primary objective of this plan is to identify when material removed requires special management as IDW.

## 12.2 Types of Potential IDW and Planned Disposition

During this removal action, media most likely encountered will be soil removed while excavating MEC MPPEH, and non-hazardous scrap. No hazardous waste, liquid waste, or chemical warfare material (CWM) is expected to be encountered.

IDW will be segregated, inventoried, demilitarized (if required) and disposed of. The following paragraphs outline the planned procedures for dealing with materials excavated or uncovered.

## 12.3 Non-Hazardous Debris Disposal

The following procedures apply to non-hazardous scrap or debris removed from the sites:

- Economically recyclable debris (such as scrap metal) will be collected and delivered to an appropriate local recycling facility. Recycling will be coordinated with the Navy
- Non-MEC debris will be accounted for in estimated pounds recovered and type of material, and then shipped offsite
- Vegetative debris will be mulched and left onsite as ground cover. This will reduce soil erosion from the brush clearing activities
- Non-recyclable and other debris, such as concrete and asphalt rubble, tires, plastic, wood, personal protective equipment (PPE), and metal that is not considered recyclable will be placed at the Vieques Landfill as part of the general fill as required

## 12.4 Disposition of MPPEH/MD

Procedures for disposal of MPPEH/MD are addressed in Section 2 and Appendix A, *Technical Management Plan*. MPPEH/MD materials will be evaluated as indicated below.

- MPPEH will be inspected by a minimum of two UXO Technicians and verified that it is free from explosives prior to it being removed from the temporary staging locations in the work area
- Material documented as safe (MDAS) will be containerized onsite and sent to a recycling facility
- Materials that cannot be certified as free from explosive hazards will be disposed of in the operating grids by the MRP Contractor
- MPPEH/MD must be demilitarized to a point that they are not recognizable as hazardous ordnance

## 12.5 Clearing and Grubbing

Vegetation that may interfere with the MEC or HTRW activity will be removed, as required, according to Section 2. Brush, grass, roots, and stumps, along with other debris that may be grubbed before implementing the activity, will be left onsite as mulched material.

## 12.6 Contaminated Soil and Hazardous Waste

If unexpected contaminated soil or hazardous waste is encountered during MEC activities, the SUXOS, UXO Safety Specialist, and UXOSO will be notified immediately and all site activities will stop if necessary. The PM, in coordination with the Navy and appropriate regulatory agencies, will develop appropriate removal and disposal procedures.

## 12.7 Transportation

Non-MEC related debris, vegetation, and contaminated soil will be transported to the Vieques Landfill or to the appropriate recycling facility for final disposition. A spill patrol will be implemented to monitor the transport route and pick up spills that may occur from the haul trucks.

The vegetation, soil, and other non-recyclable debris will be placed in the general fill by spreading with a bulldozer in thin lifts. The soil may also be used as foundation for the landfill cover provided that it meets the following specifications:

- Soil used in the upper 6-inch zone of the foundation layer will be, to the extent practicable, free of rocks greater than 0.5 inch
- The soil will not contain materials that could be deleterious to the geomembrane

A UXO technician will observe the soil as it is being spread out. The location of the soil in the landfill will be surveyed.

Transport of encountered MEC-related material, including UXO, will be in accordance with Section 2.

# Geographical Information System Plan

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This GIS Plan describes the integration of the webGIS with the data collection and management system in place at the Former VNTR. This plan was developed in accordance with MMRP MCX data item description (DID) OE-005-14.01.

The webGIS and associated database track and manage the data generated during the course of MEC investigations and the disposition of MPPEH/MD and detonated MEC. The hardware and software tools to be used have been specifically chosen to provide a flexible system that allows effective and timely data management, long-term storage and archival of data, and expansion of the database to include new information that can readily be integrated into the existing database as appropriate. The database and webGIS are also designed to be transportable to existing project applications developed and maintained by other members of the Vieques project team. This will provide an efficient mechanism for retrieving MEC -related information for technical evaluation, removal efforts, reporting, and ultimately to assist in the efficient transfer and reuse of parcels at the Former VNTR.

The data will be managed using the CAD/GIS Technology Center SDS as outlined in SDS/Facility Management Standards (FMS) release 1.95 where applicable. The intent of SDS is to provide data in an accessible and predictable format that can be used by standard, readily available GIS software applications.

## 13.1 Geographical Information System Incorporation

The purpose of this task is to leverage GIS technology to effectively manage and integrate MEC-related data collected as part of the ongoing investigations being conducted in Vieques. When properly set up, GIS applications can integrate spatial data (maps) with tabular data (such as MEC type, location, and status).

Significant amounts of background and location data collected during the various investigations that have been conducted or are currently being conducted are already integrated into a webGIS for the site. The intent of this webGIS is to allow immediate visual analysis of the data collected to assist ultimately assist with making decisions regarding future reuse of parcels.

The central database and webGIS were developed to manage, evaluate, and report site information, including MEC encountered and disposed of. The webGIS system includes geographic data for the former VNTR as well as field data collected using the handheld GPS devices. Attribute data are to be stored in a geodatabase that provides data to an ArcIMS website, which allows users to perform custom queries and spatial analysis of the data collected. All existing data is currently referenced to the 1983 North American Datum 83, UTM coordinate system.

Widely used, commercially available hardware and software were utilized in the development and maintenance of the MEC database and GIS. No proprietary software will

be used to prepare these applications. Tools developed for interim analysis will be documented and may be evaluated by the Navy. This ensures that data will be readily accessible by all members of the project team authorized to use these data. This also ensures that the data is portable should it be necessary to transfer the GIS and associated database to other servers and workstations.

The existing Vieques webGIS has been developed using ArcIMS, and in the ArcView GIS environment. ESRI ArcMap will be the primary GIS software for all GIS data management and mapping. The Microsoft Office 2000 suite of programs (including Microsoft Access, Microsoft Word, Microsoft Project, and Microsoft Excel) will also be used on this project, where applicable.

The Title II Services Contractor will maintain all data collected in a central Microsoft Access 2000 database file. The database will include functionality to import electronic field data, QC the field data, and print reports for contractor and Navy review. The file will be backed up on a daily basis. Data will be provided to the Navy and removal contractors on a weekly or as-needed basis by exporting the database to Microsoft Excel format.

A computer system with the central database is available onsite at Camp Garica for upload of field data, data management, and reporting. The Contractor will provide GIS and database support on an as-needed basis to assist with GIS system functionality and use.

All field data will be collected using ruggedized handhelds with integrated GPS receivers, and uploaded to the Access database on a daily basis. The pre-determined nomenclature for MEC Items is loaded into the handhelds to ensure consistency and database integrity. MEC Items found are stored and managed in table separate from other database tables (such as safety meetings, QC/QA operations, Team Leader Dailies, etc).

Data that are used to join tables include:

- MRS number assigned to each study area
- Grid ID-Unique ID of sampling grid investigated for MEC
- Identification number-Unique identification number assigned by the database to each item encountered in the field and imported into the Access database

MEC spatial data will be imported into the database as point data identified by a unique northing and easting coordinate pair (a unique point designator will also be assigned) collected by the handheld GPS unit. In the event that multiple MEC items encountered in the field are grouped and classified together, the cluster location will be entered into the database and webGIS as a single point.

MEC item attribute data includes both qualitative and quantitative information such as ordnance type, quantity, and status. In addition, a munitions database can be linked to the MEC item table to provide physical, chemical, and explosive data regarding each MEC or MEC item found in the field. This anomaly validation study will not require the use of various models for evaluation of buried explosives, trajectory, and other assessments related to the unintentional detonation of munitions. If required (as a result of field conditions), this analysis will be scoped in a separate task.

The workflow for transferring the field data to the database is summarized below:

1. Field observations are recorded on pre-defined field forms and using handheld Trimble GeoXT GPS units.
2. Data from the geophysical survey will be processed by the field team leader daily, and the processed files will be submitted to the project data manager for QA and incorporation into the standard data management structure. Each file will be stored in original format and converted to the standard GIS or database format to be included in the system.
3. At the end of the field day, data on field forms and in handheld GPS units are verified for completeness and accuracy (i.e., number of observations made match the number of observations recorded). Copies of the field forms are made and hard copies of the electronic forms are printed for the field office. The data from the handheld units is uploaded to the database on the field computer.
4. The onsite database is sent to the Data Manager and loaded to an FTP site, where it is used as a geodatabase to provide data to the webGIS.
5. QC checks of the data are based on a set of reports generated from the database and provided to the PM and field team leader for review.
6. Once daily data is uploaded, the database can be used for data analysis and reporting and map generation.

The MEC database is also be used to track demolition events, consolidation points, and treatment of MEC Items. If MEC is moved and detonated onsite, this information will also be included in the webGIS/database system.

Additional data will be incorporated as necessary into the onsite GIS as layers. These layers consist of pre-existing data, or other non-MEC data collected during the MEC investigation. Sources for such data include existing CAD files, published data, and output from other software applications. Examples of these layers include existing anomaly data, and spatial and attribute data collected and mapped by previous investigators, if available.

The GIS will not be used to store all raw data generated during the MEC investigations. For example, data points collected by geophysical instruments, gridded data used by modeling programs to generate contour maps, and similar types of backup data will likely be archived as separate tables in the database or as independent databases. An attribute field will be added to the GIS coverage that identifies a file location or similar reference to document these data. The interpreted results of analysis (such as interpreted geophysical results), however, will be included in the GIS.

## 13.2 Computer Files

All data, text, and digital maps will be available in standard file formats. Text will be delivered in either Microsoft Word 2000 or Adobe Acrobat Portable Document Format (PDF), as requested in the specific project task order. The shareware PDF viewer will be provided along with the PDF documents.

All GIS and associated database and digitized aerial photographs are transportable and can be copied to CD-ROM or DVD for archiving or transfer to other team members.

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**Appendix A**  
**MPPEH/MD Collection and Inspection**  
**Procedures**

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## APPENDIX A

# Material Potentially Presenting an Explosive Hazard (MPPEH)/Munitions Debris (MD) Collection and Inspection Procedures

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During removal operations, UXO Technicians will encounter many different types of material. It must be initially assumed that all of this material contains some amount of explosives until further inspection proves differently. Because the material recovered will ultimately be disposed of off-site, it is imperative that procedures be established to provide a system for the recovery, inspection and documentation of all material that will leave the site. Appendix A gives the procedures for addressing MPPEH.

Current and past practices have only required the inspection of MPPEH/MD and a certification by a qualified EOD/UXO technician that it is safe to the best of their knowledge. There are several pitfalls with this approach, depending on the type of ordnance being inspected. The following paragraphs provide guidance for avoiding these pitfalls. Specific procedures regarding the collection, certification as no longer presenting an explosive hazard, processing and the demilitarization of MPPEH will be addressed in contractor site specific work plans, however they must follow the guidance contained in this attachment.

### References:

DoD 4160.21-M	<i>Department of Defense Reutilization and Marketing Manual</i>
DoD 4160.21-M-1	<i>Department of Defense Demilitarization Manual</i>
DoD 6055.09-STD	<i>DOD AMMUNITION AND EXPLOSIVE SAFETY STANDARDS</i>
TB 700-4	<i>Department of the Army Technical Bulletin - Decontamination of Facilities and Equipment</i>
NAVSEA OP 5	<i>Ammunition and Explosives Safety Ashore</i>

### Collection Procedures

A systematic approach for collecting and inspecting material recovered during munitions removal activities will be used. The approach is designed to ensure that the materials undergo a continual evaluation and inspection process from the time acquired until finally removed from the site.

At the operating site, the UXO Team Leader will designate separate staging areas for recovered material to be placed. These areas should be adjacent to the grid they are working in. At a minimum, an area for explosive free material that does not retain an ordnance appearance such as fragments and another area for items that are free from explosives but still retain an ordnance appearance such as expended ejection projectiles will be established.

An area for MEC that is safe to move and will eventually be consolidated for disposal may also be designated at the contractors preference. These items however may be left in the location found prior to consolidation if desired. For the purpose of this work plan these areas are designated as temporary staging areas for MD Scrap , MD Demil and MEC Holding area ,if used.

Inspection procedures begin at the time the material is discovered by the UXO Technician. Contractors will develop procedures to ensure that a minimum of two UXO Technicians inspect all material prior to it being removed from the temporary staging areas. The first inspection is by the UXO technician discovering the material. The second inspection is performed by the UXO Team leader. The UXO Team leader may perform this second inspection at any time prior to the material being moved from the temporary staging areas. Upon completion of operations within a grid, the UXO Team leader for the team that cleared the grid will direct movement of the inspected material from the temporary staging areas to the consolidation point. The material may be moved by the UXO Team that cleared the grid or by a Final Clearance team at a later date. When Material is placed in the consolidation point the, MD demil will be not be located in the same pile as the MD Scrap.

## Removal of Material from Consolidation Points

Material from the consolidation points will be removed by a separate scrap management contractor. Out of an abundance of caution, the scrap management contractors UXO Technician will perform a third inspection of all material prior to it being transported to the Central Processing Center (CPC) If any suspect items are discovered, the removal contractors UXO Quality Control Specialist (UXOQCS) will be notified to rectify the situation. At the CPC, the material recovered from each consolidation point will be weighed separately and that weight will be entered in to the appropriate form on the PDA. The material will then be sorted and staged in the appropriate location within the CPC. At a minimum, areas within the CPC will be established for Range Related debris (RRD), material requiring further demilitarization and material requiring thermal treatment. The scrap management contractor may and will likely establish additional staging areas to enhance efficiency.

## Demilitarization Requirements

Many items entering the CPC, will still retain the appearance of being an ordnance item, although they have been inspected and are free of explosives. When scrap metal is released to the recycling market it is often stored for a period of time and even sold and resold before being smelted. The mere appearance of an item being a live ordnance item can cause undo alarm and may require the services of military explosive ordnance disposal. Therefore, demilitarization should to the greatest extent possible, process certified MPPEH until it no longer looks like ordnance. This means process it until a reasonable person will not mistake it for a hazardous item Strive to remove the "military look- alike. This is the guidance provided in OP5 regarding demilitarization requirements and will be followed for all material leaving the site.

## Certification as material documented as safe (MDAS)

Material that is taken to the CPC will have met the substantive requirements of DoD 6055.9-STD and NAVSEA OP 5 regarding the dual inspection of MPPEH. However, since this

material will remain at the CPC for some time, further inspection and documentation is required before any material enters the recycling stream. The scrap management contractor will develop procedures for the treatment, inspection and documentation of MPPEH based on the following guidance.

### **Munitions Debris**

All MD with the exception of MD items constructed from aluminum will be treated in a furnace to a temperature of 650 degrees F for a period of 10 minutes. Aluminum MD items are except from thermal treatment because of their low melting point but all surfaces of the item must be visible for inspection in order for it to be exempt from thermal treatment. When these items are not thermally treated, they be inspected following the procedures for range related debris (RRD).

Thermocouples will be used in each batch being thermally treated to monitor the temperature of the feedstock. These temperature readings are recorded at 30 second intervals and a printout is produced for verification. The scrap management company UXO Quality Control Specialist (UXOQCS) and the government QA manager or title II services QA assessor verify that the required time and temperature criteria have been met for each batch.

### **Range Related Debris**

RRD and any other material not subjected to thermal treatment must receive a 100% inspection by one individual followed by another 100% inspection by another individual. The first individual will be the scrap management company UXOQCS and the second individual will be the SUXOS qualified government QA manager or a SUXOS qualified title II QA assessor.

The scrap management contractor will provide documents to verify that each lot has received a 100% inspection by two individuals. Both individuals conducting the inspection must sign these documents.

**Attachment C**  
**Public Notice**

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## PUBLIC NOTICE

The Department of the Navy invites public comment on the Draft Engineering Evaluation/Cost Analysis (EE/CA) report for the surface removal of munitions within the former Surface Impact Area on Vieques, Puerto Rico. The Navy is proposing to remove munitions and explosives of concern, which may include unexploded ordnance, that are found on the surface of the land within the former Surface Impact Area.

The EE/CA evaluates alternatives to reduce the explosive risk and to support the planned future land use for the Vieques Wildlife Refuge. The EE/CA identifies the objectives of the removal action and evaluates the effectiveness, feasibility, and cost of various alternatives that may satisfy these objectives. The EE/CA also presents the Proposed Alternative, as agreed to by the Navy and regulatory agencies.

The EE/CA is based upon the findings of previous site-related documents, field investigations, and planned land use. It is available for public review at the following location:

Biblioteca Electrónica,  
Calle Carlos LeBrum #449, Isabel Segunda, Vieques  
Phone: 787-741-2114  
From 8:00 am to 4:00 pm - Monday through Friday

or by accessing NAVFAC website <http://public.lantops-ir.org/sites/public/vieques>

The public comment period will be open from September 1, 2008 through September 30, 2008. During this time, the public is invited to provide written comments on the EE/CA to the following address:

Naval Facilities Engineering Command Atlantic  
6506 Hampton Boulevard  
Norfolk, Virginia 23508-1278  
Attention: Mr. Kevin Cloe, Code EV31KRC  
FAX: (757) 322-4805  
kevin.cloe@navy.mil

**Please Note:** *Comments should be postmarked no later than September 30, 2008.*