**Final**

# Engineering Evaluation/Cost Analysis for a Non-Time Critical Interim Removal Action at the Main Access Road and Lighthouse Area UXO 15

## Atlantic Fleet Weapons Training Area—Vieques
## Former Vieques Naval Training Range
## Vieques, Puerto Rico

**Contract Task Order 005**

**March 2014**

Prepared for

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

Under the

**NAVFAC CLEAN 8012 Program**
**Contract N62470-11-D-8012**

Prepared by

CH2MHILL

**Virginia Beach, Virginia**

# Executive Summary

This Engineering Evaluation/Cost Analysis (EE/CA) report presents the evaluation of interim removal action alternatives for a non-time critical removal action (NTCRA) to reduce the explosive hazard associated with potential munitions and explosives of concern (MEC) at UXO 15, located at the former Vieques Naval Training Range (VNTR), Vieques, Puerto Rico. The NTCRA is intended to address the main access road and the area immediately surrounding the historic Spanish lighthouse located on the Peninsula Puerto Ferro, including the adjacent beach to facilitate near-term public access to the areas around the lighthouse that are readily accessible, while UXO 15 as a whole continues it Remedial Investigation (RI) and the remainder of the full Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process.

Previous investigations and road construction activities at UXO 15 identified no MEC in areas around the lighthouse that are readily accessible or along the road to the lighthouse. However, as a conservative measure to reduce the potential explosive hazard associated with public access to the accessible areas around the historic lighthouse and to reduce the potential for unauthorized access to restricted areas of UXO 15, the following removal action alternatives were evaluated in this EE/CA:

- Alternative 1 - No Action
  - Alternative 1 consists of performing no interim removal action and serves only as a baseline to which to compare the other alternatives; it is not a viable option considered for the site.
- Alternative 2 - Hazard Warning Signs and Educational Kiosks
  - Alternative 2 includes installing signs to guide public access along the road and accessible areas around the lighthouse, the adjacent beach, and the path between them and to deter access outside these areas. It also includes installing kiosks to educate people accessing the site about the hazards associated with munitions.
- Alternative 3 - Fence with Hazard Warning Signs and Educational Kiosks
  - Alternative 3 contains the same elements as Alternative 2, but includes the installation of a fence along both sides of the road and around the lighthouse

This EE/CA includes detailed descriptions, evaluations, and comparative analysis of the alternatives listed above. Based on the evaluation process, Alternative 2 – Hazard Warning Signs and Educational Kiosks is recommended as the removal action alternative. Alternative 3 provides no significant increase in effectiveness due to the relative ease of circumventing fencing. Further, community members have previously opposed fencing on the wildlife refuge to deter public access, and since the lighthouse is considered a cultural resource to the people of Vieques, a fence leading to and surrounding the lighthouse may not be readily accepted.

Since this NTCRA is only an interim removal action for UXO 15, the full CERCLA process will continue to evaluate the nature and extent of contamination, potential risks to human health and the environment, and develop and evaluate site-wide remedial alternatives to mitigate unacceptable risks and explosive hazards, if present.

NOTE: THIS SUMMARY IS PRESENTED IN ENGLISH AND SPANISH FOR THE CONVENIENCE OF THE READER. EVERY EFFORT HAS BEEN MADE FOR THE TRANSLATIONS TO BE AS ACCURATE AS REASONABLY POSSIBLE. HOWEVER, READERS SHOULD BE AWARE THAT THE ENGLISH VERSION OF THE TEXT IS THE OFFICIAL VERSION.

NOTA: ESTE RESUMEN SE PRESENTA EN INGLÉS Y EN ESPAÑOL PARA LA CONVENIENCIA DEL LECTOR. SE HAN HECHO TODOS LOS ESFUERZOS PARA QUE LA TRADUCCIÓN SEA PRECISA EN LO MÁS RAZONABLEMENTE POSIBLE. SIN EMBARGO, LOS LECTORES DEBEN ESTAR AL TANTO QUE EL TEXTO EN INGLÉS ES LA VERSIÓN OFICIAL.

# Resumen Ejecutivo

Este informe de Evaluación de Ingeniería/Análisis de Costos (EE/CA por sus siglas en inglés) presenta la evaluación de las alternativas de remoción interinas para la Acción de Remoción de Tiempo No Crítico (NTCRA por sus siglas en inglés) para reducir las amenazas relacionadas con la presencia potencial de explosivos y municiones de preocupación (MEC por sus siglas en inglés) en UXO 15, localizado en el antiguo Campo de Adiestramiento Naval de Vieques (VNTR por sus siglas en inglés), Vieques, Puerto Rico. El objetivo de la NTCRA es atender el camino de acceso principal y el que área que rodea directamente al faro histórico Español localizado en la Península Puerto Ferro, incluyendo el área junto a la playa para facilitar el acceso del público a corto plazo las áreas del faro más accesibles, mientras la totalidad de UXO 15 continua bajo la Investigación para la Remediación (RI por sus siglas en inglés) y lo que queda para completar el proceso de la Ley de Respuesta, Compensación y Responsabilidad Ambiental (CERCLA por sus siglas en inglés).

Durante las investigaciones previas y las actividades de construcción del camino en UXO 15 no identificaron MEC en áreas más accesibles alrededor del faro o a lo largo del camino que va al faro. Sin embargo, como una medida conservadora para reducir la amenaza potencial asociada con explosivos, el acceso del público a las áreas más accesibles alrededor del faro histórico y para reducir el potencial del ingreso no autorizado a las áreas restringidas alrededor de UXO 15, en este EE/CA se han evaluado las siguientes acciones de remoción alternativas:

- Alternativa 1 - Ninguna Acción
  - La Alternativa 1 consiste en llevar a cabo una acción de remoción interina y sirve sólo como una base de referencia con la que se comparan las otras alternativas; no es una opción viable para este sitio.
- Alternativa 2 – Letreros de Advertencia de Peligro y Kioscos de Información
  - La Alternativa 2 incluye la instalación de letreros para guiar al público a lo largo del camino que va a las áreas más accesibles del faro, a la playa adyacente y al sendero que se encuentra en el medio, y para desalentar el acceso fuera de estas áreas. También incluye la instalación de kiosco para educar a las personas que ingresan al sitio sobre los peligros asociados a municiones.
- Alternativa 3 – Cercas con Letreros de Advertencia de Peligro y Kioscos de Información
  - La Alternativa 3 contiene los mismos elementos que la Alternativa 2, pero incluye la instalación de una cerca a los dos lados del camino que rodea el faro.

Este EE/CA incluye descripciones detalladas, evaluaciones y un análisis comparativo de las alternativas que se presentan arriba. En base al proceso de evaluación, se recomienda la Alternativa 2 – Letreros de Advertencia de Peligro y Kioscos de Información como la alternativa para la acción de remediación. La alternativa 3 no provee un aumento significante en la efectividad debido a la relativa facilidad de eludir la cerca. Además, los miembros de la comunidad en el pasado se han opuesto a la implementación de cercas en el refugio para desalentar el acceso del público, y ya que el faro es considerado un recurso cultural para las personas de Vieques, una cerca que conduzca y rodee al faro pude que no sea fácilmente aceptada.

Debido a que esta NCRA es sólo una acción de remoción interina para UXO 15, el proceso CERCLA completo continuará evaluando la naturaleza y extensión de la contaminación y desarrollará y evaluará las alternativas de remediación del sitio en su totalidad para mitigar los riesgos inaceptables y las amenazas que presentan los explosivos, de estar presentes.

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**Appendixes**

A Applicable or Relevant and Appropriate Requirements
B USFWS Road Repair Plans

# Acronyms and Abbreviations

| | |
|---|---|
| ARAR | applicable or relevant and appropriate requirement |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR | Code of Federal Regulations |
| CLEAN | Comprehensive Long-term Environmental Action—Navy |
| CTO | Contract Task Order |
| DMM | discarded military munitions |
| DOI | Department of Interior |
| EADA | elevated anomaly density areas |
| ECA | Eastern Conservation Area |
| EE/CA | Engineering Evaluation/Cost Analysis |
| EMA | Eastern Maneuver Area |
| ERA/SI | Expanded Range Assessment/Site Inspection |
| ERP | Environmental Restoration Program |
| ICs | institutional controls |
| IRP | Installation Restoration Program |
| LIA | Live Impact Area |
| LUCs | land use controls |
| MC | munitions constituents |
| MD | munitions debris |
| MEC | munitions and explosives of concern |
| MPPEH | material potentially presenting an explosive hazard |
| MRAs | Munitions Response Areas |
| MRP | Munitions Response Program |
| NAVFAC | Naval Facilities Engineering Command, Atlantic Division |
| Navy | Department of the Navy |
| NCP | National Contingency Plan |
| NTCRA | non-time critical removal action |
| PI | Photo Identified |
| PREQB | Puerto Rico Environmental Quality Board |
| RAOs | removal action objectives |
| RFI | Recovery Act Facility Investigation |
| RI | Remedial Investigation |
| SARA | Superfund Amendments and Reauthorization Act |
| SIA | Surface Impact Area |
| USEPA | U.S. Environmental Protection Agency |
| USFWS | United States Fish and Wildlife Service |
| UXO | Unexploded ordnance |
| VNTR | Vieques Naval Training Range |

SECTION 1

# Introduction

This Engineering Evaluation/Cost Analysis (EE/CA) report presents the evaluation of interim removal action alternatives for a non-time critical removal action (NTCRA) to reduce the explosive hazard associated with potential munitions and explosives of concern (MEC) at UXO 15, located at the former Vieques Naval Training Range (VNTR), Vieques, Puerto Rico (**Figure 1-1**). The NTCRA is intended to address the main access road and the area immediately surrounding the historic Spanish lighthouse, including the adjacent beach (**Figure 1-2**) to facilitate near-term public access to the areas around the lighthouse that are readily accessible while UXO 15 as a whole continues its Remedial Investigation (RI) and the remainder of the full Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process.

This report was prepared under the Naval Facilities Engineering Command, Atlantic Division (NAVFAC), Comprehensive Long-term Environmental Action—Navy (CLEAN) 8012 Contract N62470-11-D8012, Contract Task Order (CTO) 005, for submittal to NAVFAC, the U.S. Environmental Protection Agency (USEPA) Region 2, the Commonwealth of Puerto Rico Environmental Quality Board (EQB), and the United States Fish and Wildlife Service (USFWS). NAVFAC, USEPA, EQB, and USFWS work jointly as the Vieques CERCLA Environmental Restoration Program (ERP) Technical Subcommittee.

This document was prepared following USEPA's guidance provided in document 540/R93/057 *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (USEPA, 1993). Submittal of this document fulfills the requirements for a NTCRA defined by CERCLA, Superfund Amendments and Reauthorization Act (SARA), and the National Oil and Hazardous Substance Pollution Contingency Plan (National Contingency Plan) (NCP). The report was prepared to ensure it contains the information pertinent to an EE/CA, but in a format that facilitates an expedited review process and, as requested by EQB and USFWS, accelerated public access to the areas around the lighthouse that are readily accessible.

R:\USNAVFACENGCOM405450\VIEQUES\MAPFILES\UXO_15_ROAD_AND_LIGHTHOUSE_AREA_EECA\FIGURE 1-1 - REGIONAL LOCATION MAP.MXD CELEFTHERIADIS 11/22/2013 7:34:58 AM

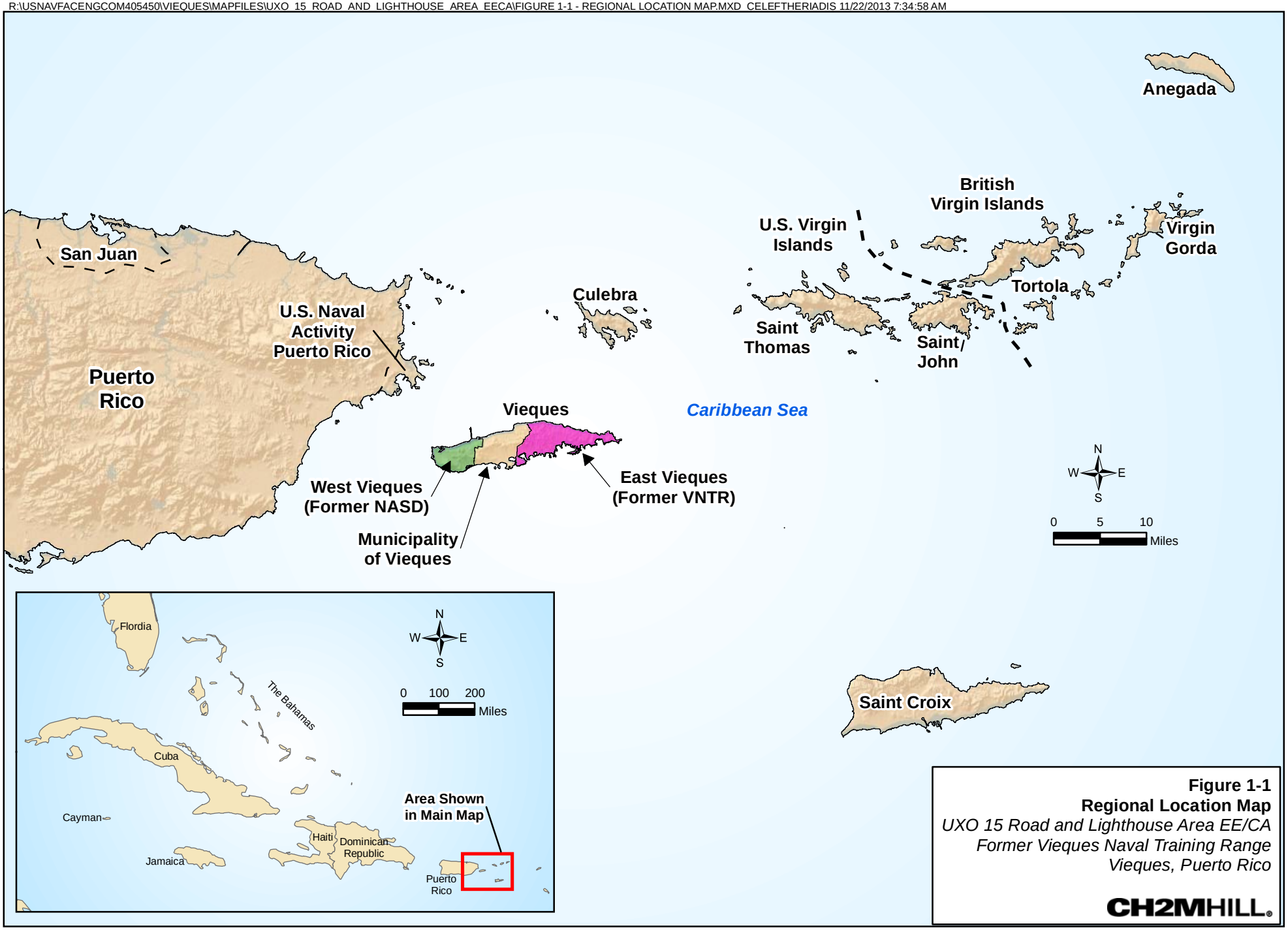


**Figure 1-1**
**Regional Location Map**
*UXO 15 Road and Lighthouse Area EE/CA*
*Former Vieques Naval Training Range*
*Vieques, Puerto Rico*

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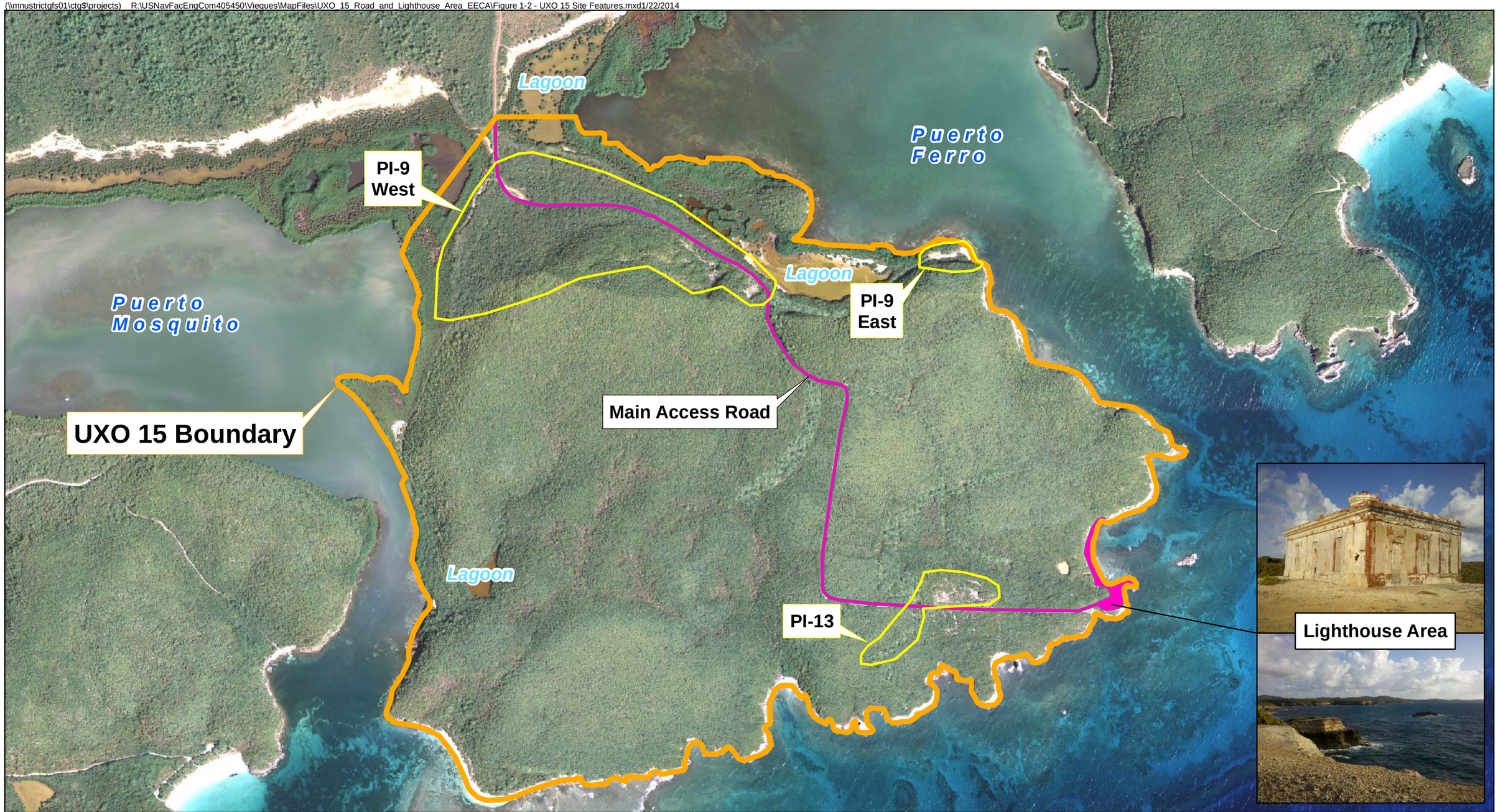
(\\mnustrictgfs01\ctg$\projects) R:\USNavFacEngCom405450\Vieques\MapFiles\UXO_15_Road_and_Lighthouse_Area_EECA\Figure 1-2 - UXO 15 Site Features.mxd1/22/2014




**Legend**

- PI Areas
- UXO 15
- Interim Removal Action Area

2007 Aerial Imagery

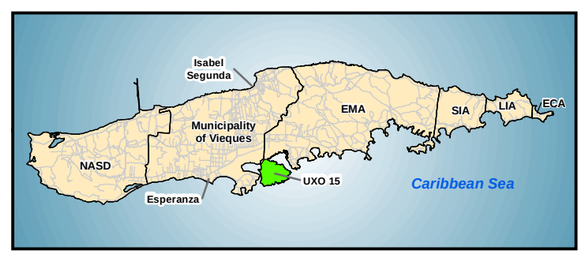



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**Figure 1-2**
**UXO 15 Site Features**
*UXO 15 Road and Lighthouse Area EE/CA*
*Former Vieques Naval Training Range*
*Vieques, Puerto Rico*

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SECTION 2

# Site Characterization

## 2.1 Site Description and Background

- Vieques is located in the Caribbean Sea and is the largest offshore island of the Commonwealth of Puerto Rico; it is approximately 20 miles long and 4.5 miles wide (**Figure 1-1**).
- The former VNTR is situated in the eastern half 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 consists of approximately 14,500 acres that were divided operationally into four Munitions Response Areas (MRAs) that (from west to east) comprise: the 10,673-acre Eastern Maneuver Area (EMA); the 2,500-acre Surface Impact Area (SIA); the 900-acre Live Impact Area (LIA), and the 200-acre Eastern Conservation Area (ECA) on the easternmost tip of Vieques (CH2M HILL, 2006) (**Figure 1-2** inset).
- The EMA, which includes UXO 15, was established in 1947 and provided maneuvering areas and ranges for the training by Marine amphibious units and battalion landing teams in exercises that included amphibious landings, small-arms fire, artillery and tank fire, shore fire control, and combat engineering tasks.
- UXO 15 is approximately 535 acres, located in the western portion of the EMA, and includes Photo Identified (PI) Sites PI 9 and PI 13 (**Figure 1-2**). PI 9 was likely used for ammunition storage and possibly ammunition disposal based on historical information and aerial photographs. PI 13 may have been the firing point from which long-range artillery was launched to the LIA/SIA.
- The former VNTR was transferred to the Department of Interior (DOI) in 2003 to be operated and managed by the USFWS as a National Wildlife Refuge. The Commonwealth of Puerto Rico has requested that public access to the historic Spanish lighthouse located in UXO 15 be accelerated; USFWS has indicated that public access would be via vehicle or bicycle along the main road. Due to the potential presence of MEC at UXO 15, access to the site is currently restricted from public use.
- In 2007, USFWS constructed the main access road to the lighthouse to allow workers access to the lighthouse and surrounding area; the road was built with geotextile followed by a 6-inch-thick aggregate.

## 2.2 Physical Characteristics

- Most of UXO 15 is characterized as rocky land where rock outcrops of limestone and dolomite occur in the topographically elevated areas (**Figure 2-1**). Loose stones with very shallow soil material are found between the outcrops. PI 9 additionally contains tidal flats and a tidal swamp. The tidal flats are slightly above sea level, affected by sea water at high tide, and have a high salt concentration. The tidal swamp is covered with thick mangroves and immersed in salt water the majority of the year.
- The vegetative communities across much of UXO 15 consist of dense evergreen scrub and dry scrub forest, as well as areas of mixed native/naturalized and invasive vegetation, with entirely invasive vegetation occurring in areas of historic habitat disturbance. There is also extensive area of exposed limestone/dolomite with scarce vegetation. At lower elevations along the north and west sides of the peninsula there are extensive areas of mangrove forest and pockets of secondary growth forest.
- Surface water bodies bound three sides of UXO 15. Puerto Mosquito is located to the west and Puerto Ferro to the east. The ocean is to the south. There is also a small lagoon between the two PI 9 areas, a small lagoon in the southwest portion of UXO 15, and a small lagoon in the northern portion of the site (**Figure 1-2**).
- Groundwater likely exists primarily in bedrock and discharges to the large lagoons to the east and west and ocean to the south.

## 2.3 Previous Investigations

- A Preliminary Range Assessment of the former VNTR (CH2M HILL, 2003) identified PI 9 as a potential munitions response site based on aerial photograph analysis (ERI, 2000).
- The Phase I Resource Conservation and Recovery Act Facility Investigation (RFI) Report recommended PI 9 for further evaluation under the Munitions Response Program (MRP) and an inspection of potential MEC at PI 13 (CH2M HILL, 2004).
- The Expanded Range Assessment/Site Inspection (ERA/SI) identified 31 munitions debris (MD) items, one material potentially presenting an explosive hazard (MPPEH) item, and five debris piles on the surface during transect inspections; munitions-related items encrusted in the rock in the eastern portion of PI 9; and two elevated anomaly density areas (EADA) from an aerial magnetometer survey at UXO 15; munitions were not identified along the main access road or areas around the lighthouse that are readily accessible. The ERA/SI recommended further investigation of the debris piles and encrusted munitions-related items and evaluation of the potential ecological and human health risks (CH2M HILL, 2010).
- A Remedial Investigation (RI) was initiated in 2012 to characterize the potential for subsurface munitions; characterize the potential for a release of hazardous constituents to soil and sediment from subsurface munitions and from the surface debris piles; characterize the extent of the encrusted munitions-related items; and determine the appropriate path forward for UXO 15. During the investigation to date, only one MEC item (a teargas grenade classified as a discarded military munitions [DMM]) was found at the site on the ground surface and no MEC was found in the subsurface at the site. No evidence of munitions was found in any of the areas identified by a community member as having been possible areas of munitions use/disposal. Several berms were found throughout the northern portion of the site and will be the subject of future evaluation as part of the RI. The locations of the items found on the ground surface and the berms are presented in **Figure 2-2**. The locations of the subsurface items found during the intrusive investigation are shown on **Figure 2-3**. As noted previously, the RI is ongoing (CH2M HILL, 2013a).
- During the 2007 road construction activity, an embankment for drainage was constructed along the road buffer up to 11 feet from the edge of the road; anomaly avoidance support was provided during which no MEC was identified along the road or the shoulders. **Appendix B** shows the area of road construction, including the drainage buffers.

## 2.4 Nature and Extent of Contamination

- Based on the findings of the ERA/SI and RI activities (**Figures 2-2 and 2-3**), and the fact that no munitions were identified during the 2007 road construction, the nature and extent of MEC/MPPEH (and related debris) have been characterized sufficiently within the road/lighthouse area portion of UXO 15 to perform a NTCRA for these areas.
- Only two MPPEH items (one 50-caliber ball ammunition and one teargas riot control grenade) were identified on the surface within UXO 15, both in the vicinity of berms; MEC/MPPEH was not identified in the subsurface; and, as noted previously, no MEC/MPPEH was identified along the road during investigation or road construction (Figures 2-2 and 2-3). In addition, no evidence of long-range artillery use was identified at PI 13 during the ERA/SI; therefore, it is highly unlikely that PI 13 was used as a gun position.
- Results to date indicate environmental contamination is likely insignificant; most likely relatively low levels of inorganics associated with the debris piles, none of which were found on the road. Further, the road has been covered with a geotextile membrane and 6 inches of aggregate.

## 2.5 Evaluation of Risk

- Due to the general absence of MEC/MPPEH at the site as a whole, the absence of MEC/MPPEH along the road, the presence of the road bed material, and the presence of bedrock at the ground surface around the lighthouse, the explosive hazard along the road and around the lighthouse is very low to absent. Even if

munitions constituents (MC) are present in the soil beneath the road, which is unlikely based on the findings to date, the exposure pathway is absent due to the geotextile membrane and aggregate. The lighthouse was not used by the Navy, is structurally unsound, and its entrances have been blocked to prevent access to the interior. The exposure pathway to MC around the lighthouse is absent due to the absence of a MEC contaminant source in that area and the presence of bedrock at or within inches of the ground surface.

- Although the likelihood of MEC/MPPEH to be present at the beach adjacent to the lighthouse is low, based on the potential historic use of UXO 15 and the findings to date, surface and subsurface MEC/MPPEH clearance along the beach adjacent to the lighthouse and a path between the lighthouse and the beach will be performed. The clearance will be added to the Work Plan for Munitions and Explosives of Concern Subsurface Interim Removal Action, Beaches and Selected Roadways (CH2M HILL, 2008), revised as necessary to incorporate Field Change Request (FCR) 2 (CH2M HILL, 2013b) and associated Subsurface Anomaly Removal Standard Operating Procedure (SOP) (CH2M HILL, 2013c). Therefore, the beach and path MEC/MPPEH clearance is not part of this EE/CA; only the land use controls (LUCs) along the path and beach are part of this EE/CA. The road to lighthouse will be opened only after the beach and associated path clearance has been completed. Any MEC found on the beach or associated path will be removed and disposed, as appropriate, before opening the road to the lighthouse and the beach and associated path to the public.

(\\mnustrictgfs01\ctg$\projects) R:\USNavFacEngCom405450\Vieques\MapFiles\UXO_15_Road_and_Lighthouse_Area_EECA\Figure 2-1 - UXO 15 Topographic Map.mxd1/22/2014

**Legend**

- Topographic Contours (5 Meter)
- UXO15
- PI Site

Notes:
Topographic Conours from USGS.
USGS contours are mean sea level.

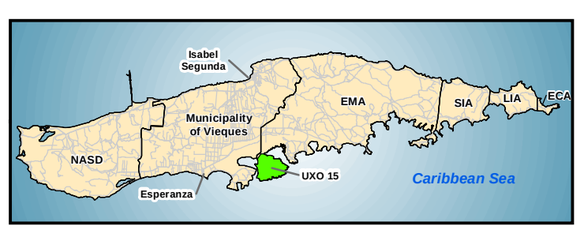


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**Figure 2-1**
**UXO 15 Topographic Map**
*UXO 15 Road and Lighthouse Area EE/CA*
*Former Vieques Naval Training Range*
*Vieques, Puerto Rico*

2007 Aerial Imagery

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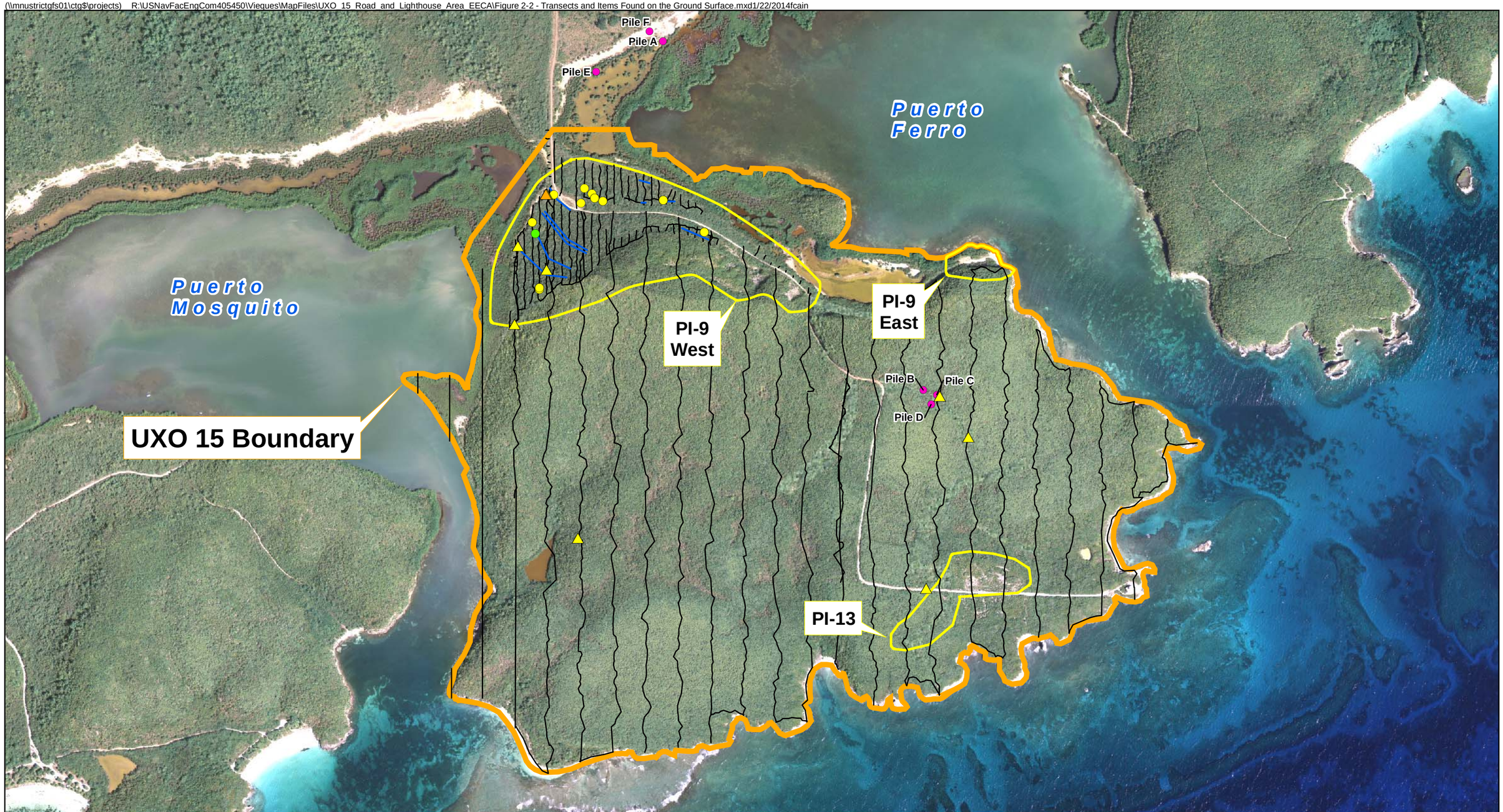
(\\mnustrictgfs01\ctg$\projects) R:\USNavFacEngCom405450\Vieques\MapFiles\UXO_15_Road_and_Lighthouse_Area_EECA\Figure 2-2 - Transects and Items Found on the Ground Surface.mxd1/22/2014fcain




**Legend**

**RI**
- MD Item
- DMM Item

**ERA/SI**
- MD Item
- MPPEH Item

- Debris Pile
- Berm Location
- Transect
- PI Site
- UXO15

2007 Aerial Imagery

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**Figure 2-2**
**Transects and Items Found on the Ground Surface**
*UXO 15 Road and Lighthouse Area EE/CA*
*Former Vieques Naval Training Range*
*Vieques, Puerto Rico*

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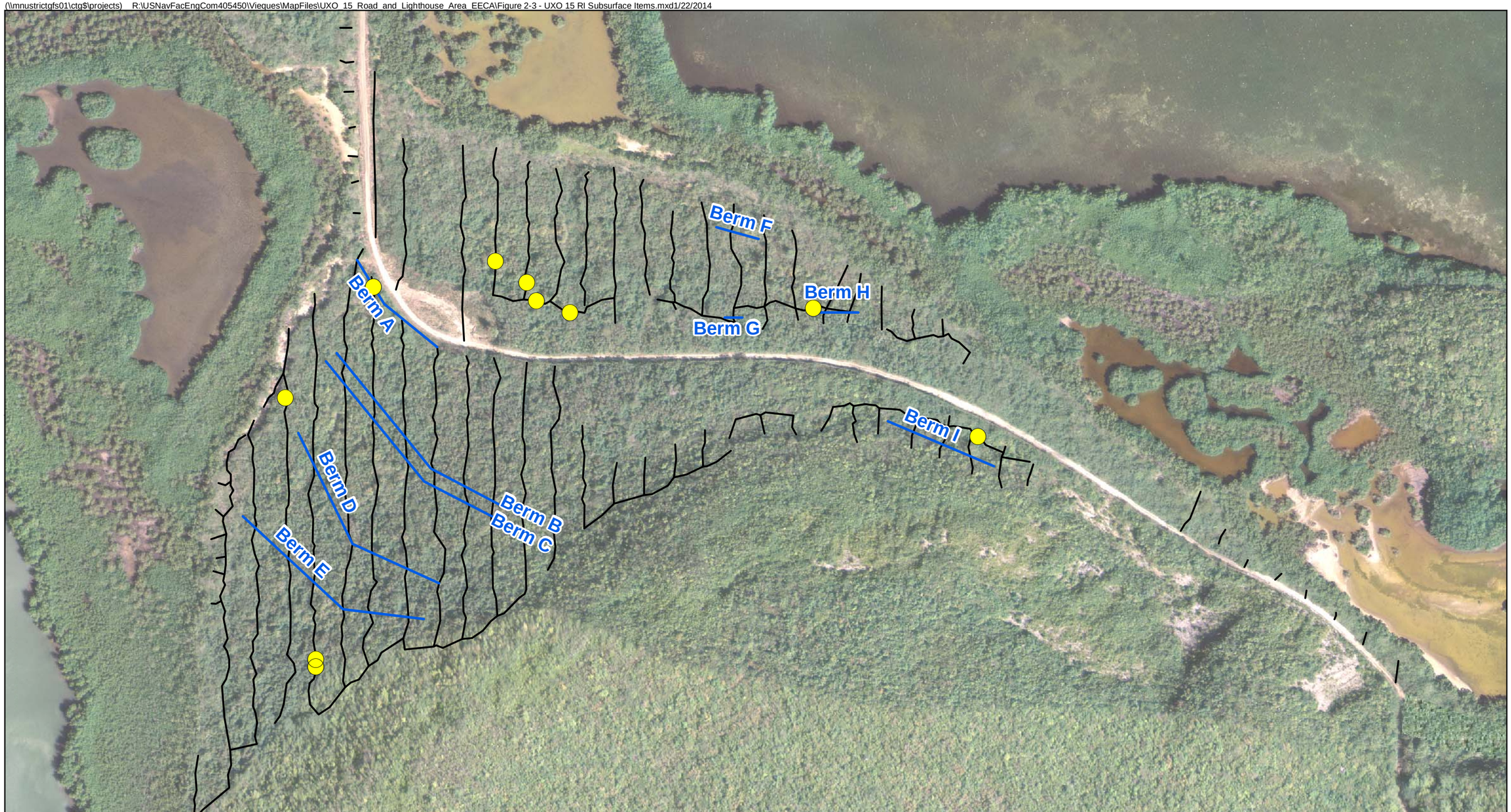
(\\mnustrictgfs01\ctg$\projects) R:\USNavFacEngCom405450\Vieques\MapFiles\UXO_15_Road_and_Lighthouse_Area_EECA\Figure 2-3 - UXO 15 RI Subsurface Items.mxd1/22/2014




**Legend**

- MD Item
- Berm Location
- Surveyed Transect

2007 Aerial Imagery

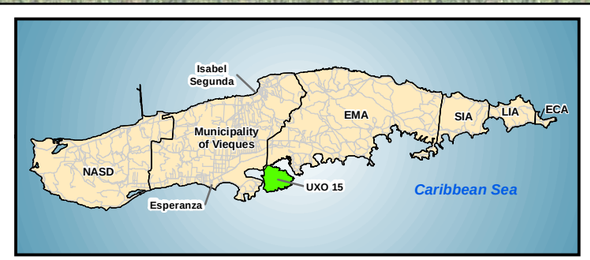



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**Figure 2-3**
**UXO 15 RI Subsurface Items**
*UXO 15 Road and Lighthouse Area EE/CA*
*Former Vieques Naval Training Range*
*Vieques, Puerto Rico*

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SECTION 3

# Removal Action Objectives and Scope

## 3.1 Statutory Limits on Removal Actions

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

## 3.2 Applicable or Relevant and Appropriate Requirements

The selected removal action will comply with ARARs under federal and Puerto Rico laws. **Appendix A** contains the ARAR tables and provides a summary of each potentially related environmental and munitions regulation. Other federal and Puerto Rico advisories, criteria, or guidance will be considered, as appropriate, in formulating the removal action.

## 3.3 Removal Action Objectives and Scope

The removal action objectives (RAOs) for this NTCRA are:

- Reduce the potential explosive hazard associated with access to the area around the historic lighthouse at UXO 15.
- Reduce the potential for unauthorized access to restricted areas of UXO 15.

The goal of this EE/CA and subsequent interim removal action is to accelerate public access to the areas around the lighthouse that are readily accessible within UXO 15 while the site as a whole continues through the full CERCLA process. Therefore, the scope of this removal action is to guide access along the main road and to accessible areas around the lighthouse and adjacent beach, and to deter access to the remaining (restricted) area of UXO 15.

## 3.4 Determination of Removal Action Schedule

The EE/CA will be placed in the Administrative Record and notice of its availability for public review along with a brief summary will be published in the local newspaper. The EE/CA will then be available for a 45-day public comment period. Following the public comment period, a Responsiveness Summary will be prepared that summarizes responses to significant comments and will be included in the Administrative Record. Since this removal action has been designated non-time-critical, the start date will be initiated following the resolution of the comments.

The total project period is anticipated to span an estimated a few months, from the end of the public comment period through completion of the selected interim removal action. This is an estimated schedule for project completion, should critical milestones not be met, the total project timeframe would also be extended. Critical milestone periods related to the EE/CA are summarized below:

- EE/CA Public Comment Period—45 days
- Material procurement and site preparation—less than 1 month
- NTRCA — less than 1 month (this is variable and contingent upon the alternative selected, site conditions, availability of the work force and project materials, and other external influences)

SECTION 4

# Identification and Detailed Analysis of Removal Action Alternatives

## 4.1 Removal Action Alternatives Description

Based on the information provided in Section 2 and RAOs presented in Section 3, the following removal action alternatives have been considered for detailed evaluation:

1. No Action
2. Hazard Warning Signs and Educational Kiosks
3. Fence with Hazard Warning Signs and Educational Kiosks

A description of each of these alternatives is provided below.

### 4.1.1 Alternative 1—No Action

The no action alternative consists of leaving the site as it currently is, with no LUCs.

### 4.1.2 Alternative 2—Hazard Warning Signs and Educational Kiosks

- This alternative consists of implementing LUCs to guide (via signs) access along the road to and including the areas around the lighthouse that are readily accessible, the adjacent beach, and the path between them and to deter access outside these areas (hazard warning signs), educating people accessing the site about the hazards associated with munitions (kiosks), and establishing institutional controls (ICs) for practicing avoidance for potential construction or intrusive activities along the road and around the lighthouse.
- Signs will be installed along both sides of the road to guide people along the road/lighthouse and at the adjacent beach and inform people that access to the remainder of UXO 15 is prohibited and potentially dangerous. The signs will also inform of the dangers of munitions items. For the purposes of this EE/CA, it is assumed that 23 signs will be installed along the road (on each side of the road), 3 signs along the lighthouse area, 1 sign at the entrance to the path to the beach, and 3 signs along the beach adjacent to the lighthouse (**Figure 4-1**). The actual number of signs and associated sign language will be included in the Interim Removal Action Work Plan.
- Kiosks will be installed containing information about UXO 15 and MEC awareness information (see **Figure 4-1** for an example). These kiosks will be installed along the access road at the entrance to the site and in the vicinity of the lighthouse (locations where the public will have the highest likelihood to read them).
- In order to facilitate the repair/maintenance of road and activities around the lighthouse, anomaly avoidance procedures will be required in the event intrusive activities are necessary within the road bed below the depth of the geotextile, to any depth along the shoulders of the road, around the lighthouse, along the path to the beach, and along the beach. The anomaly avoidance procedures will require that UXO Technicians carefully inspect the area with the aid of an appropriate geophysical instrument (e.g., Schonstedt GA-52CX magnetometer) for evidence of a metallic object on or beneath the ground surface.
- Prior to public access, a Land Use Control Implementation Plan (LUCIP) will be prepared for this interim action that will include the details of the avoidance procedures necessary for any intrusive road maintenance/parking lot construction (i.e., construction support), sign/kiosk maintenance, and any other necessary land use control requirements.

### 4.1.3 Alternative 3—Fence, Hazard Warning Signs, and Educational Kiosks

- This alternative contains the same elements as Alternative 2, but includes the installation of a fence along both sides of the road and around the lighthouse (**Figure 4-2**). Based on previous requests by USFWS, the fence will be a 3-strand barbed wire fence that is installed with anomaly avoidance support.

## 4.2 Analysis of Removal Action Alternatives

The alternatives were evaluated in detail using the National Contingency Plan evaluation criteria (40CFR300.430(e)(9)). Detailed evaluations of the alternatives are presented in **Table 4-1**. Detailed cost estimates of the removal alternatives are provided in **Tables 4-2 and 4-3**. The alternative cost estimates are in 2013 dollars, based on RS Means and engineer's estimates for similar projects. It should be noted that the costs in **Tables 4-2 and 4-3** do not include periodic monitoring and maintenance costs associated with the signs and fence because these costs would be relatively insignificant.

The cost estimates presented in **Tables 4-2 and 4-3** has been developed strictly for comparing the removal alternatives. The final costs of the project and the resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, the implementation schedule, and other variables. Therefore, final project costs may vary from the cost estimates.

The cost estimates are order-of-magnitude estimates having an intended accuracy range of +50 to -30 percent. The range applies only to the alternatives as they are defined herein and does not account for changes in the scope of the alternatives.

TABLE 4-1
**Detailed Evaluation of Removal Action Alternatives**
*UXO 15 Road and Lighthouse EE/CA*
*Former NASD, Vieques, Puerto Rico*

| Evaluation Criteria | Alternative 1<br>No Action | Alternative 2<br>Hazard Warning Signs and Educational Kiosks | Alternative 3<br>Fence, Hazard Warning Signs, and Educational Kiosks |
|---|---|---|---|
| **Overall Protection to Human Health and the Environment** | | | |
| Reduce explosive hazard associated with MEC/MPPEH to be compatible with current and future land use and reduce the potential for unauthorized access to the site. | Will not meet RAOs. Although the dense vegetation acts as a deterrent, trespassing has been observed. This alternative includes no means to control access to the site, and thereby reduce uncontrolled human contact with potential MEC. | This alternative will meet RAOs because it implements LUCs to control site access, limits intrusive activities, and reduces the potential for uncontrolled exposure. Unauthorized access to the site will be reduced by signage, kiosks, and IC mechanisms. | This alternative will meet RAOs because it implements LUCs to control site access, limits intrusive activities, and reduces the potential for uncontrolled exposure. Unauthorized access to the site will be reduced by fencing, signage, kiosks, and IC mechanisms. |
| **Compliance with ARARs** | | | |
| Location-specific ARARs | Complies with ARARs. | Complies with ARARs. | Complies with ARARs. |
| Action-specific ARARs | Not applicable. No action-specific ARARs. | Complies with ARARs. | Complies with ARARs. |
| Chemical-specific ARARs | Not applicable. No chemical-specific ARARs. | Not applicable. No chemical-specific ARARs. | Not applicable. No chemical-specific ARARs. |
| **Long-Term Effectiveness and Permanence** | | | |
| Magnitude of Residual Risks | No significant change in explosive hazard because no action would be taken; explosive hazard relatively low even without interim action. | Explosive hazard is reduced by reducing potential exposure to MEC by LUCs and ICs. | Explosive hazard is reduced by reducing potential exposure to MEC by LUCs and ICs. |
| Adequacy and Reliability of Controls | Access to the site is partially restricted naturally by vegetation, but no formal controls to reduce exposure potential. | LUC and ICs would reliably reduce the potential for uncontrolled exposure to MEC. | LUC and ICs would reliably reduce the potential for uncontrolled exposure to MEC. However, fencing difficult to maintain due to dense, fast growing vegetation and damaging insects (e.g., termites). |
| **Reduction of Toxicity, Mobility, or Volume through Treatment** | | | |
| Reduction of Toxicity, Mobility, or Volume through Treatment | No active treatment. | No active treatment. | No active treatment. |
| **Short-Term Effectiveness** | | | |
| Protection of workers during removal action | Not applicable. | ICs would likely require administrative resources and local co-operation. Signage installation and kiosk construction easily completed with UXO avoidance support and normal health and safety procedures. | ICs would likely require administrative resources and local co-operation. Fence and signage installation and kiosk construction easily completed with UXO avoidance support and normal health and safety procedures. |
| Short-term risk that might be posed to the community during implementation | Not applicable. | No community is located near the area where LUCs would be installed. Insignificant impact to the community from traffic to transport materials to the site. | No community is located near the area where LUCs would be installed. Insignificant impact to the community from traffic to transport materials to the site. |

| Evaluation Criteria | Alternative 1<br>No Action | Alternative 2<br>Hazard Warning Signs and Educational Kiosks | Alternative 3<br>Fence, Hazard Warning Signs, and Educational Kiosks |
|---|---|---|---|
| Potential environmental impacts of removal action and effectiveness and reliability of mitigation measures during implementation | Not applicable. | No potential negative environmental impacts. | No potential negative environmental impacts. |
| Time until protection is achieved | Desired level of protectiveness not achieved without controls. | Desired level of control of explosive hazard almost immediate due to short timeframe required to implement LUCs and ICs. | Desired level of control of explosive hazard slightly longer than Alternative 2 due to time required to install fence. |
| Environmental Footprint (In terms of GHG emissions and energy consumption) | None. | Insignificant. | Insignificant. |
| **Implementability** | | | |
| Technical feasibility | No Action is technically feasible. | Services and materials are available and easily implementable. | Services and materials are available and easily implementable. |
| Administrative feasibility | Agency approval unlikely, especially considering likely community input | Feasible, especially considering minimal aesthetic disruption while achieving desired level of control of potential explosive hazard. | Feasible, but less likely to achieve agency approval, especially considering likely community input regarding proposed fencing. |
| Availability of services, equipment, and materials | Not applicable | Readily available | Readily available |
| **Cost** | | | |
| Cost (See Tables 4-2 and 4-3 for Cost Breakdown) | $0 | $69,000 | $296,000 |

TABLE 4-2
**Alternative 2 Cost Estimate**
*UXO 15 Road and Lighthouse EE/CA*
*Former Vieques Naval Training Range*
*Vieques, Puerto Rico*

## Alternative 2 - Hazard Warning Signs and Educational Kiosks

Site: UXO 15, Former Vieques Naval Trainging Range
Base Year: 2013
Location: Vieques, Puerto Rico
Date: November 2013
Phase: EE/CA
Alternative Description:
- No surface or subsurface MEC removal from the planned public access areas (road and area around lighthouse
- Implement ICs that restrict access and intrusive work and future site development
- Implement engineering controls via LUC plan (install signage and educational kiosks

| Description | Quantity | Unit | $/Unit | Total Cost | Notes |
|---|---|---|---|---|---|
| **(1) Establishing IC and LUC** | | | | | |
| 1.1 Work Plans | 1 | EA | $10,000 | $10,000 | Estimate |
| 1.2 Signage and kiosk language development | 24 | HR | $83 | $2,004 | Estimated 4 hours for sign language development and 16 hours for kiosk language development |
| 1.3 Installation of Signage for Restricting Access and Intrusive Activities, includes material and labor costs | 30 | EA | $180 | $5,400 | Metal 24"x24" metal signs installed on 4”x4” wooden posts that are concreted into the ground; Cost estimate based similar work |
| 1.4 Installation of Educational Kiosks, includes material and labor costs | 2 | EA | $10,000 | $20,000 | Wooden kiosks with concrete pad, same as what has been installed elsewhere on Vieques; Cost estimate based similar work |
| 1.5 MEC Avoidance Support for Sign and Kiosk Installation Instrusive Activities | 38 | HR | $100 | $3,808 | Assume 1 hr per sign and 1 hour per kiosk post (8 posts total) |
| Subtotal | | | | $41,211 | |
| **CONTINGENCY** | 20% | | $41,211 | $9,000 | EPA July 2000 guidance |
| **SUBTOTAL - CONSTRUCTION COST** | | | | **$51,000** | |
| ***(2) DESIGN&CM&PM*** | | | | | |
| **Project Management** | 6% | | $51,000 | $3,060 | EPA July 2000 guidance page 5-13 |
| **Construction Management** | 8% | | $51,000 | $4,080 | EPA July 2000 guidance page 5-13 |
| **General&Administration (G&A)** | 9.2% | | $51,000 | $4,692 | RSMeans 5% to 15% |
| **Pollution Liability Insurance** | 2% | | $51,000 | $1,020 | market price |
| **Payment & Performance Bond** | 1.75% | | $51,000 | $893 | market price |
| **Fee** | 8% | | $55,692 | $4,455 | |
| **Tax** | 7% | | $51,000 | $3,570 | Puerto Rico tax |
| **TOTAL - Design &CM&PM** | | | | **$22,000** | |
| **TOTAL Capital Cost** | | | | **$73,000** | |

**Note:**
**This estimate has been developed and provided as an Order of Magnitude Estimate (ROM)/Budgetary Estimate and as such is suitable for the purpose of budget development and/or planning only.This estimate is offered as an opinion of cost to perform the work and is not an offer to contract for construction services, procure and/or provide such services.**
**(Cost Accuracy Range: +50% / -30%).**

TABLE 4-3
**Alternative 3 Cost Estimate**
*UXO 15 Road and Lighthouse EE/CA*
*Former Vieques Naval Training Range*
*Vieques, Puerto Rico*

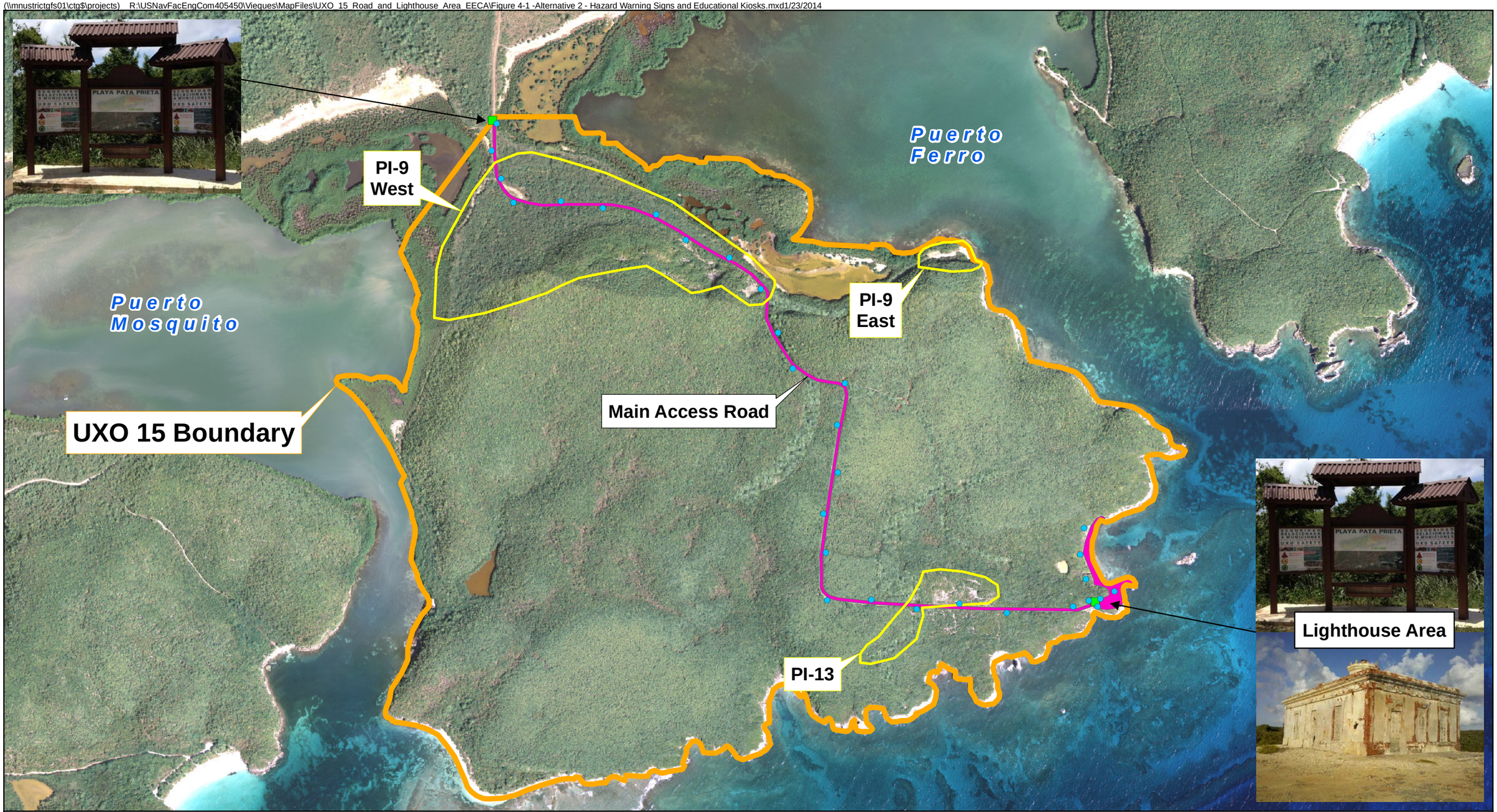
## Alternative 3 - Fence, Hazard Warning Signs, and Educational Kiosks

Site: UXO 15, Former Vieques Naval Trainging Range
Base Year: 2013
Location: Vieques, Puerto Rico
Date: November 2013
Phase: EE/CA
Alternative Description:
- No surface or subsurface MEC removal from the planned public access areas (road and area around lighthouse
- Implement ICs that restrict access and intrusive work and future site development
- Implement engineering controls via LUC plan (install signage, fencing, and educational kiosks

| Description | Quantity | Unit | $/Unit | Total Cost | Notes |
|---|---|---|---|---|---|
| **(1) Establishing IC and LUC** | | | | | |
| 1.1 Work Plans | 1 | EA | $10,000 | $10,000 | Estimate |
| 1.2 Signage and kiosk language development | 24 | HR | $83 | $2,004 | Estimated 4 hours for sign language development and 16 hours for kiosk language development |
| 1.3 Installation of Signage for Restricting Access and Intrusive Activities, includes material and labor costs | 30 | EA | $180 | $5,400 | Metal 24"x24" metal signs installed on 4”x4” wooden posts that are concreted into the ground; Cost estimate based similar work |
| 1.4 Installation of Fencing, includes material and labor costs | 16300 | FT | $8 | $122,250 | 3-strand barbed wire fence on wooden posts; Road length is approximately 7,900 ft, perimeter of lighthouse area is approximately 500 ft; Cost estimate based similar work |
| 1.5 Installation of Educational Kiosks, includes material and labor costs | 2 | EA | $10,000 | $20,000 | Wooden kiosks with concrete pad, same as what has been installed elsewhere on Vieques; Cost estimate based similar work |
| 1.6 MEC Avoidance Support for Sign, Fence, and Kiosk Installation Instrusive Activities | 138 | HR | $100 | $13,828 | Assume 1 hr per sign, 2 weeks (10 10-hour days), and 1 hour per kiosk post (8 posts total) |
| Subtotal | | | | $173,481 | |
| **CONTINGENCY** | 20% | | $173,481 | $35,000 | EPA July 2000 guidance |
| **SUBTOTAL - CONSTRUCTION COST** | | | | **$209,000** | |
| ***(2) DESIGN&CM&PM*** | | | | | |
| **Project Management** | 6% | | $209,000 | $12,540 | EPA July 2000 guidance page 5-13 |
| **Construction Management** | 8% | | $209,000 | $16,720 | EPA July 2000 guidance page 5-13 |
| **General&Administration (G&A)** | 9.2% | | $209,000 | $19,228 | RSMeans 5% to 15% |
| **Pollution Liability Insurance** | 2% | | $209,000 | $4,180 | market price |
| **Payment & Performance Bond** | 1.75% | | $209,000 | $3,658 | market price |
| **Fee** | 8% | | $228,228 | $18,258 | |
| **Tax** | 7% | | $209,000 | $14,630 | Puerto Rico tax |
| **TOTAL - Design &CM&PM** | | | | **$90,000** | |
| **TOTAL Capital Cost** | | | | **$299,000** | |

**Note:**
**This estimate has been developed and provided as an Order of Magnitude Estimate (ROM)/Budgetary Estimate and as such is suitable for the purpose of budget development and/or planning only.This estimate is offered as an opinion of cost to perform the work and is not an offer to contract for construction services, procure and/or provide such services.**
**(Cost Accuracy Range: +50% / -30%).**

(\\mnustrictgfs01\ctg$\projects) R:\USNavFacEngCom405450\Vieques\MapFiles\UXO_15_Road_and_Lighthouse_Area_EECA\Figure 4-1 -Alternative 2 - Hazard Warning Signs and Educational Kiosks.mxd1/23/2014




**Legend**

- Warning Sign
- Informational Kiosk
- PI Areas
- UXO 15
- Interim Removal Action Area

2007 Aerial Imagery

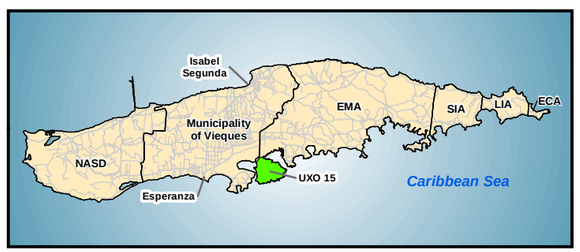



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**Figure 4-1**
**Alternative 2 - Hazard Warning Signs and Educational Kiosks**
*UXO 15 Road and Lighthouse Area EE/CA*
*Former Vieques Naval Training Range*
*Vieques, Puerto Rico*

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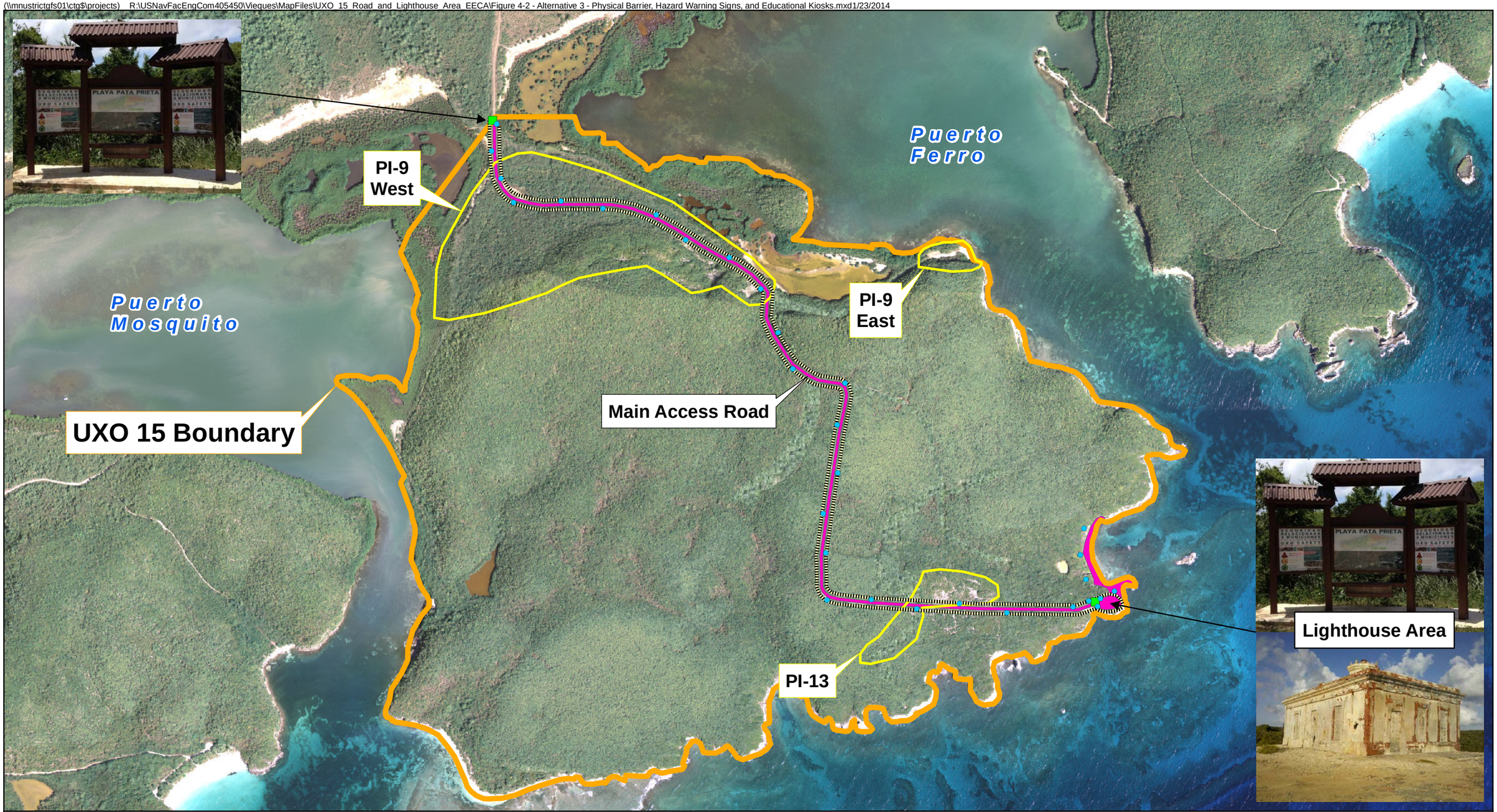
(\\mnustrictgfs01\ctg$\projects) R:\USNavFacEngCom405450\Vieques\MapFiles\UXO_15_Road_and_Lighthouse_Area_EECA\Figure 4-2 - Alternative 3 - Physical Barrier, Hazard Warning Signs, and Educational Kiosks.mxd1/23/2014




## Legend

- Warning Sign
- Informational Kiosk
- Fence
- PI Areas
- UXO 15
- Interim Removal Action Area

2007 Aerial Imagery

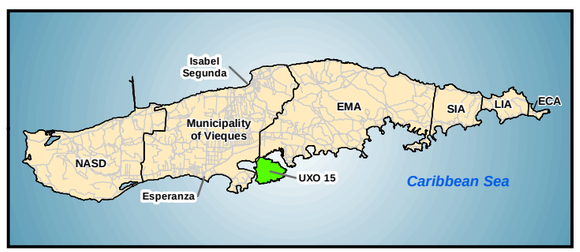



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**Figure 4-2**
**Alternative 3 - Physical Barrier, Hazard Warning Signs, and Educational Kiosks**
*UXO 15 Road and Lighthouse Area EE/CA*
*Former Vieques Naval Training Range*
*Vieques, Puerto Rico*

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SECTION 5

# Comparative Analysis of Removal Action Alternatives

A summary of the relative comparative analysis is provided in **Table 5-1.**

## 5.1 Overall Protection of Human Health and the Environment

- Alternative 1 does not provide any additional protection of human health and the environment over what is currently provided by the existing conditions. Alternatives 2 and 3 are protective of human health and the environment because they implement LUCs and ICs to reduce the explosive hazard associated with MEC/MPPEH by minimizing the potential for uncontrolled contact along the roads and within other areas of UXO 15. It is noted, however, that both FWS and members of the public have expressed opposition to fences due to their detraction from the aesthetic appeal of the surroundings and because they can be circumvented by a determined trespasser.

## 5.2 Compliance with ARARs

- **Appendix A** presents a compilation and evaluation of state (Commonwealth) and federal chemical-specific, location-specific, and action-specific ARARs. All of the removal alternatives meet the ARARs.

## 5.3 Long-Term Effectiveness and Permanence

- Alternative 1 does not provide any long-term effectiveness. Alternatives 2 and 3 utilize LUCs and ICs to reduce the potential for exposure to MEC/MPPEH that may be present at the site. While both of these alternatives are effective, the adequacy and reliability of controls is for Alternative 3 is less than that for Alternative 2 due to the difficulty maintaining fences in the tropical setting (heavy, fast growing vegetation; termites).

## 5.4 Reduction of Toxicity, Mobility, and Volume through Treatment

- There is no reduction in toxicity, mobility, and volume through treatment for any of the alternatives. However, as noted previously, there is unlikely MEC/MPPEH or associated contamination present beneath the road and, if present, is covered by a geotextile membrane and aggregate and if present along the path or beach will be removed during clearance under the separate NTCRA Work Plan. In addition, UXO 15 as a whole is still in the RI stage of the CERCLA process.

## 5.5 Short-Term Effectiveness

- Because there would be no construction activities associated with Alternative 1, this alternative has the least short-term impacts. Alternative 2 involves the installation of signage and kiosks, which will have negligible short term impacts, but will be immediately effective in meeting the ROAs. Alternative 3 will have slightly higher short-term impacts than Alternative 2, as the installation of the fence will add to the implementation time and area of disturbance for the interim action, but will also be immediately effective in meeting the ROAs.
  - Although worker safety would be manageable, the following safety concerns for workers will exist:
    - Working in an area with potentially live munitions is the main hazard to workers associated with Alternatives 2 and 3. All personnel involved with the removal actions will receive site-specific training, including munitions awareness training (often referred to as Recognize, Retreat, Report [3R] Training) as appropriate. In addition, all work will be conducted under the supervision of UXO qualified technicians providing anomaly avoidance support. All exclusion areas where removal is

taking place will be restricted for explosive safety purposes and only authorized personnel will be allowed in the exclusion zone.

  - The project area contains rough terrain in a tropical and vegetated environment. Proper planning, equipment, and task- and site-appropriate personal protective equipment can mitigate the health and safety concerns associated with these site conditions.

- Potential impacts to the environment are primarily associated with temporary land disturbance associated with the sign, kiosk, and, potentially, fence installation.
- The timeframe to achieve the NTCRA RAOs is the anticipated duration of the NTCRA, which is less than one month.

## 5.6 Implementability

- Since Alternative 1 is the No Action alternative and does not meet the RAOs, it would be difficult to obtain administrative approval for this alternative. Alternatives 2 and 3 are technically and administratively feasible; however, as noted previously, members of the community and FWS have previously expressed opposition to installing fencing (associated with Alternative 3) to deter access on Vieques.

## 5.7 Cost

- Alternative 1 is the most cost effective as there is no cost associated with it; however, this alternative does not meet the RAOs. The estimated cost of Alternative 2 is $73,000, which is less than a quarter the cost of Alternative 3 ($299,000).

TABLE 5-1

**Comparative Analysis of Remedial Alternatives**

*UXO 15 Road and Lighthouse EE/CA*

*Former Vieques Naval Training Range*

*Vieques, Puerto Rico*

| Criterion | Alternative 1<br>No Action | Alternative 2<br>Hazard Warning Signs and Educational Kiosks | Alternative 3<br>Fence, Hazard Warning Signs, and Educational Kiosks |
|---|---|---|---|
| *Threshold Criterion* | | | |
| **Overall protection of human health and the environment** | ○ | ● | ● |
| **Compliance with ARARs** | ● | ● | ● |
| Compliance with Chemical-Specific ARARs | Not Applicable | Not Applicable | Not Applicable |
| Compliance with Action-Specific ARARs | Not Applicable | ● | ● |
| Compliance with Location-Specific ARARs | ● | ● | ● |
| *Balancing Criterion* | | | |
| **Long-term effectiveness and permanence** | ○ | ◕ | ◕ |
| Magnitude of Residual Risk | ◒ | ◕ | ◕ |
| Adequacy and Reliability of Controls | ○ | ● | ◕ |
| **Reduction of toxicity, mobility, or volume through treatment** | ○ | ○ | ○ |
| **Short-term effectiveness** | ○ | ◕ | ◕ |
| Protection of Community During Removal Actions | Not Applicable | ● | ● |
| Protection of Workers During Removal Actions | Not Applicable | ◕ | ◕ |
| Environmental Impacts | Not Applicable | ● | ● |
| Time Until Removal Action Objectives are Achieved | ○ | ● | ◕ |
| **Implementability** | ◒ | ● | ◒ |
| Technical Feasibility | ● | ● | ● |
| Administrative Feasibility | ◔ | ● | ◕ |
| Availability of Services, Equipment, and Materials | Not Applicable | ● | ● |
| **Cost (Total Present Value)** | **$ -** | **$ 73,000** | **$ 299,000** |

Individual criterion scores: ○ not met ◔ poor ◒ satisfactory ◕ good ● excellent

SECTION 6

# Recommended Interim Removal Action Alternative

Alternative 2, Hazard Warning Signs and Educational Kiosks, is the recommended NTCRA alternative. The following factors were used for making the recommendation:

- Alternative 2 is effective and implementable and meets the RAOs, through the installation of hazard warning signs and educational kiosks and with the dense vegetation acting as a deterrent to access beyond the road and areas around the lighthouse that are readily accessible.
- Because Alternative 3 does not provide a significant increase in protectiveness, the increased cost associated with the fence installation does not provide a proportional increase in protectiveness. In addition, as noted previously community members and FWS have previously expressed opposition to the installation of fencing on the wildlife refuge to deter public access. Since the lighthouse is considered a cultural resource to the people of Vieques, a fence leading to and surrounding the lighthouse may not be readily accepted by the community.
- Since this NTCRA is only an interim removal action for UXO 15, the full CERCLA process will continue to evaluate the nature and extent of contamination, potential risks to human health and the environment, and develop and evaluate site-wide remedial alternatives to mitigate unacceptable risks and explosive hazards.

SECTION 7

# References


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CH2M HILL, 2013b. Field Change Request (FCR) 2: Munitions and Explosives of Concern Subsurface Interim Removal Action, Beaches and Select Roadways. August 16, 2013.

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USEPA, 1993. Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA. August.

# Appendix A
# Applicable or Relevant and Appropriate Requirements

Table 1(a)
**Federal Chemical-Specific ARARs**
*UXO-15 EE/CA*
*Vieques, Puerto Rico*

| Media | Requirement | Prerequisite | Citation | Alternative | ARAR Determination | Comment |
|---|---|---|---|---|---|---|
| No federal chemical-specific ARARs apply. | | | | | | |

Table 1(b)
**Puerto Rico Chemical-Specific ARARs**
*UXO-15 EE/CA*
*Vieques, Puerto Rico*

| Media | Requirement | Prerequisite | Citation | Alternative | ARAR Determination | Comment |
|---|---|---|---|---|---|---|
| No Puerto Rico chemical-specific ARARs apply. | | | | | | |

Table 1(c)

**Federal Location-Specific ARARs**

*UXO-15 EE/CA*

*Vieques, Puerto Rico*

| Location | Requirement | Prerequisite | Citation | Alternative | ARAR Determination | Comment |
|---|---|---|---|---|---|---|
| ***Coastal Zone Management Act*** | | | | | | |
| Coastal zone or area that will affect the coastal zone | Federal activities must be consistent with, to the area that will affect maximum extent practicable, State coastal zone management programs. Federal agencies must supply the State with a consistency determination. | Activity taking place in a wetland, flood plain, estuary, beach, dune, barrier island, coral reef, and fish and wildlife and their habitat, within the coastal zone. | 15 CFR 930.33(a)(1), (a)(2), (b); .35(a), (b); .36(a) | 2 and 3 | Applicable | Activities at UXO 15 that will affect Puerto Rico's coastal zone will be consistent to the maximum extent practicable with Puerto Rico's enforceable policies. Activities performed on-site and in compliance with CERCLA are not subject to administrative review; however the substantive requirements of making a consistency determination will be met. |
| ***Migratory Bird Treaty Act*** | | | | | | |
| Migratory bird area | Protects almost all species of native birds in the United States from unregulated taking. | Presence of migratory birds. | *Migratory Bird Treaty Act* , 16 USC 703 | 2 and 3 | Applicable | The site is located in the Atlantic Americas Migratory Flyway. If migratory birds, or their nests or eggs, are identified at the site, operations will not destroy the birds, nests, or eggs. |
| **Endangered Species Act 1978** | | | | | | |
| Endangered Species | Actions to protect endangered or threatened species and prevent adversely impacting critical habitat. | Presence of protected species or their critical habitat | 16 USC 1538(a)(1)(B) | 2 and 3 | Applicable | Several endangered species and critical habitat have been identified within UXO-15. If protected species are present at the site during the response action, steps will be taken to prevent adverse impacts. Activities will avoid identified critical habitat areas or, if they cannot be avoided, actions resulting in permanent impact will be avoided. |
| **Archaeological Resources Protection Act of 1979** | | | | | | |
| Locations of Archaeological Significance | Provides for the preservation of historically and archaeologically significant artifacts. | Applies to archaeological sites and artifacts. | 16 USC 470ee(a) | 2 and 3 | Applicable | The lighthouse within the project site is a cultural resource. Activities will avoid the lighthouse to the maximum extent practical. Activities performed on-site and in compliance with CERCLA are not subject to permits or administrative review; however, the substantive requirements of a permit to disturb these sites will be met if they cannot be avoided. |

Table 1(d)
**Puerto Rico Location-Specific ARARs**
*UXO-15 EE/CA*
*Vieques, Puerto Rico*

| Location | Requirement | Prerequisite | Citation | Alternative | ARAR Determination | Comment |
|---|---|---|---|---|---|---|
| No Puerto Rico Location-Specific ARARs apply. | | | | | | |

Table 1(e)
**Federal Action-Specific ARARs**
*UXO-15 EE/CA*
*Vieques, Puerto Rico*

| Action | Requirement | Prerequisite | Citation | Alternative | ARAR Determination | Comment |
|---|---|---|---|---|---|---|
| Performing activities that will disturb greater than one acre of land | Requires the development and implementation of best management practices and erosion and sedimentation control measures during construction activity. | Implementation of construction activities that will disturb more than one acre of land | one to five acres: 40 CFR 122.26(a)(1)(ii), (a)(9)(i)(b), (b)(15); 122.44(k)(2) and (s)(1)<br><br>five acres or more: 40 CFR 122.26(a)(1)(ii), (a)(9)(i)(b), (b)(14)(x); 122.44(k)(2) and (s)(2) | 2 and 3 | Applicable | If the selected remedy disturbs greater than, or equal to, one acre of land a Storm Water Pollution Prevention Plan will be prepared and implemented. Since activities are taking place onsite and in compliance with CERCLA, the substantive requirements will be met, but a permit will not be required. |
| Management of military munitions | Specifies management requirements for those military munitions that are no longer exempt from the definition of solid waste | Management of unused military munitions that have been disposed of or fired/used military munitions that have been removed from the range. | 40 CFR 266.202(b) and (c) ; 205 (a) and (b) | 2 and 3 | Applicable | All NTCRA activities will be conducted practicing avoidance techniques. Therefore, no military munitions will be managed as part of the NTCRA. However, if munitions are incidentally encountered during the NTCRA, the management regulations will be followed. |

Table 1(f)
**Puerto Rico Action-Specific ARARs**
*UXO-15 EE/CA*
*Vieques, Puerto Rico*

| Action | Requirement | Prerequisite | Citation | Alternative | ARAR Determination | Comment |
|---|---|---|---|---|---|---|
| Land disturbance | A Control of Erosion and Sediment (CES) Plan and a Work Plan must be prepared for any activities that involve the alteration of ground or soil conditions that have not been specifically excluded. | Disturbance of more than 40 cubic meters of soil during construction activity | Puerto Rico Regulation 5754.1230(B), (C) | 2 and 3 | Applicable | Disturbing more than 40 cubic meters of soil is unlikely; however, a CES and Work Plan will be prepared for this activity if disturbance threshold is exceeded. |
| Production of Fugitive Dust | Dust control measures must be implemented during construction activities to prevent emissions beyond the property boundary. These include, but are not limited to, the use of water or other chemicals on road ways to control dust, covering haul trucks, and cleaning tracked soil off of paved roads | Construction activity causing particulate matter to become airborne | Puerto Rico Regulation 5300.404(A)(2), (4), (7); (B) | 2 and 3 | Applicable | Applicable to activities that produce fugitive dust. Dust control measures will be implemented. |
| Performing construction activities that generate noise | No construction activity may be performed at night or in such a way that vibrations are produced that can be felt beyond the property boundary. If equipment used in construction is not manufactured in accordance with USEPA standards for newly manufactured equipment then it may not produce noise that exceeds 70 dBA. | Construction activity including earthwork | Puerto Rico Regulation 3418.3.1.5(A),(C);3.1.10; 3.1.13; and 4.1 | 2 and 3 | Applicable | The site is considered to be in Zone II (Commercial) for noise production. Noise pollution during MEC clearance and demolition, and earthwork activities will be prevented. |
| Management of non-hazardous solid waste onsite in containers and piles | Non-hazardous solid waste staged onsite must not create a hazard or public nuisance. | Generation of non-hazardous solid waste that is managed onsite in containers or in piles. | Puerto Rico Non-Hazardous Solid Waste Regulation 531.H | 2 and 3 | Applicable | The generation of non-hazardous solid wastes are not anticipated during this NTCRA. |

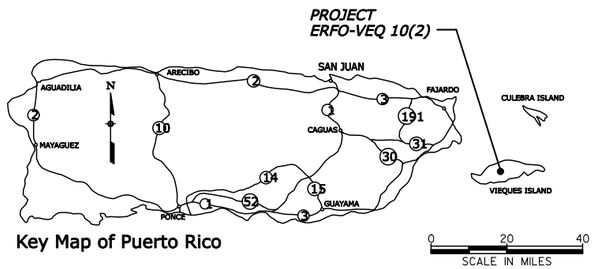
# Appendix B
# USFWS Road Repair Plans

| REG | STATE | PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|
| SE | PR | ERFO-VEQ 10(2) | A1 | 114+164 |

# U.S. DEPARTMENT OF THE INTERIOR

## FISH AND WILDLIFE SERVICE

## VIEQUES NATIONAL WILDLIFE REFUGE



Key Map of Puerto Rico

PLANS FOR PROPOSED

# PROJECT ERFO-VEQ 10(2)

THE PROJECT CONSISTS OF THE REPAIR OF EXISTING AGGREGATE SURFACED ROADS AND DRAINAGE FEATURES WITHIN THE VIEQUES NATIONAL WILDLIFE REFUGE.

**VIEQUES, PUERTO RICO**

## INDEX TO SHEETS


| SHEET NO | DESCRIPTION |
|---|---|
| A1 | Title Sheet |
| A2 | Symbols And Abbreviations |
| A3-4 | Location Map |
| A5-18 | Survey Information Sheet |
| B1 | Typical Section |
| C1-11 | Tabulation of Quantities, Schedules and Summaries |
| D1-D10 | Plans And Profiles and Drainage Cross Sections Rte 104 |
| E1-E10 | Plans And Profiles and Drainage Cross Sections Rte 103 |
| F1-F7 | Plans And Profiles and Drainage Cross Sections Rte 102 |
| G1-G13 | Plans And Profiles and Drainage Cross Sections Rte 011 |
| H1-H8 | Plans And Profiles and Drainage Cross Sections Rte 012 |
| K1-K17 | Plans And Profiles and Drainage Cross Sections Rte 109 |
| M1-3 | Erosion Control Narrative |
| N1-3 | Traffic Control Plans |
| S1-S13 | Standards And Details |
| T1-T25 | Roadway Cross Sections Rte 104 |
| U1-U22 | Roadway Cross Sections Rte 103 |
| V1-V16 | Roadway Cross Sections Rte 102 |
| W1-W33 | Roadway Cross Sections Rte 011 |
| X1-X23 | Roadway Cross Sections Rte 012 |
| Y1-Y45 | Roadway Cross Sections Rte 109 |


## DESCRIPTION OF PROJECT

**IMPROVEMENT:** Rehabilitation and drainage improvements

**PROJECT LENGTH:** 11.76 Miles (+ 1.06 Miles Access only)

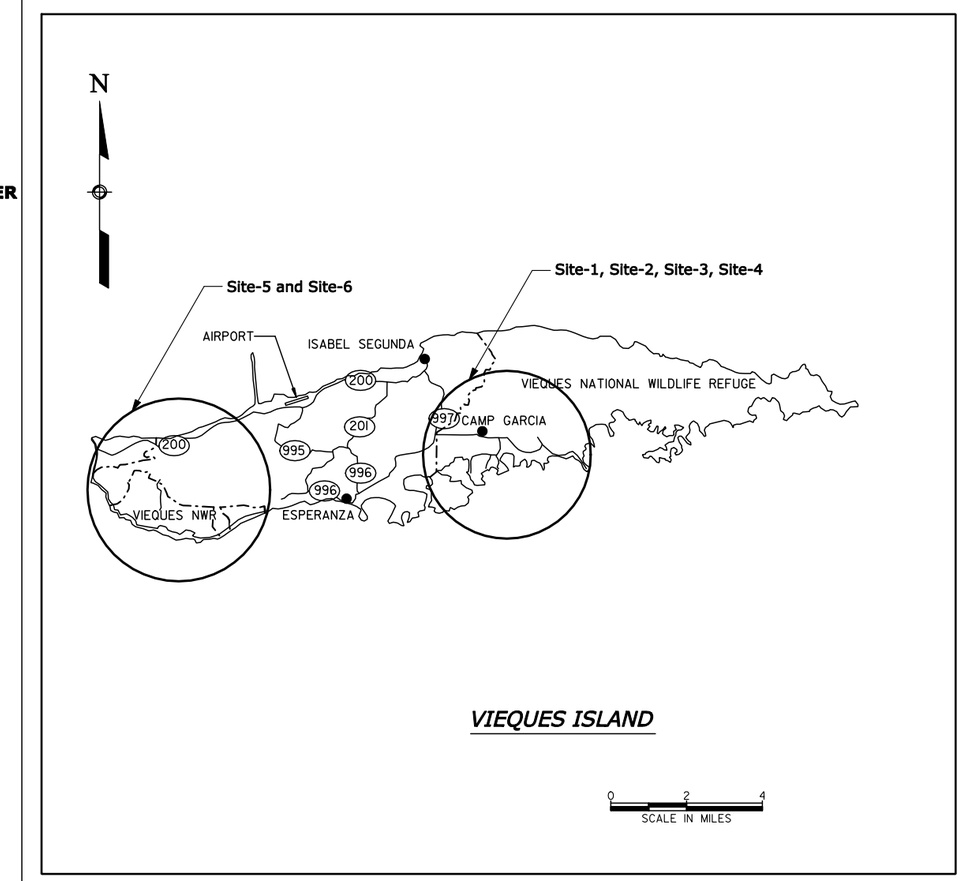
| ROAD | LENGTH | WIDTH | SITE | SAMMS ASSET NUMBER |
|---|---|---|---|---|
| Rte 104 - Blue Beach Rd. (La Chiva Rd.) | 1.68 Miles | 12' | 1 | 10050015 |
| Rte 103 | 1.63 Miles | 12' | 2 | 10050014 |
| Rte 102 - Puerto Ferro Beach Rd. (Bahia Puerto Ferro Rd.) | 1.29 Miles | 12' | 3 | 10050010 |
| Rte 011 - Lighthouse Rd. (Puerto Ferro Peninsula Rd.) | 2.47 Miles | 15' | 4 | 10050056 |
| Rte 012 - Punta Arenas Rd. | 1.69 Miles | 15' | 5 | 10040183 |
| Rte 109 - Laguna Playa Grande Rd. | 3.00 Miles | 13' | 6 | 10055546 |
| (Rte 109 Repair for Access only | 1.06 Miles | | | 10055547 |

**DESIGN DESIGNATION:**

| | |
|---|---|
| ADT (2007) | 100 |
| ADT (2027) | 190 |
| D | 50/50 |
| V (MPH) | 25 |
| e(max) | 4% |

**SPECIFICATIONS:**

"Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects", FP-03 U.S.Customary Units.




# 100% SUBMISSION

**PLANS PREPARED BY**

U.S. Department of Transportation
Federal Highway Administration

EASTERN FEDERAL LANDS HIGHWAY DIVISION
STERLING, VIRGINIA
JUNE, 2007

**DISASTER NO. PR2004-2-FWS**

| PROJECT MANAGER | LEAD DESIGNER |
|---|---|
| D. Madlansacay | J. Fife |

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| REG | STATE | PROJECT | SHEET NO. |
|---|---|---|---|
| SE | PR | ERFO-VEQ 10(2) | A2 |

| | |
|---|---|
| Abutment | Abut. |
| Aggregate | aggr. |
| Ahead | AH |
| Alternate | alt. |
| Average daily traffic | ADT |
| Back | BK |
| Balance point | BP |
| Bearing | brg. |
| Begining | beg. |
| Bench mark | BM |
| Centerline | |
| Center to center | cc, c-c or c. to c. |
| Centers | ctrs. |
| Clear | clr. |
| Column | col. |
| Connection | conn. |
| Construction joint | Constr. jt. |
| Continuous | cont. |
| Corrugated metal pipe | CMP |
| Culvert | culv. |
| Curve centeral angle (spiral curve transitions) | $\Delta_c$ |
| Curve total angle (curve delta or deflection) | $\Delta$ |
| Design hourly volume | DHV |
| Design speed | V |
| Diagonal | diag. |
| Diameter | D, dia., or |
| Diaphragm | diaph. |
| Distance | dist. |
| Drawing(s) | dwg(s), or drwg(s) |
| Drop Inlet | DI |
| East | E |
| Edge of pavement | EP or EOP |
| Elevation | elev. |
| Elevation with number | El. 94.161 [El. 94.16] |
| Embankment | emb. |
| End section | ES |
| Equation | EQ or eq. |
| Excavation | exc. |
| Expansion joint | exp. jt. |
| Finish | fin. |
| Flange | flg. |
| Footing | ftg. |
| Galvanized | galv. |
| Gage(gauge) | ga. |
| Headwall | hdwl. |
| Hexagon | hex. |
| High water | HW |
| Inside diameter | ID |
| Joint | jt. |
| Lamination | lam. |
| Latitude | lat. |
| Left | lt., Lt. or LT |
| Length of curve(simple curve) | L |
| Length of curve (spiral curve transision) | Lc |
| Length of spiral | Ls |
| Longitudinal(longitude) | long. |
| Low water | LW |

| | |
|---|---|
| Mainline | M.L. |
| Material | matl. |
| Maximum | max. |
| Mile[Kilometer] post | M.P[K.P.] |
| Minimum | min. |
| Monument | mon. |
| Mechanically stabilized embankment | MSE |
| Original groung | OG |
| Out to out | o. to o. |
| Outside diameter | OD |
| On centers | o. c. |
| Normal crown | NC or NCR |
| North | N |
| Pavement | pvmt. |
| Plate | pl. |
| Point of compound curve | PCC |
| Point of curve | PC |
| Point of curve to spiral | PCS or CS |
| Point of intersection | PI |
| Point of spiral to curve | PSC or SC |
| Point of spiral to reverse spiral | SRS |
| Point of spiral to tangent | PST or ST |
| Point of tangent | PT |
| Point of tangent to spiral | PS or TS |
| Point on curve | POC |
| Point on spiral | POS |
| Point on tangent | POT |
| Radius | R |
| Range | R. |
| Reinforcement (reinforced) | reinf. |
| Required | reqd. |
| Right | Rt., rt.or RT |
| Right-of-way | R/W |
| Roadway | Rdwy. |
| Route | Rte. |
| Section | Sec. |
| South | S |
| Spacing, spaces or spaced | spa. |
| Spiral central angle | s |
| Standard | std. |
| Station | Sta. |
| Stiffener | stiff. |
| Stringer | stgr. |
| Structure | struc. |
| Superelevation rate | e |
| Symmetrical | sym. |
| Tangent distance (tangent length) | T |
| Tangent distance (spiral curve transision) | Ts |
| Temporary benchmark | TBM |
| Temporary construction easement | TCE |
| Thread | thd. |
| Township | T. |
| Typical | typ. |
| Vehicle per hour | vph |
| Vertical point of intersection | VPI |
| West | W |

NATIONAL BOUNDARY
STATE BOUNDARY
COUNTY BOUNDARY
CITY BOUNDARY
TOWNSHIP or RANGE LINE
SECTION LINE
¼ SECTION LINE
1/16 SECTION LINE
NATIONAL PARK or FOREST BOUNDARY
PROPERTY LINE — P/L
TRAVERSE POINT (Horizontal & Vertical) Top of Triangle Points North — T-45 2,645.9
TRAVERSE POINT (Horizontal) — T-3
BRASS CAP
STEEL PIN
HUB & TACK
SPOT ELEVATION — x 99.9
COORDINATE GRID TICK

| | EXISTING | PROPOSED |
|---|---|---|
| RIGHT-OF-WAY LINE | R/W | R/W |
| RIGHT-OF-WAY LINE with MONUMENT | R/W | R/W |
| SECTION CORNER | FOUND 36 31 1 6 | PROJECTED 36 31 1 6 |
| ¼ SECTION CORNER | 15 22 | 15 22 |
| 1/16 SECTION | | |
| PROPERTY CORNER | | No Symbol |
| PARCEL NUMBER | No Symbol | 400 |
| EASEMENT (Permanent - Construction) | P/E | C/E |
| ROUTE NUMBERS | 26 INTERSTATE | 25 U.S. / 694 STATE |

SLOPE STAKE — TOP OF CUT / TOE OF FILL / TRANSITION
ROADWAY, EXISTING
RAILROAD — SINGLE TRACK / MULTIPLE TRACK
TRAIL
INTERMITTENT DRAINAGE/ SMALL CREEK
SPRING
LARGE CREEK/RIVER
LAKE, POND or RESERVOIR; MARSHLAND
PAVEMENT REMOVAL/ROADWAY OBLITERATION
FULL DEPTH PAVEMENT
SIDEWALK ASPHALT/CONCRETE
MILL AND OVERLAY
OVERLAY
SILT FENCE — SF
DIVERSION BERM — DB
DIVERSION CHANNEL
CHECK DAM
RIPRAP/CULVERT RIPRAP
BORING LOCATION — B-1
TEST PIT — TP-1
NORTH ARROW — N
MATERIAL SOURCE

AREA PATTERN

| | EXISTING | PROPOSED |
|---|---|---|
| FENCE | X X | XX XX |
| GATE with FENCE | X X | XX XX |
| CATTLEGUARD | | |
| GUARDRAIL | | |
| MEDIAN & SIDE (CONCRETE) BARRIER | | |
| SIGNS — POST MOUNTED | | |
| SIGNS — PORTABLE | No Symbol | |
| RETAINING WALL | | wall face |
| OVERHEAD(POWER POLE) UTILITIES P=Electrical for transmission line E=Electrical for distribution line T=Telephone, E&T=Joint Electrical and Telephone FO=Fibre optics | P | P |
| SUPPORT POLE with ANCHOR | | |
| TELEPHONE BOOTH or PEDESTAL | TB or TP | TB or TP |
| STREET LIGHT | or | or |
| UNDERGROUND UTILITIES G=gas, O=oil, P=power, SA=sanitary sewer, SS=storm sewer, T=telephone, W=water E=electrical, FO=fibre optics | W | W |
| BRIDGE | | |
| PIPE CULVERT (arrow shows flow) | | |
| PIPE CULVERT with END SECTION | | |
| PIPE CULVERT with HEADWALL | | |
| CULVERT with DROP INLET | | |
| BOX CULVERT | | |
| UNDERDRAIN | UD | UD |
| BUILDING | | |
| TREELINE; TREE | | |

PROJECT SPECIFIC SYMBOLS AND ABBREVIATIONS:-

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
EASTERN FEDERAL LANDS HIGHWAY DIVISION
STERLING, VIRGINIA

**VIEQUES FISH AND WILDLIFE REFUGE**

# SYMBOLS AND ABBREVIATIONS

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| REG | STATE | PROJECT | SHEET NO. |
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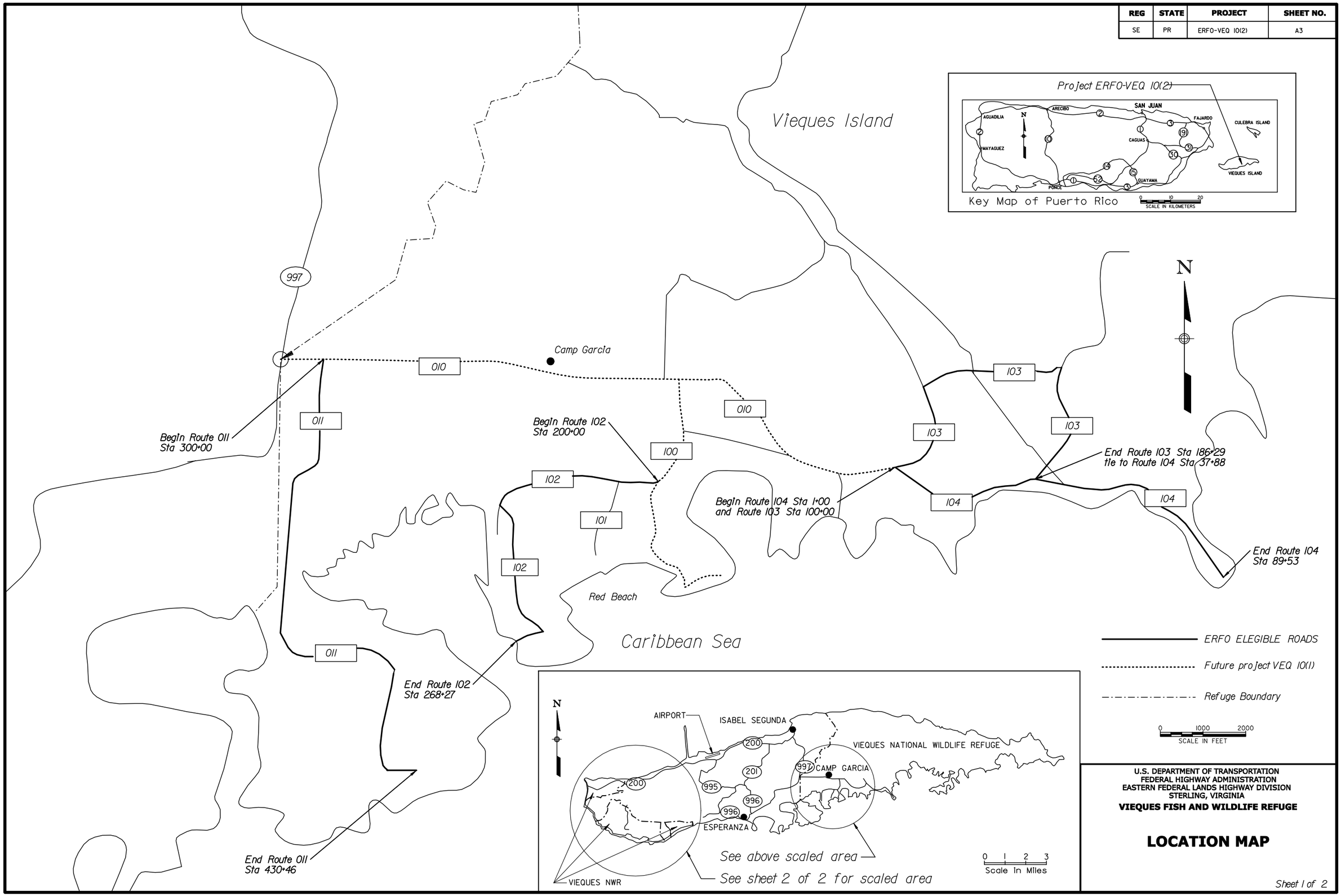
| SE | PR | ERFO-VEQ 10(2) | A3 |




U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
EASTERN FEDERAL LANDS HIGHWAY DIVISION
STERLING, VIRGINIA

**VIEQUES FISH AND WILDLIFE REFUGE**

# LOCATION MAP

Sheet 1 of 2

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| REG | STATE | PROJECT | SHEET NO. |
|---|---|---|---|
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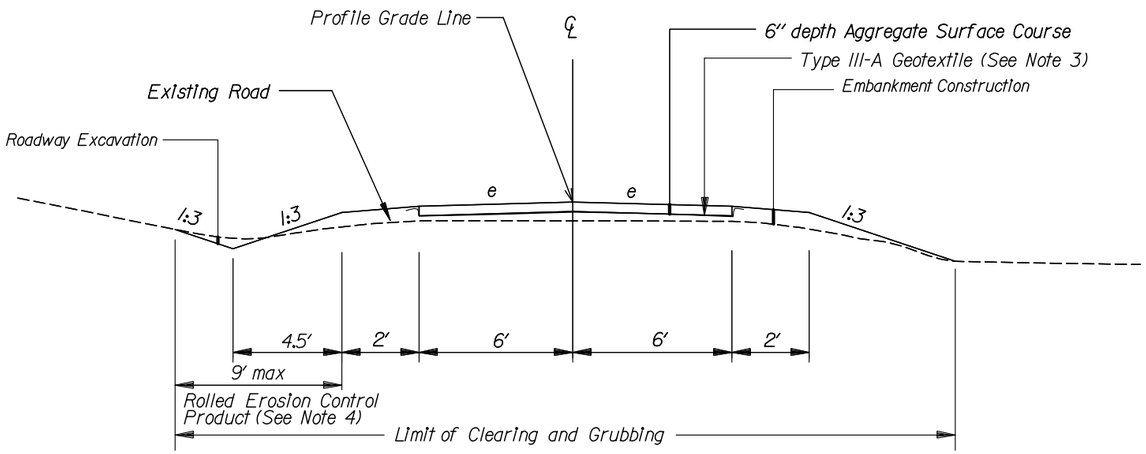
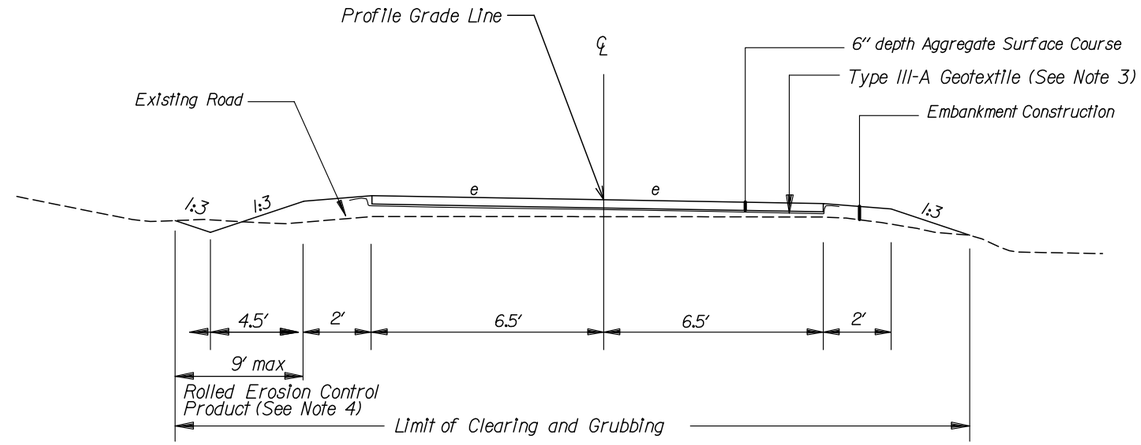



RTE.104 - Blue Beach Road (Sta.1+00 to 89+53)

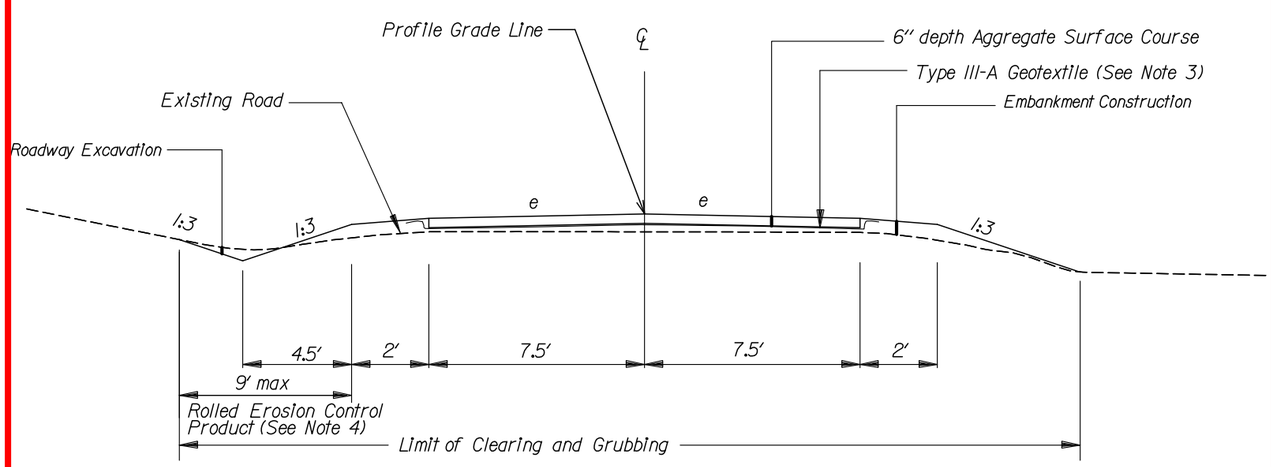
RTE.102 - Puerto Ferro Beach Road (Sta.200+00 to 245+00)

RTE.103 - (Sta.100+00 to 186+29)



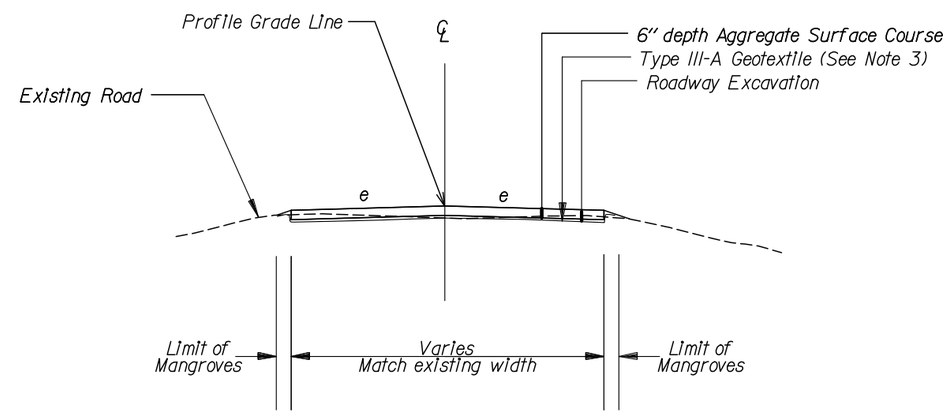

RTE.109 - Playa Grande Road (Sta.600+00 to 773+11)

Road design applicable for Route 011 (road to lighthouse)




RTE.012 - Punta Arena Road (Sta.500+00 to 521+00) (See Note 1)

RTE.011 - Light House Road (Sta.300+00 to 430+46)




Typical Section near Mangroves (See Note 2)

RTE.102 - Puerto Ferro Beach Road (Sta.245+00 to 268+27)

RTE.012 - Punta Arena Road (Sta.521+00 to 589+34)

Notes:

1. Contact utility companies to mark underground utilities prior to digging.
2. Do not disturb Mangroves.
3. See Earthwork Summary for location of Geotextile.
4. See Soil Erosion Control Summary and Detail 629-A for placement of Rolled Erosion Control Product.

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
EASTERN FEDERAL LANDS HIGHWAY DIVISION
STERLING, VIRGINIA

**VIEQUES FISH AND WILDLIFE REFUGE**

# TYPICAL SECTIONS

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