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FINAL UNEXPLODED ORDNANCE 16 (UXO 16) NEARSHORE MUNITIONS NON TIME CRITICAL REMOVAL ACTION WORK PLAN ATLANTIC FLEET TRAINING AREA, FORMER NAVAL AMMUNITION SUPPORT DETACHMENT AND FORMER VIEQUES NAVAL TRAINING RANGE VIEQUES PUERTO RICO

08/01/2018

CH2M HILL

Atlantic
Norfolk, Virginia

Final

UXO 16 Nearshore Munitions Non-Time-Critical Removal Action Work Plan

Atlantic Fleet Weapons Training Area – Vieques
Former Naval Ammunition Support Detachment and
Former Vieques Naval Training Range
Vieques, Puerto Rico

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Vieques, Puerto Rico

August 2018

Prepared for NAVFAC Atlantic
by CH2M HILL, Inc.
Virginia Beach, Virginia
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Executive Summary

This Work Plan presents the approach for a non-time-critical removal action (NTCRA) to reduce the explosive hazard associated with munitions and explosives of concern (MEC) and material potentially presenting an explosive hazard (MPPEH) within the nearshore environment of UXO 16, at the former Naval Ammunition Support Detachment (NASD) and former Vieques Naval Training Range (VNTR) in Vieques, Puerto Rico. The NTCRA is intended to reduce the potential explosive hazard associated with individual MEC/MPPEH identified within the nearshore environment of UXO 16, in areas known or expected to be used for recreational/commercial activities such as swimming, snorkeling, diving, boating, or fishing, while UXO 16 as a whole continues its Remedial Investigation (RI) and the remainder of the full Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. Since this NTCRA is only an interim removal action, 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 remedial alternatives for the site as a whole.

Munitions considered for removal will first be evaluated via reconnaissance to determine if each item is indeed munitions and if the item and surroundings are conducive for its removal under the NTCRA. Each munition will be removed if they meet the following guidelines:

- The item is safe to move
- The item's removal is not exceedingly complex for the resources available under the NTCRA
- The item's removal will have no deleterious effect on federally listed threatened or endangered species or sensitive habitat, or approved mitigation measures can be readily implemented

For each item determined to be acceptable to remove, a determination of the removal approach will be made, which will include hand removal (when acceptable) or remote methods (lift bag or tripod method). Once removed, the MEC/MPPEH will be transported to an approved disposal area within the former VNTR to be destroyed using the open detonation practices currently followed for terrestrial munitions response activities on Vieques.

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.

Resumen Ejecutivo

Este Plan de Trabajo presenta el enfoque para una acción de remoción de tiempo no crítico (NTCRA, por sus siglas en inglés) para reducir el peligro de explosión asociado con municiones y explosivos de preocupación (MEC, por sus siglas en inglés) y el material que potencialmente presenta un peligro de explosión (MPPEH, por sus siglas en inglés), dentro del entorno de la costa de UXO 16, en el antiguo Destacamento de Apoyo a Municiones Navales (NASD, por sus siglas en inglés) y en el antiguo Campo de Adiestramiento Naval de Vieques (VNTR, por sus siglas en inglés) en Vieques, Puerto Rico. El objetivo de la NTCRA es reducir el peligro potencial de explosión asociado con los MEC/MPPEH individuales que se han identificado dentro del entorno cercano a la costa del UXO 16, en áreas donde se conoce, o que se espera que se utilicen para actividades recreativas/comerciales como natación, buceo de superficie, buceo, paseos en bote o pesca, mientras que UXO 16, como un todo, continúa con su Investigación para la Remediación (RI, por sus siglas en inglés) y sigue el resto del proceso completo de la Ley Abarcadora de Respuesta, Compensación y Responsabilidad Ambiental (CERCLA, por sus siglas en inglés). Como esta NTCRA es sólo una acción de remoción provisional, el proceso completo de CERCLA continuará evaluando la naturaleza y el alcance de la contaminación, los riesgos potenciales para la salud humana y el ambiente, y desarrollará y evaluará alternativas de remediación para el sitio en conjunto.

Las municiones que se consideren para moverse serán inicialmente evaluadas a través de un reconocimiento inicial para determinar si cada objeto es de hecho una munición, y si el objeto y su entorno son propicios para su remoción con el NTCRA. Se removerá cada munición si se cumplen las siguientes pautas:

- Se puede mover el objeto de manera segura
- La remoción del objeto no es demasiado compleja para los recursos disponibles bajo la NTCRA
- La remoción del objeto no tendría un efecto nocivo sobre especies amenazadas o en peligro de extinción que están en la lista federal o en hábitats sensibles, o las medidas de mitigación aprobadas se pueden implementar fácilmente.

Para cada objeto que se determine es aceptable su remoción, se realizará una determinación del enfoque de la remoción, que incluirá una extracción manual (cuando sea aceptable) o métodos remotos (bolsa de suspensión o método de trípode). Una vez se remueva el MEC/MPPEH, éste se transportará a un área de disposición aprobada dentro del antiguo VNTR para ser destruido usando las prácticas de detonación abierta que actualmente se están siguiendo durante las actividades de respuesta a municiones terrestres en Vieques.

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.

Contents

Acronyms and Abbreviations

AFWTA	Atlantic Fleet Weapons Training Area
AMS	aerial magnetometer survey
BRS	Bomb Recovery System
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-term Environmental Action—Navy
CSM	conceptual site model
DFOW	definable feature of work
DPS	distinct population segment
DQO	data quality objective
EADA	elevated anomaly density area
ECA	Eastern Conservation Area
EMA	Eastern Maneuver Area
EOD	explosive ordnance disposal
EPA	Environmental Protection Agency
ERP	Environmental Restoration Program
ESS	Explosives Safety Submission
EZ	Exclusion Zone
FS	Feasibility Study
GPS	global positioning system
km	kilometer(s)
lb	pound(s)
LIA	Live Impact Area
m	meter(s)
MEC	munitions and explosives of concern
mm	millimeter(s)
MPPEH	material potentially presenting an explosive hazard
MRS	Munitions Response Site
NASD	Naval Ammunition Support Detachment
NAVFAC	Naval Facilities Engineering Command
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NTCRA	Non-Time-Critical Removal Action
OB/OD	open burn/open detonation
PRDNER	Puerto Rico Department of Natural and Environmental Resources
PREQB	Puerto Rico Environmental Quality Board
QA	quality assurance
QC	quality control
RAO	removal action objective
RI	Remedial Investigation
ROV	remotely operated vehicle

SCUBA	self-contained underwater breathing apparatus
SIA	Surface Impact Area
SOP	Standard Operating Procedure
SUXOS	Senior UXO Supervisor
SWMU	Solid Waste Management Unit
UAV	unmanned aerial vehicle
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
UXO	unexploded ordnance
UXOQCS	UXO Quality Control Specialist
UXOSO	UXO Safety Officer
VNTR	Vieques Naval Training Range
WAA	Wide Area Assessment

SECTION 1

Introduction

This Work Plan presents the approach for a non-time-critical removal action (NTCRA) to reduce the explosive hazard associated with munitions and explosives of concern (MEC) and material potentially presenting an explosive hazard (MPPEH) within the nearshore environment of UXO 16, at the former Naval Ammunition Support Detachment (NASD) and former Vieques Naval Training Range (VNTR) in Vieques, Puerto Rico (**Figures 1-1** and **1-2**).

This document was prepared under the Naval Facilities Engineering Command (NAVFAC) Atlantic, Comprehensive Long-term Environmental Action—Navy (CLEAN) 9000 Contract N62470-16-D-9000, Contract Task Order 0004, for submittal to NAVFAC, the Environmental Protection Agency (EPA) Region 2, the Commonwealth of Puerto Rico Environmental Quality Board (PREQB), the Commonwealth of Puerto Rico Department of Natural and Environmental Resources (PRDNER), and the United States Fish and Wildlife Service (USFWS). NAVFAC, EPA, PREQB, PRDNER, and USFWS work jointly to implement the Vieques Environmental Restoration Program (ERP). In addition, because UXO 16 includes offshore areas of Vieques, this NTCRA includes coordination with the National Marine Fisheries Service (NMFS).

1.1 Objective

Because portions of UXO 16, especially the nearshore areas, are known or expected to be used for recreational/commercial activities such as swimming, snorkeling, diving, boating, or fishing, the removal action objective (RAO) of this NTCRA is as follows:

- Reduce the potential explosive hazard associated with individual MEC/MPPEH identified within the nearshore environment of UXO 16 while UXO 16 as a whole continues through the full Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process.

“Nearshore” is not exact; for the purposes of the NTCRA, it is defined as the areas adjacent to the shoreline where MEC/MPPEH can be observed and/or encountered by boaters/swimmers/divers using or likely to use the areas. It is important to note that it is not necessary to remove all nearshore munitions nor any particular item in order to satisfy the NTCRA objective. Removal of any MEC/MPPEH incrementally reduces the explosive hazard. Therefore, the decision whether or not to conduct a removal action on any identified MEC/MPPEH will be based on a number of criteria, such as known or potential use, water depths, potential natural resources impact during removal operations, etc. A more detailed listing of the selection criteria is provided in Section 2.1. Based on this, the removal area may extend several hundred yards offshore.

As noted previously, there is no intention to remove all known underwater munitions as part of the interim action. However, additional underwater munitions not removed during the interim action may be removed at a later date, depending on the final remedy selected for UXO 16. The objective is to expeditiously reduce the explosive hazard of munitions that may be readily observable or accessible while UXO 16 as a whole continues through the full CERCLA process. However, the interim action is intended to ultimately support the final remedy selection for the site via the full CERCLA process.

Munitions considered for removal will first be evaluated via reconnaissance to determine if each item is indeed munitions and if the item and surroundings are conducive for its removal under the NTCRA. Reconnaissance may include use of underwater video/photographs of potential items to be removed utilizing remotely operated vehicles (ROVs)/pole mounted cameras to help determine if an item can/should be removed. If underwater video/photographs utilizing ROVs/pole mounted cameras do not provide the level of detail necessary to determine if removal can/should be completed, divers may be used to inspect an item to help make the determination. Further, if additional munitions are observed near each “target” item, they will be evaluated for removal at the same time. Chemical constituent characterization will not be part of this NTCRA, but will be

considered as part of the UXO 16 Remedial Investigation (RI), as warranted. For any item not identified for removal, the item location and reason for leaving it in place will be documented.

1.2 Site Background

Vieques is located in the Caribbean Sea approximately 7 miles southeast of the eastern tip of the main island of Puerto Rico and 20 miles southwest of St. Thomas, United States Virgin Islands (**Figure 1-1**). It is approximately 20 miles long and 4.5 miles wide, and has an area of approximately 33,088 acres (51 square miles).

The Navy purchased large portions of Vieques in the early 1940s to conduct activities related to military training. The Atlantic Fleet Weapons Training Area (AFWTA) was historically divided into two portions – the NASD and VNTR. Site operations on the western end of Vieques (former NASD), consisted mainly of ammunition loading and storage, vehicle and facility maintenance, and open burn/open detonation (OB/OD). The eastern end of Vieques (former VNTR) was used for various aspects of naval gunfire training, including air-to-ground ordnance delivery and amphibious landings, as well as housing the main base of operations for these activities, Camp Garcia.

1.2.1 Former NASD and VNTR

The former NASD includes Solid Waste Management Unit (SWMU) 4, which was formerly used as an OB/OD area for the thermal destruction and open detonation of retrograde and surplus munitions, fuels, and propellants from 1969 through 1979, and may have periodically been used as far back as the late 1940s (CH2M, 2012). An explosive arc (maximum projected extent of MEC/MPPEH) extends radially 2,500 feet from the center of the historical OB/OD area; the offshore portion of the arc is part of UXO 16 (**Figures 1-2 and 1-3**).

The former VNTR consists of approximately 14,600 acres and is divided into four separate operational areas that from west to east comprise the 11,000-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), as shown in **Figures 1-2 and 1-4**.

- EMA – established in 1947 to provide military maneuvering areas and ranges for training in amphibious landings, small arms fire, artillery and tank fire, shore fire control, and combat engineering tasks. The ranges located in the northern portion of the EMA were used for the following activities: small arms ranges (Range 1 and 2), rifle grenade range (Range 3), rocket range (Range 4), and grenade range (Range 5).
- SIA – established in the 1950s when several Marine artillery targets were constructed; in 1969, a bullseye target was constructed and used for inert bombing.
- LIA – established in 1965, where several targets were maintained for aerial bombing including old tanks and vehicles, a simulated railroad tunnel, simulated ammunition dump, simulated fuel farm, a simulated airstrip, two simulated surface-to-air missile sites, and a strafing target; several point and area targets were used for ships to practice naval gunfire support; one bullseye target used for inert bombing; and an OB/OD area was used for treatment of retrograde ordnance and open burning of propellants and pyrotechnics.
- ECA – established as a conservation area and not used as an operational area for munitions; however, the site is located adjacent to the LIA.

1.2.2 UXO 16

UXO 16 comprises the waters surrounding the areas on the former VNTR and NASD where the Navy historically conducted operations (**Figure 1-2**). The historical site operations and the Naval gunfire support targets shown in **Figures 1-3 and 1-4** conceptually illustrate site operations (MEC/MPPEH sources and release mechanisms) and potentially impacted areas. The following summarizes each of the component areas of UXO 16.

Anchorage Areas (approximately 413 acres)

Navy ships containing munitions used during the training activities at the former AFWTA would temporarily anchor at three anchoring locations in the Vieques Passage and Vieques Sound while waiting to be unloaded (**Figure 1-2**). When the anchorage areas were operational, explosives in quantities no greater than 1,625 short tons were handled in any area at one time.

Each anchorage point was defined by the area in which the ammunition supply ship could rotate around a single anchorage point. Each anchorage area radius was established using the depth of water, the ship horizontal offset from its anchor line, the length of the largest ammunition supply ship, and a distance buffer from the designated anchorage point (NOSSA, 2004). The two westernmost anchorage areas were defined with a maximum radius of 440 yards and the other anchorage area with a maximum radius of 500 yards.

Mosquito Pier (approximately 60 acres)

Mosquito Pier was used for loading and unloading ordnance from Navy ships. This area includes a 100-foot radius around the perimeter of the pier to account for any munitions that may have been dropped during loading and unloading (**Figure 1-2**).

Offshore of SWMU 4 (approximately 196 acres)

The explosives safety arc of the OB/OD operations at SWMU 4 extends approximately 2,000 feet offshore to the west of the former OB/OD area; the offshore area is part of UXO 16 (**Figure 1-2**). Over 90 percent of the munitions recovered during investigation and interim actions within SWMU 4 were 20-millimeter (mm) projectiles. Significantly lower quantities of high explosive, low explosive, incendiary, white phosphorous, fuzes, and other munitions were also identified at SWMU 4. White phosphorous and incendiary munitions were not identified within UXO 16 adjacent to SWMU 4. This area is part of an ongoing RI/Feasibility Study (FS) and is therefore not included in this NTCRA.

Explosives Safety Arcs and Artillery Safety Fans adjacent to the Former VNTR (approximately 9,013 acres)

A series of explosives safety arcs and artillery safety fans associated with the historical ranges and gun emplacements were developed for the former VNTR as part of the Vieques Land Use Plan (Navy, 1999) and the Preliminary Range Assessment (NAVFAC, 2003). The safety fans provide an estimate of the lateral extent of the potential munitions impact area extending from the ranges and artillery gun positions. The areas where the explosives safety arcs and artillery safety fans extend offshore of the former VNTR are shown in **Figure 1-2**.

This area also includes documented water hits based on air-to-ground bombing and naval gunfire support rounds that were recorded by the Navy (Navy, 1999). From 1989 to 1999, a total of 811 munitions were observed entering the water. Following 1999, all air-to-ground bombing (25-pound [lb] practice bombs [MK76] to 1,000-lb bombs [MK83] and naval gunfire support rounds [5-inch projectiles]) were inert.

The marine artillery fans from former gun positions were based on 175-mm marine artillery fire (**Figure 1-4**). The area of the safety fans is based on historical ordnance use records and the projected safety fans documented in the Preliminary Range Assessment Report (NAVFAC, 2003).

Other Offshore Areas (approximately 1,185 acres)

As a conservative measure, all offshore areas to a depth of 10 feet surrounding the former VNTR (outside the explosives safety arcs and artillery safety fans) were included as part of UXO 16 (**Figure 1-2**). The majority of this area is contained within the safety arcs and fans described previously; outside of these areas, coverage is primarily along the southern portion of Vieques from Puerto Ferro to the eastern portion of Playa La Chiva (Blue Beach), as well as the eastern tip of the ECA. Encrusted munitions in the waters adjacent to Puerto Ferro (UXO 15) are planned to be removed under a separate NTCRA. Specific details associated with the scope of that work can be found in the Engineering Evaluation/Cost Analysis (CH2M, 2015a) and the NTCRA Work Plan (USAE, 2017) for UXO 15 PI 9 East and adjacent area of UXO 16.

Cayo La Chiva (approximately 36 acres)

Cayo La Chiva (UXO 18) is a 12-acre island located south of the EMA (**Figure 1-2**). A simulated machine gun nest was located on Cayo La Chiva during Operation Portrex conducted in 1950 (Sibert, 1993). No additional training activities are documented to have occurred in the UXO 18 area; however, fired 5-inch rockets were identified both on and offshore of Cayo La Chiva, which indicates the area may have been used for live fire training, albeit potentially in a single event. The offshore munitions were removed under a separate NTCRA. Specific details associated with the removal can be found in the After Action Report (CH2M, 2017).

1.2.3 Physical Characteristics

This subsection summarizes the physical characteristics of UXO 16 under typical conditions, including wind, bathymetry, tides, currents, benthic habitats, and waves; this information was obtained from three sources: Bauer et al. (2008), GMI (2005), and Morelock et al. (2014).

- The circulation patterns in the Greater Antilles region are dominated by the westward-directed North Equatorial Current. Nearshore currents are variable, with flood and ebb tidal currents varying in speed and directions in different areas. These currents are also influenced by the prevailing northeasterly trade winds and tidal flow (Bauer et al., 2008).
- The tides of the Caribbean Sea are mostly mixed, with two unequal occurrences of high and low water in each tidal day. Some areas exhibit primarily semi-diurnal tides and other areas are dominated by diurnal tides (Nanlal et al., 2012). At Isabel Segunda on the north side of the island, the mean tidal range is 0.25 meters (m) and the diurnal tide range is 0.38 m. Esperanza on the south side of Vieques exhibits a mean tidal range of 0.21 m and a diurnal range of 0.22 m.
- The bathymetry around Vieques differs markedly between the north and south shore (**Figure 1-5**). North of the island, the seafloor is generally uniform and shallow, interrupted only by patch reefs and a sand and gravel shoal denoted as the Escollo de Arenas on the northwestern end of the island. The seafloor in this area slopes gently from the shore to a depth of approximately 50 feet, with a broad 80-foot deep shelf that extends to the north and west. The south side of Vieques is characterized by numerous small inlets and lagoons, an east-west trending reef (depth of 50 to 65 feet), and a relatively steep shelf slope drop-off toward the Caribbean Sea between 2 and 5 kilometers (km) from the shoreline (to depths over 3,000 feet). The majority of UXO 16 is less than 60 feet deep, with the deepest portion approximately 80 feet within the northern portion of the site.
- Water visibility in the area is generally clear, but can be affected by sea conditions.
- The National Oceanic and Atmospheric Administration (NOAA) conducted benthic habitat mapping of the waters surrounding Vieques in 2009 (**Figures 1-6 through 1-9**) (Bauer and Kendall, 2010). Seagrass communities, which are generally limited to shallow depths and protected, low-energy regions, are widespread northwest of Vieques where depth is shallow and conditions are relatively calm. In contrast, hard bottom habitats are typified by higher topographic complexity than seagrass and other soft bottom habitats.

1.2.4 Listed Species and Sensitive Habitats

Threatened and endangered species (for example, elkhorn coral) and critical habitats exist within UXO 16. The following federally listed species have the potential to occur in the Munitions Response Site (MRS):

- Sea Turtles
  - Hawksbill sea turtle (*Eretmochelys imbricata*) - Endangered
  - Green sea turtle (*Chelonia mydas*), North and South Atlantic distinct population segments (DPSs) - Threatened
  - Leatherback sea turtle (*Dermochelys coriacea*) - Endangered

  - Loggerhead sea turtle (*Caretta caretta*), Northwest Atlantic DPS - Threatened
- Corals
  - Elkhorn coral (*Acropora palmata*) - Threatened
  - Staghorn coral (*Acropora cervicornis*) - Threatened
  - Pillar Coral (*Dendrogyra cylindrus*) - Threatened
  - Rough Cactus Coral (*Mycetophyllia ferox*) - Threatened
  - Lobed Star Coral (*Orbicella annularis*) - Threatened
  - Mountainous Star Coral (*Orbicella faveolata*) - Threatened
  - Boulder Star Coral (*Orbicella franksi*) - Threatened
- Marine Mammals
  - West Indian manatee (*Trichechus manatus*) - Threatened (downlisted from Endangered on March 30, 2017)
  - Fin whale (*Balaenoptera physalus*) - Endangered
  - Sei whale (*Balaenoptera borealis*) - Endangered
  - Sperm whale (*Physeter microcephalus*) - Endangered
  - Blue whale (*Balaenoptera musculus*) - Endangered
- Marine Fish
  - Nassau grouper (*Epinephelus striatus*) - Threatened
  - Scalloped Hammerhead Shark (*Sphyrna lewinii*), Central and Southwest Atlantic DPS - Threatened
  - Giant manta ray (*Manta birostris*) - proposed as Threatened (January 12, 2017)
  - Oceanic whitetip shark (*Carcharhinus longimanus*) - proposed as Threatened (December 29, 2016)
- Critical Habitat
  - Critical habitat is established for elkhorn coral and staghorn coral, and includes all areas surrounding the islands of the Commonwealth of Puerto Rico (which includes Vieques), 98 feet (30 m) in depth and shallower. Critical habitat for these species also includes having the essential feature of substrate of suitable quality and availability (that is, natural consolidated hard substrate or dead coral skeleton free from algal or sediment cover) to support larval settlement and recruitment, and reattachment and recruitment of asexual fragments.

The Standard Operating Procedures (SOPs) that will be implemented during the NTCRA for the protection of federally listed species and sensitive habitat are provided as **Attachment A** of this Work Plan.

Although the previously listed species may potentially occur in the MRS, because there are no specific munitions that are necessary to remove in order to satisfy the NTCRA objective, if removing any particular item has the potential to cause harm to threatened and endangered species or critical habitat and/or its removal puts the workers at significant risk, it is very likely the item will be left in place (at least as part of the interim action) unless the benefits of its removal significantly outweigh the risks and those risks can be confidently and economically managed via the aforementioned protective measures and other safety precautions. Currently, a program-wide biological assessment is underway for the entirety of UXO 16. The findings and conclusions of the biological assessment will be appropriately factored into planned nearshore munitions interim action activities as they become available.

1.3 Previous Investigations

The following is a summary of the previous investigations within UXO 16 during which potential munitions on the seafloor have been identified. The information described, along with information that may be gathered during future UXO 16 investigations, will be used to help identify "target" munitions for removal.

- A joint pilot test between NOAA Office of Response and Restoration, the Office of Coast Survey, the Navy, and the University of New Hampshire's Joint Hydrographic Center was conducted in 2006 using high resolution side scan, multibeam sonar, and magnetometer survey to identify the distribution of potential munitions and other objects on the seafloor and the associated habitats at Bahía Salina del Sur and Bahía Icacos (NOAA, 2007).
- A pilot test using a Marine Towed Array equipped with an underwater magnetometer was conducted in 2007 within 195 acres of Bahiá Salinas del Sur to identify geophysical anomalies that may be potential munitions. The survey identified locations of 603 magnetic anomalies (SAIC, 2009).
- Based on the results of the aforementioned pilot tests, divers/snorkelers conducted an underwater visual survey of 42 anomalies identified at Bahiá Salina del Sur and Bahiá Icacos to determine if the sources of the anomalies were munitions or only had the general appearance (shape and size) of potential munitions. Additionally, 20 of the targets were investigated by ROV video. All targets were photographed from different view directions and positions, and bottom type and associated habitats were documented. A metal detection survey was also conducted within a small portion of Bahiá Icacos to evaluate the potential for munitions north of the LIA (GMI, 2007). Potential MEC was confirmed in these areas during the underwater visual inspection performed by the divers. Only munitions present on the surface of the seafloor were inspected by the divers. Buried anomalies and anomalies obscured by coral were not included in the survey.
- In 2008, an aerial magnetometer survey (AMS) was conducted to assess potential munitions locations over the entire VNTR terrestrial portion, extending into the nearshore areas. The AMS identified 12 elevated anomaly density areas (EADAs) that lie wholly or partially in the water that represent areas of large clusters/groupings of magnetic anomalies (Sky, 2009).
- In 2009, the Navy conducted a pilot test of a VideoRay Miniature ROV within the underwater areas at Bahiá Salinas. The pilot test demonstrated specifically that the ROV was able to locate specific targets on the surface of the seafloor identified from previous geophysical surveys and identify those targets as munitions (USAE, 2010a). In addition, subsequent ROV surveys were conducted to identify whether there were any underwater munitions offshore of UXO 15 (USAE, 2010b), at the three anchorage areas, and in Bahiá Icacos and Bahiá Salina del Sur (USAE, 2012).
- In 2010, Navy explosive ordnance disposal (EOD) divers/snorkelers conducted visual underwater surveys at Puerto Diablo, within Bahiá de la Chiva, and at UXO 15. Navy EOD divers identified potential MEC at Puerto Diablo. As noted previously, the nine munitions identified off the shore of Cayo La Chiva were removed under a separate NTCRA.
- In 2014, a Beach Dynamics Investigation was initiated that includes a survey to evaluate relative changes of beaches and tracking of munitions surrogates placed in the nearshore (CH2M, 2014). Potential munitions have been identified on the seafloor as part of this investigation and coordinates of these munitions were recorded.
- In 2015, a pilot test of an unmanned aerial vehicle (UAV) was conducted to evaluate if underwater munitions could be identified; munitions were observed with the general locations recorded. Additional nearshore UAV surveys may be conducted to support this NTCRA.
- In 2016, a field demonstration of the Polar Organic Chemical Integrative Sampler was performed in Bahiá Salina del Sur. During the field demonstration, these passive sampling devices were deployed adjacent to 15 munitions on the seafloor. The 15 munitions were selected from the existing database of potential

underwater MEC, but during the demonstration project, coordinates were recorded and photographs of the munitions and surrounding areas were taken.

- A Wide Area Assessment (WAA) is a phased reconnaissance process that took place in 2016 and 2017, which is intended to evaluate EADAs throughout UXO 16 that are potentially representative of underwater munitions (CH2M, 2015b). In addition, underwater video of the seafloor was collected; the locations of suspected munitions on the seafloor were estimated from the video logs. While the information gathered during the WAA is intended to aid in the decision-making process for the future investigations and munitions response actions at UXO 16, it may provide useful information for the NTCRA.

1.4 Nature and Extent of MEC/MPPEH Contamination

Characterization of offshore munitions is in the early stages of the CERCLA process, with the initiation of the WAA. Since the NTCRA will take place over multiple years, additional information regarding the locations of potential nearshore munitions may be obtained over time from future investigations while the NTCRA is ongoing. This additional information will be incorporated as warranted into the NTCRA activities and communicated to the regulatory agencies but no addenda will be produced solely because additional information has been gathered because this NTCRA work plan covers the procedures that will be implemented for evaluating potential "target" munitions and removal of MEC/MPPEH, regardless of when they are identified. The results of the NTCRA will be used to develop/update the conceptual site models (CSMs) for use in future investigations, removals, and/or remedial actions, and associated documentation, as warranted.

1.5 Evaluation of Explosive Hazard

MEC/MPPEH in the MRS pose a potential explosive hazard to people that may use the area for swimming, snorkeling, diving, boating, or fishing due to their potential to unintentionally or intentionally contact or move the munitions. The potential explosive hazard presented by the MEC/MPPEH (in place) to ecological receptors is negligible.

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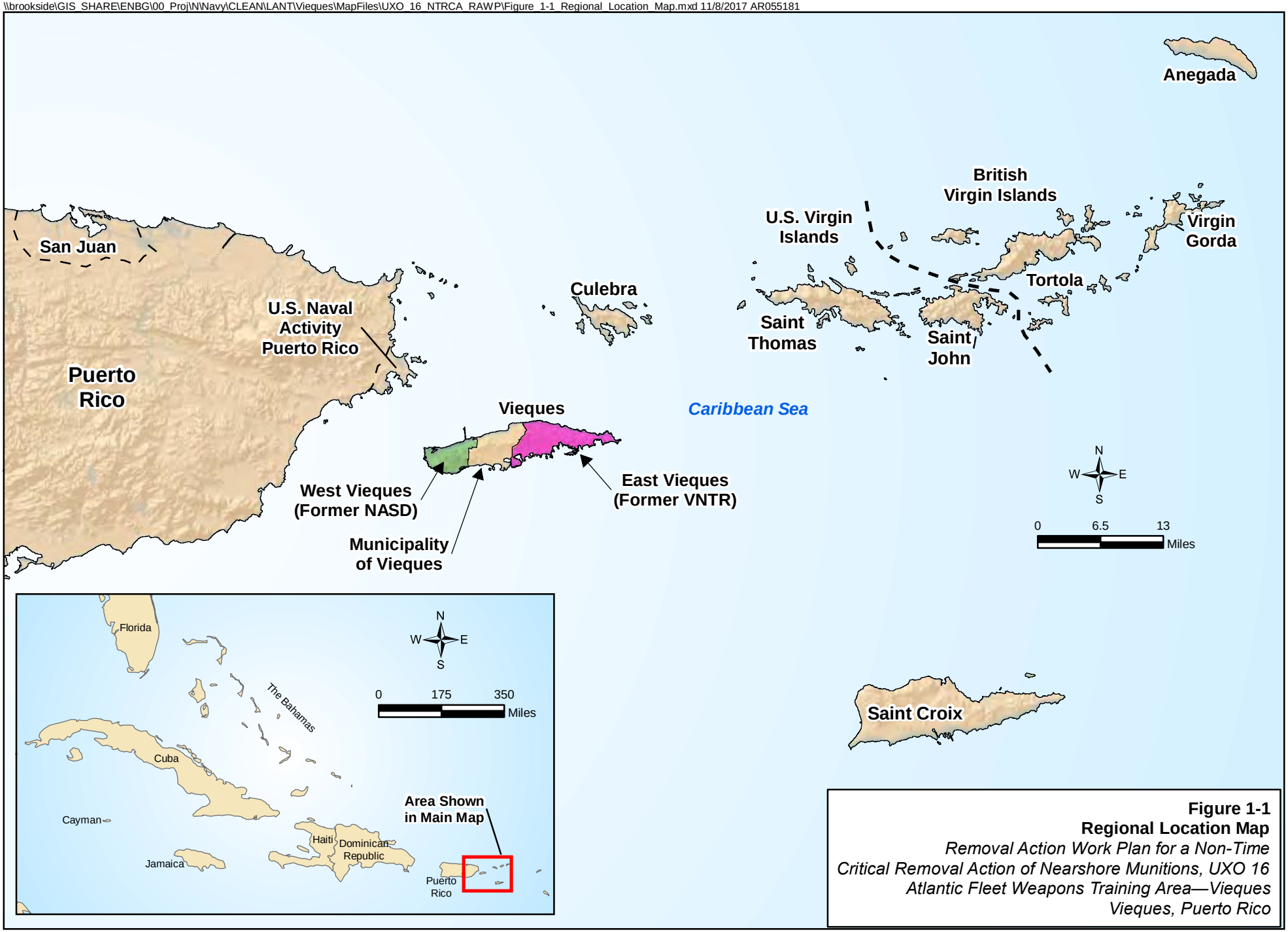

Figure 1-1
Regional Location Map
Removal Action Work Plan for a Non-Time Critical Removal Action of Nearshore Munitions, UXO 16
Atlantic Fleet Weapons Training Area—Vieques
Vieques, Puerto Rico

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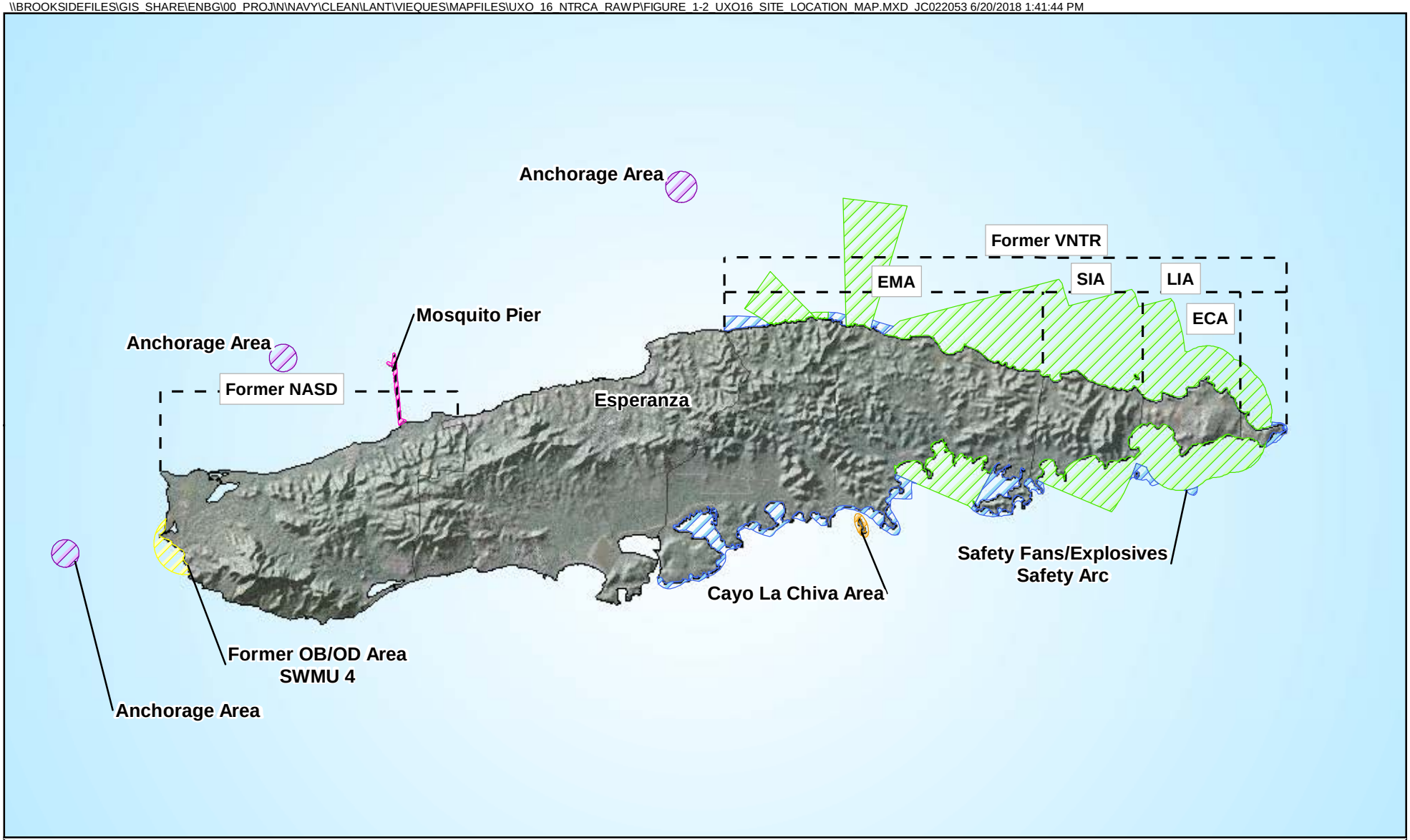
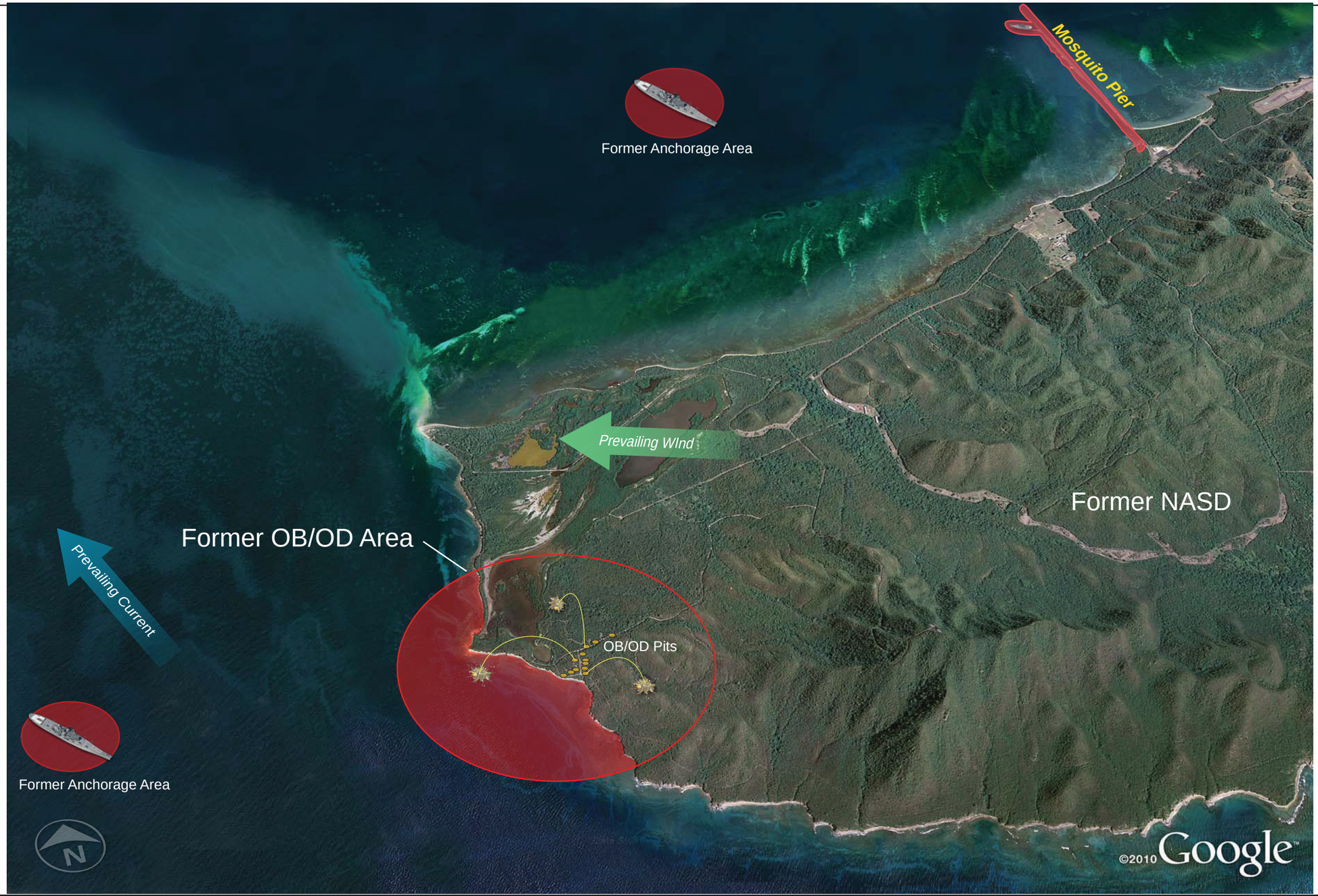


Legend

- Anchorage Areas
- Mosquito Pier
- Offshore of SWMU 4
- Explosive Safety Arcs and Artillery Safety Fans
- Cayo La Chiva
- Other Offshore Areas

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

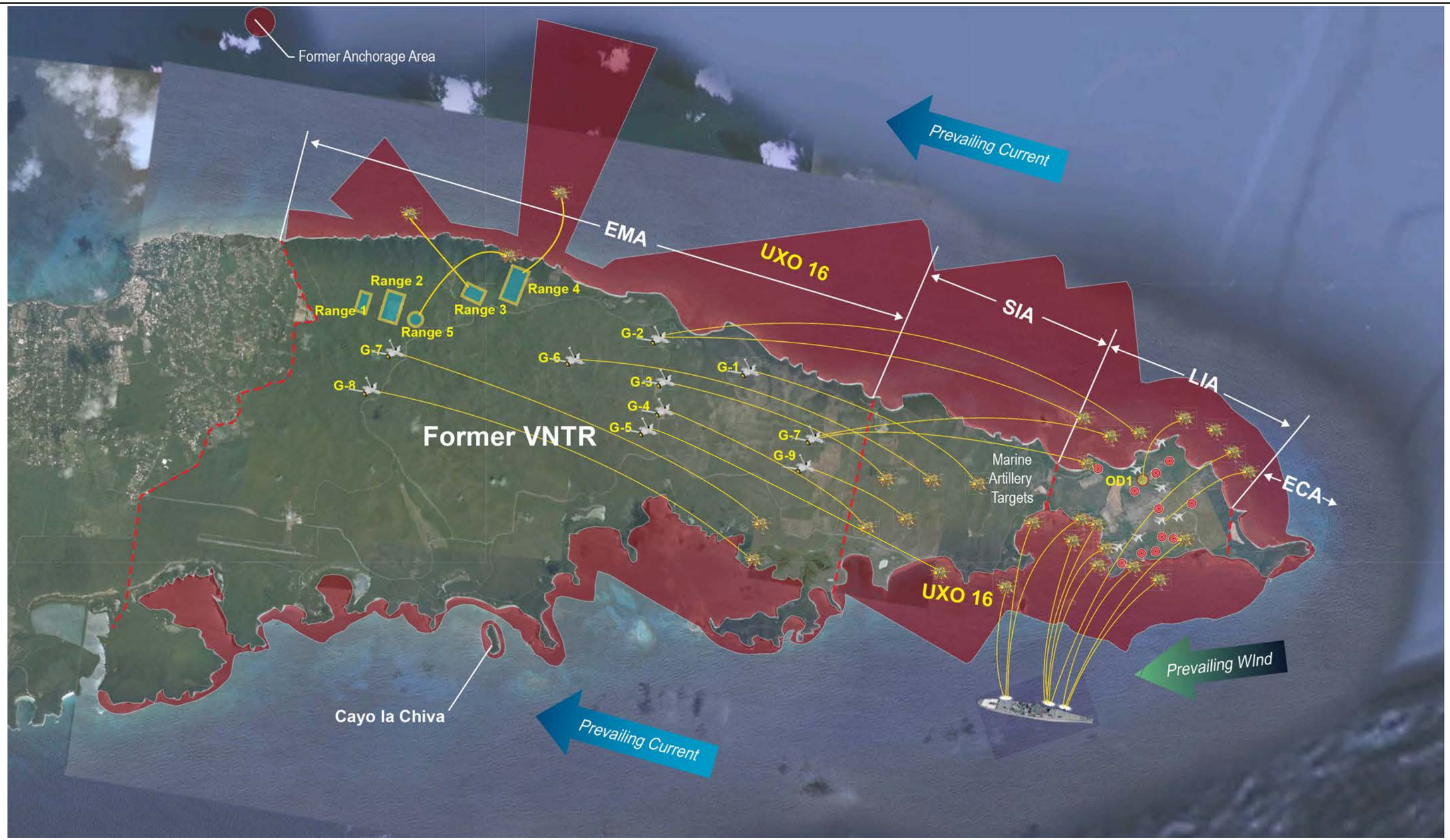
Figure 1-2
UXO 16 Site Location Map
Removal Action Work Plan for a Non-Time Critical Removal Action of Nearshore Munitions, UXO 16
Atlantic Fleet Weapons Training Area—Vieques
Vieques, Puerto Rico



LEGEND

UXO 16

Figure 1-3
UXO 16 Conceptual Site Model – West
Removal Action Work Plan for a Non-Time Critical Removal Action of Nearshore Munitions, UXO 16
Atlantic Fleet Weapons Training Area—Vieques
Vieques, Puerto Rico



LEGEND

- Air-To-Ground (ATG) Target
- Naval Gunfire Support NGFS Target or Overshoot/Undershoot
- Gun Position
- Range
- Operational Area Boundary
- UXO 16
- Fighter/Bomber Plane

Notes:

1. The former anchorage areas are not included in this NTCRA; they are part of separate studies.
2. The area around Cayo La Chiva is not included in this NTCRA; it is part of separate NTCRA.

Figure 1-4
UXO 16 Conceptual Site Model – East
Removal Action Work Plan for a Non-Time Critical Removal Action of Nearshore Munitions, UXO 16 Atlantic Fleet Weap ons Training Area—Vieques Vieques, Puerto Rico

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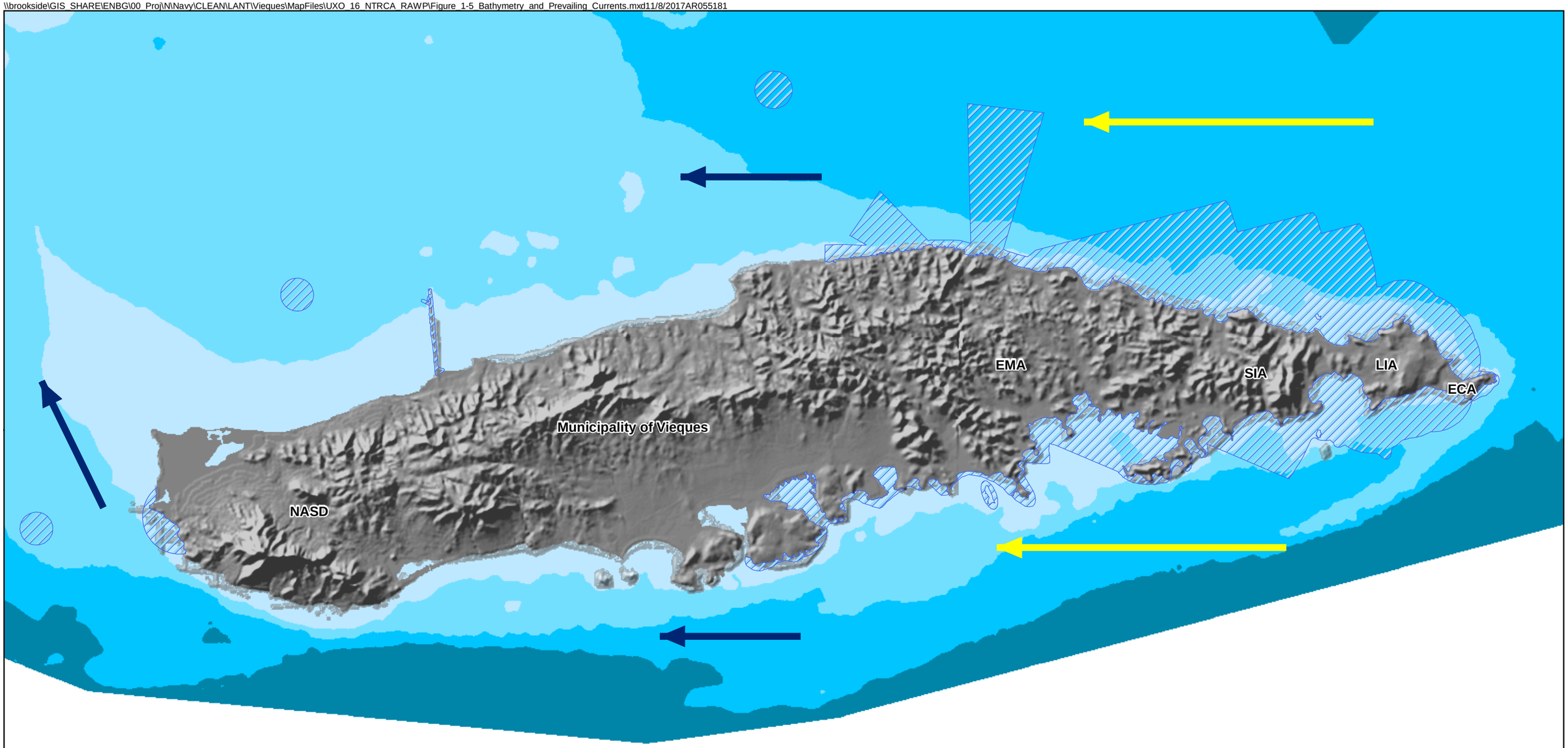

Legend

- Prevailing Winds
- Prevailing Currents
- UXO 16

Underwater Depth (feet)

- 0 - 30
- 30 - 60
- 60 - 120
- 120 - 164

N
W E
S

0 1.5 3
Miles

Figure 1-5
Bathymetry and Prevailing Currents
Removal Action Work Plan for a Non-Time Critical Removal Action of Nearshore Munitions, UXO 16
Atlantic Fleet Weapons Training Area—Vieques
Vieques, Puerto Rico

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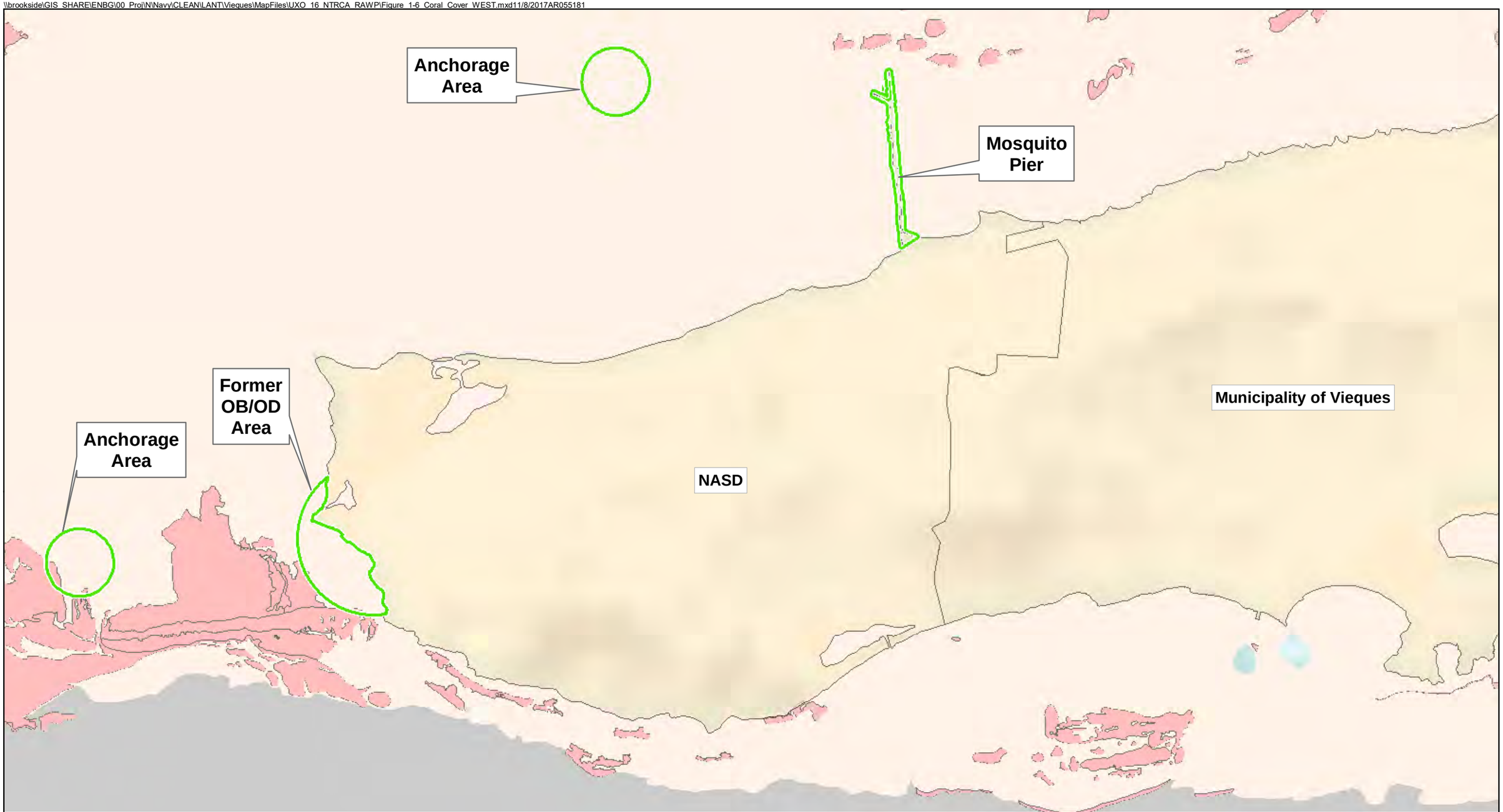

Legend

Percent Coral Cover UXO 16

- 0% - <10%
- 10% - <50%
- 50% - <90%
- Unknown

Source – Geospatial data from NOAA's Ocean Service, National Centers for Coastal Ocean Science (NCCOS) at http://ccma.nos.noaa.gov/ecosystems/coralreef/vieques/data.aspx, and documented in Bauer, L.J., M.S. Kendall, A.G. Zitello, and T. Battista. 2010. Benthic Habitats of Vieques, Puerto Rico.

N
W E
S

0 0.7 1.4
Miles

Figure 1-6
Coral Cover - West
Removal Action Work Plan for a Non-Time Critical Removal Action of Nearshore Munitions, UXO 16
Atlantic Fleet Weapons Training Area—Vieques
Vieques, Puerto Rico

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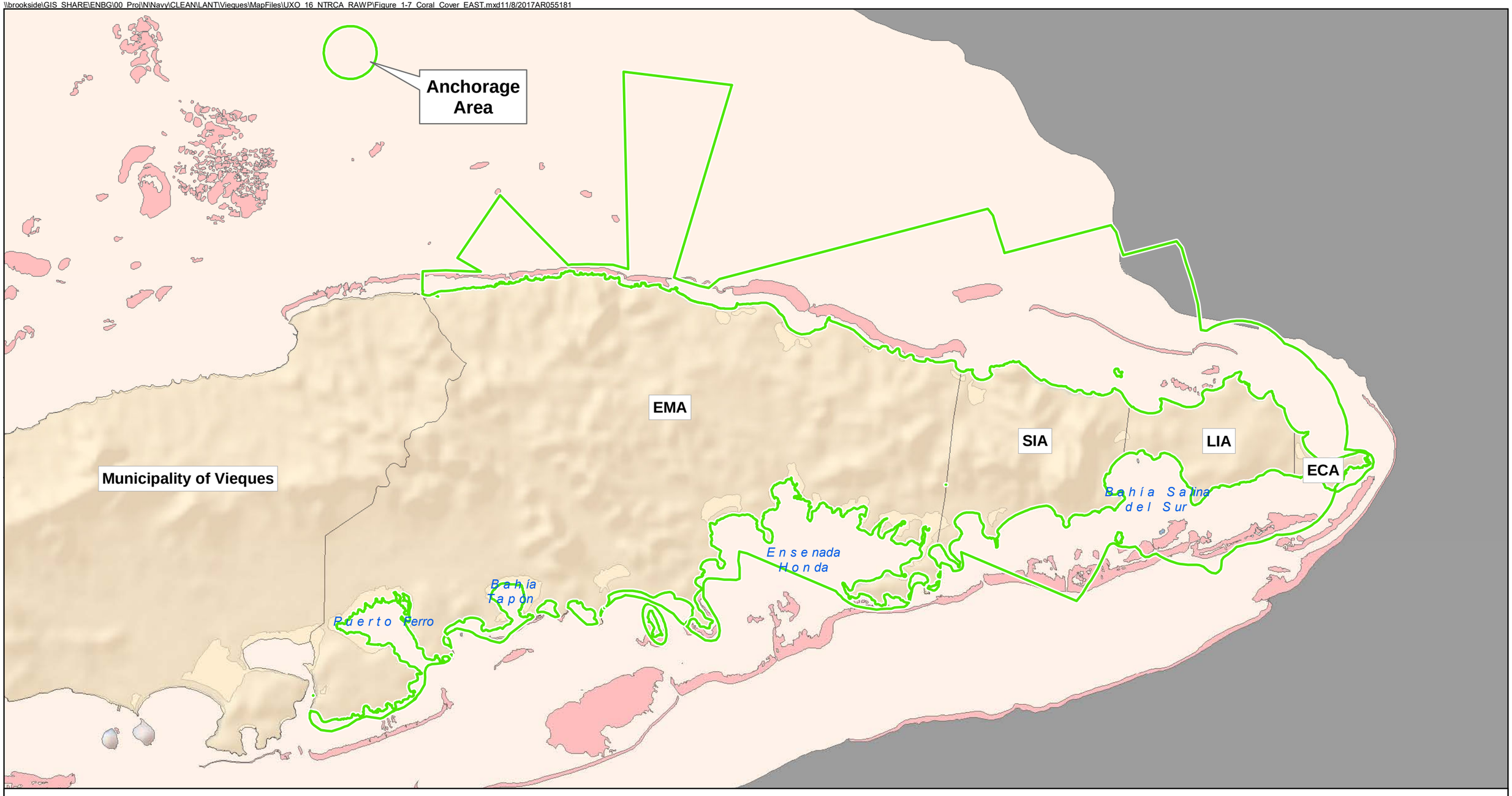

Legend

Benthic Habitat — UXO 16

Percent Coral Cover

- 0% - <10%
- 10% - <50%
- 50% - <90%
- Unknown

Source – Geospatial data from NOAA's Ocean Service, National Centers for Coastal Ocean Science (NCCOS) at http://ccma.nos.noaa.gov/ecosystems/coralreef/vieques/data.aspx, and documented in Bauer, L.J., M.S. Kendall, A.G. Zitello, and T. Battista. 2010. Benthic Habitats of Vieques, Puerto Rico.

N W E S

0 1 2 Miles

Figure 1-7
Coral Cover - East
Removal Action Work Plan for a Non-Time Critical Removal Action of Nearshore Munitions, UXO 16
Atlantic Fleet Weapons Training Area—Vieques
Vieques, Puerto Rico

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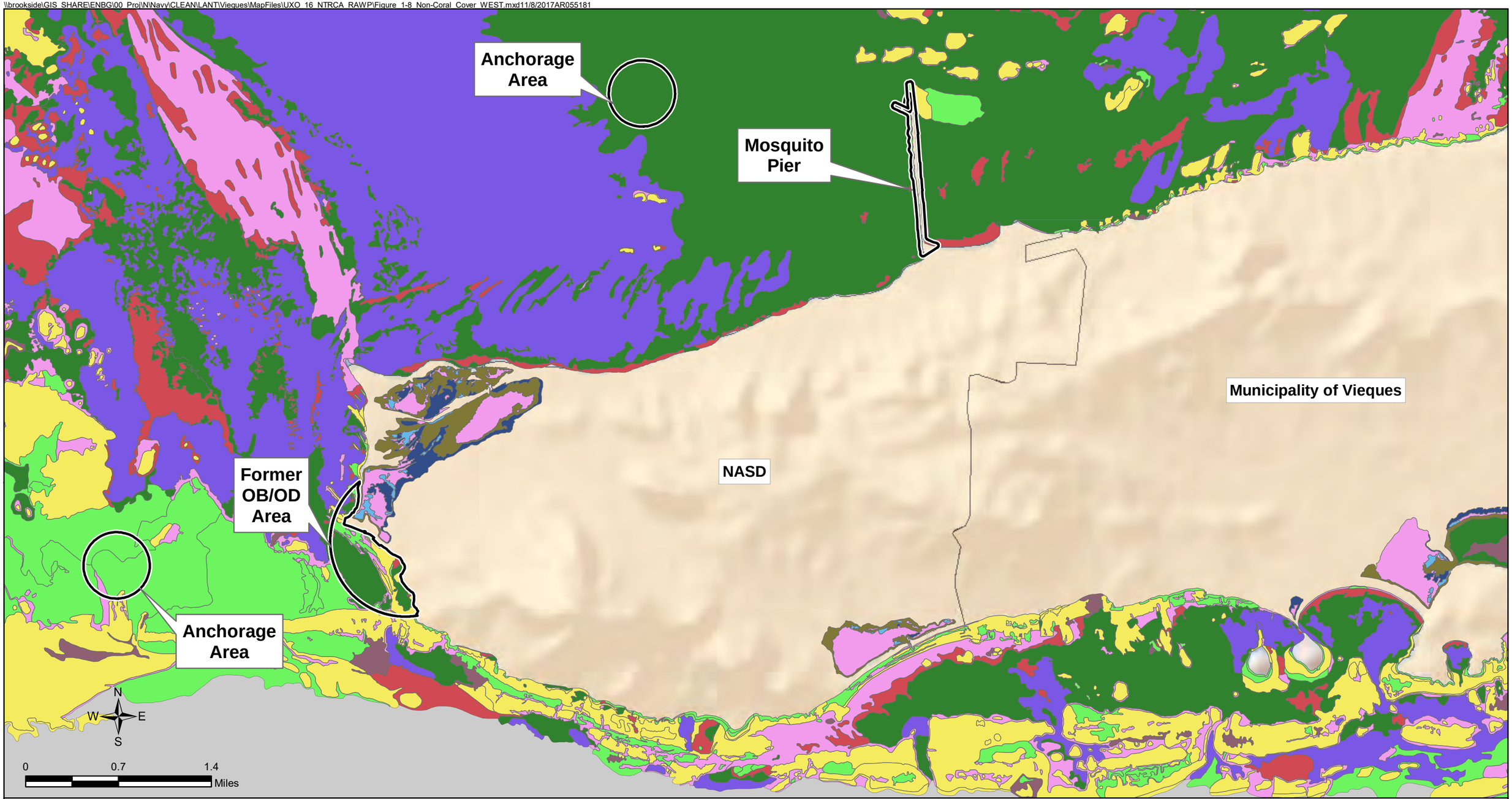

Legend

Non-Coral Biological Cover

- Algae 10% - <50%
- Algae 50% - <90%
- Algae 90% - 100%
- Mangrove 10% - <50%
- Mangrove 50% - <90%
- Mangrove 90% - 100%
- No Cover 90% - 100%
- Seagrass 10% - <50%
- Seagrass 50% - <90%
- Seagrass 90% - 100%
- Unknown
- UXO 16

Source – Geospatial data from NOAA's Ocean Service, National Centers for Coastal Ocean Science (NCCOS) at http://ccma.nos.noaa.gov/ecosystems/coralreef/vieques/data.aspx, and documented in Bauer, L.J., M.S. Kendall, A.G. Zitello, and T. Battista. 2010. Benthic Habitats of Vieques, Puerto Rico.

Figure 1-8
Non-Coral Biological Cover - West
Removal Action Work Plan for a Non-Time Critical Removal Action of Nearshore Munitions, UXO 16
Atlantic Fleet Weapons Training Area—Vieques
Vieques, Puerto Rico

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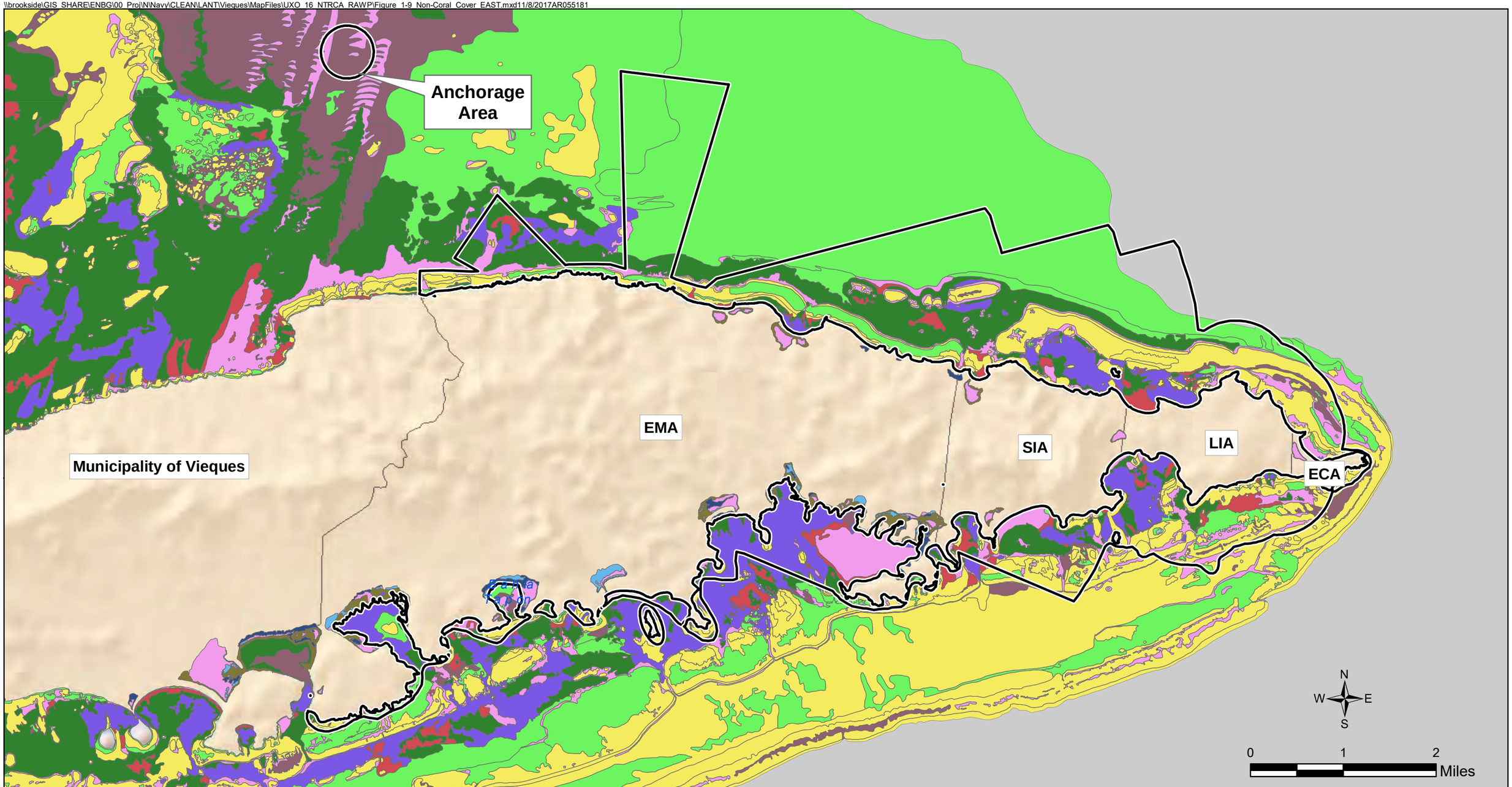

Legend

Non-Coral Biological Cover

- Algae 10% - <50%
- Algae 50% - <90%
- Algae 90% - 100%
- Mangrove 10% - <50%
- Mangrove 50% - <90%
- Mangrove 90% - 100%
- No Cover 90% - 100%
- Seagrass 10% - <50%
- Seagrass 50% - <90%
- Seagrass 90% - 100%
- Unknown
- UXO 16

Source – Geospatial data from NOAA's Ocean Service, National Centers for Coastal Ocean Science (NCCOS) at http://ccma.nos.noaa.gov/ecosystems/coralreef/vieques/data.aspx, and documented in Bauer, L.J., M.S. Kendall, A.G. Zitello, and T. Battista. 2010. Benthic Habitats of Vieques, Puerto Rico.

Figure 1-9
Non-Coral Biological Cover - East
Removal Action Work Plan for a Non-Time Critical Removal Action of Nearshore Munitions, UXO 16
Atlantic Fleet Weapons Training Area—Vieques
Vieques, Puerto Rico

SECTION 2

Technical Management Plan

This section identifies the approach, methods, and operational procedures to be implemented during the NTCRA. The project team will include munitions removal personnel, who will be responsible for conducting all underwater munitions removal/disposal operations (including quality control [QC]) and third-party quality assurance (QA) personnel, who will be responsible for assessing adherence to the NTCRA Work Plan, the Master MEC Work Plan (CH2M. 2006), Explosives Safety Submission (ESS) (CH2M, 2018), the SOPs in **Attachment A**, and any other plan under contractual agreement between the Navy and the munitions response contractor (USAE, 2018). The project team will also include technical personnel (e.g., biologists, scientific divers) with expertise in identifying marine species (primarily federally listed) and sensitive habitat, who will provide assistance to the munitions response contractor during munitions removal activities.

Prior to the commencement of underwater munitions operations, a request for a Notice to Mariners will be filed with the United States Coast Guard (USCG) to alert the public of the operations. Divers and snorkelers will operate from a designated dive boat. One or more additional vessels will provide ancillary support during operations, including a security boat which will patrol the area to stop boats from entering the Exclusion Zone (EZ) or to notify the dive boat to cease operations until the EZ is clear.

2.1 Selection of MEC/MPPEH for Removal

Given that it is not technically practical to remove all munitions under this NTCRA, nor is it necessary to do so in order to achieve the NTCRA RAO, this subsection presents evaluation factors that will be considered when selecting munitions for removal from the UXO 16 nearshore environment. Factors/questions that will be considered include:

Potential for Complete Exposure Pathways

- Beach Use/Swimmers – Are there potential munitions near beaches known or likely to be used by the public? Are these munitions visible from the shoreline and/or in locations where swimmers might be exposed to potential explosive hazards?
- Divers – Are there known or suspected munitions in or around areas known or likely to be frequented by recreational divers (e.g., near shipwrecks, in areas of notable coral or other aesthetic marine structures, etc.)?
- Fishing/Anchorage – Are there known or suspected munitions in areas where recreational and/or commercial fishermen may come into contact with them? Are there known or suspected munitions in areas where recreational boaters would likely anchor?
- Munitions Removal Workers – Because no demolition will be conducted on munitions in place, can the munitions item be moved in a manner that is safe and not exceedingly complex for the project personnel?

Type and Condition of Munitions

- Type and Origin – What type of munitions are suspected (e.g., aerial bombs, projectiles, mortars, rockets, etc.)? What is the potential explosive hazard from the item(s)? Would the known or suspected nearshore munitions most likely have been dropped, fired, or placed?
- Condition – What is the condition of the munition (intact, bent/dented, or broken open)? Is the munition fuzed (or potentially fuzed)?
- Mobility – What is the mobility potential of the item, especially with respect to other potential exposure areas (e.g., beaches)? Is the munition encrusted (immobilized) in rock/coral or able to migrate (see “Seafloor Condition”)?
- Density – Are there other munitions in the same general area?

- Proximity to threatened and endangered species or sensitive habitat – Can the munitions be removed in a manner that is appropriately protective of federally listed threatened and endangered species and sensitive habitat?

Physical Characteristics at UXO 16

- Water Depth – What is the water depth at the known or suspected munitions location?
- Seafloor Condition – What is the condition of seafloor? Will the munition item likely remain at a location where sediment/sand will get deposited over the top of it or will algae, seagrass, and coral grow around and/or over the item or is the munition item likely to be influenced by currents, tides, and storm events?
- Wave/Current Action – What are the normal waves and currents at the sector? Will they potentially contribute to or diminish the munition density?
- Tidal Influence – Is there one or more tide cycles in a 24-hour period and how significant is the rise and fall between high and low tide?

The answers to these questions will assist in selecting and prioritizing munitions in the UXO 16 nearshore environment for removal to ensure the NTCRA RAO will be systematically met. Other factors, such as funding availability, logistical considerations, regulatory and community input, and newly-gathered information, will also be taken into consideration when selecting specific munitions for removal.

2.2 Mobilization

Mobilization activities will include the following:

- Transport project personnel and ship equipment to project site
- Assemble, inspect, and test field equipment
- Set up support facilities and communication systems
- Initiate coordination with the USCG, decompression chamber, hospital, and other emergency responders
- Conduct pre-task briefing/activity hazard analysis for dive team and boat crew

2.3 Assess MEC/MPPEH and Surrounding Underwater Environment

For each potential munitions item selected under Section 2.1, its location will be verified using global positioning system (GPS) equipment, visually confirmed from the surface (if possible), and marked with a marker float (small sandbag with a line and pelican float, or comparable) placed in the water from the surface. Unexploded ordnance (UXO) divers utilizing self-contained underwater breathing apparatus (SCUBA) or snorkel, depending on the water depth, will then conduct a visual circle line search, aided by a handheld magnetometer, around the marker float in all directions to confirm the item location, as well as any other suspected munition item(s) in the general vicinity. The UXO divers will mark the exact location(s) of the item(s) with a marker float(s) and will determine if each item is a munition and, if so, will conduct an initial assessment of the item, including type, fuzing, and level of encrustation. Underwater ROVs may be used to support diving operations under this and other tasks.

After location and initial assessment of each item by the UXO divers, the UXO divers will exit the water and discuss their initial assessment with the project team. For each suspected munition item, scientific divers, escorted by UXO divers, will then assess the natural environment at and in the immediate vicinity of the item. Alternatively, if sufficient information can be gathered by the ROV, it will be used to gather this information. Pre-removal photographs of munitions will be collected. The benthic community will be documented and the information relayed to the UXO divers such that they can factor the information into the determination of whether/how to remove the item.

Munitions will be removed only if the project team determines:

- The item is safe to move
- The item's removal is not exceedingly complex for the resources available under the NTCRA
- The item's removal will have no deleterious effect on federally listed threatened or endangered species or sensitive habitat, or approved mitigation measures can be readily implemented

For any item not identified for removal, the item location and reason for leaving it in place will be documented. For each munition item to be removed, the UXO divers will define the item-specific removal procedure (i.e., by hand or remotely; see Section 2.4), with input from the scientific divers, to maximize worker safety and minimize potential impacts to the natural environment based on the following factors:

- Physical condition of each item
- The type of benthic habitat at each item
- The distance of the nearest colonies of listed and non-listed corals from each item
- Water depth and predominate sea conditions (such as, wave action) at each item
- Logistical considerations

2.4 Removal of MEC/MPPEH

For each item determined to be acceptable to remove, a determination of the removal approach will be made. Each potential removal method is described in detail. The SOPs that will be implemented during item removal for the protection of federally listed species and sensitive habitats are provided as **Attachment A** of this Work Plan. Post-removal photographs of munitions will be collected and used with the pre-removal photographs to document that each munitions item has been removed (i.e., that the removal action objective for that item has been achieved).

Hand Removal of Munitions

Munitions determined to be acceptable to remove by hand will be removed from the seafloor directly by the UXO divers. The UXO divers will pick up the item and carry it to the surface or will place the item in a basket, or suitable substitute that will be brought to the surface by topside UXO personnel on the vessel for transport and disposal (see Section 2.5).

Remote Removal of Munitions

Munitions determined not possible/acceptable to remove by hand will be removed remotely by UXO personnel. Remote removal of an item will involve the use of a lift bag/balloon or tripod system. UXO divers will attach a bridle or line directly to the item for either method. Floating lines made of polypropylene or suitable substitute will be used to prevent the lines from impacting benthic habitat. A buoy with a line that exceeds the depth of water by approximately 25 percent will be attached directly to each item to help make the location visible to topside personnel.

Lift Bag/Balloon Method

A lift bag/balloon may be used to remotely remove the item from the seafloor under certain conditions, particularly in areas that have greater than 4-foot water depths and no listed coral species within 10 feet of the item. The lift bag/balloon will be SUBSALVE Bomb Recovery System (BRS)-100, or suitable substitute. The lift bag/balloon method is considered to have a very low probability of impacting coral located greater than 10 feet from an item in 4 feet or greater water depths (specific procedures are discussed further in **Attachment A**).

Tripod Method

A tripod may be used to remotely remove the item from the seafloor, particularly in areas that have less than 6-foot water depths and listed coral species relatively close to the item, but no listed coral species within 3 feet of the item (based on 3-foot width of tripod). Specific procedures for use of the tripod method are included in Attachment A.

2.5 Transport and Disposal of MEC/MPPEH

Under this task, the removed MEC/MPPEH will be transported to an approved disposal area within the former VNTR to be destroyed using the open detonation practices currently followed for terrestrial munitions response activities on Vieques. Prior to MEC being transported, the Senior UXO Supervisor (SUXOS) and UXO Safety Officer (UXOSO) must agree that the risk associated with the movement is acceptable and that the movement is necessary for the efficiency of the activities being conducted or for the protection of people, property, or critical assets.

All recovered MEC/MPPEH will be managed as C/D 1.1. Per the 49 Code of Federal Regulations (CFR): C/D 1.1 represents the Hazard Class and Division of the MEC/MPPEH item being removed from the UXO 16 nearshore areas. Specifically, the Hazard Class (C), which represents one of nine classes of hazardous materials, is “1” representing Explosives. The Hazard Division represents the type of explosives, in this case is also “1” representing explosives with a mass explosive hazard. The Hazard Class and Division are important with regards to handling, compatibility for labeling, placarding, storage, and transportation. No MEC or MPPEH will be transported to areas other than established MRSs within the VNTR. The material being transported will be secured in a manner to prevent unnecessary movement. The recovered MEC/MPPEH may be transported on board a vessel or in a vehicle. Personnel and equipment involved in the loading, handling, and transportation of MEC/MPPEH shall adhere to the general safety and equipment requirements contained in OP-5 Chapter 10 (NAVSEA, 2015).

2.6 Demobilization

Demobilization activities will include the following:

- Inform the USCG, decompression chamber, hospital, and other emergency responders that operations have been completed
- Disassemble, inspect, clean, and conduct post-operation maintenance on field equipment
- Return support facilities and communication systems to pre-operation conditions
- Transport project personnel and ship equipment back to home bases

2.7 NTCRA Status Updates

NTCRA status updates, including NTCRA activities performed and additional planned NTCRA activities, will be provided during interagency meetings or at an alternative frequency agreed to by the project team members.

SECTION 3

Quality Control/Quality Assurance Plan

This section presents the QC/QA plan that will be implemented for the NTCRA.

3.1 Quality Control Implementation

QC will be implemented through the establishment of data quality objectives (DQOs) and acceptance criteria, and their monitoring by the munitions removal contractor's UXO Quality Control Specialist (UXOQCS). QC will be monitored through Definable Features of Work (DFOW) using a three-phase control process. The DFOWs for this NTCRA are divided into activities related to planning and field operations. Planning consists of pre-mobilization activities such as preparation of the various plans required for the project. Field operations include mobilization, location and assessment of potential MEC/MPPEH , removal of MEC/MPPEH , transportation and disposal of MEC/MPPEH , and demobilization. If a DFOW has not achieved the level of quality established in this QC/QA Plan, work will not proceed until the nonconformance has been corrected or the work will be redone. Any nonconformances, and associated corrective actions, and work that is required to be redone will be included in routine NTCRA status updates and associated documentation.

The UXOQCS is responsible for ensuring that the three-phase control process, including the Preparatory Phase, Initial Phase, and Follow-up Phase is implemented for each DFOW defined in this QC/QA Plan. The QC methods and pass/fail criteria are presented in **Table 3-1**.

3.2 Quality Assurance Implementation

QA will be conducted by a designated QA Assessor. For this project, QA assessment will:

- Ensure that the removal contractor complies with the Work Plan, including SOPs
- Observe/evaluate the removal contractor's UXOQCS audit processes
- Verify that each of the potential MEC/MPPEH being removed is effectively located, assessed, removed, transported, and disposed

TABLE 3-1
Quality Control Methods and Pass/Fail Criteria for Definable Features of Work
UXO 16 Nearshore Munitions NTCRA Work Plan

DFOW	Standard	Audit	Pass/Fail	Corrective Action
Locate MEC/MPPEH	Conforms to NTCRA Work Plan and any other applicable plan under contractual agreement between the Navy and the munitions response contractor	UXOQCS verifies locations via GPS	Item is not located or the verified GPS location of the item is farther than 10 feet from the GPS location recorded by the removal team	Reacquire the GPS location so the recorded and verified locations are within 10 feet of each other (unless item is suspected to have been moved to an unknown location [e.g., burial, storm-related transport, etc.])
Instrument validation	Conforms to manufacturer's operating instructions	UXOQCS daily observes instrument/ equipment checks	Instruments and equipment must be operable as per the operating manual	Repair or replace defective instruments or equipment
Data collection	Conforms to NTCRA Work Plan and any other applicable plan under contractual agreement between the Navy and the munitions response contractor	UXOQCS daily reviews data collection	Data not collected or not in compliance with applicable plan(s)	Data must be corrected or redone as appropriate
MEC/MPPEH management	Conforms to NTCRA Work Plan and any other applicable plan under contractual agreement between the Navy and the munitions response contractor	100% UXOQCS oversight of all record keeping detailing munitions and explosives	Zero deviation from applicable plan(s)	Redo non-conforming work

Details regarding specific DFOWs for Material Documented as Safe and instrument validation are included in the Master MEC Work Plan (Table 9-1) (CH2M, 2006).

SECTION 4

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Attachment A
Standard Operating Procedures

STANDARD OPERATING PROCEDURE

Protection of Federally Listed Species and Sensitive Habitat

These Standard Operating Procedures (SOPs) apply to the non-time critical removal action (NTCRA) to be conducted to reduce the explosive hazard associated with munitions and explosives of concern (MEC) and material potentially presenting an explosive hazard (MPPEH) within the nearshore environment of UXO 16, at the former Naval Ammunition Support Detachment (NASD) and former Vieques Naval Training Range (VNTR) in Vieques, Puerto Rico. The project team will consist of USA Environmental, Inc. (USAE) personnel, who will be responsible for conducting all underwater and terrestrial munitions removal/disposal operations (including quality control [QC]), and CH2M HILL, Inc. (CH2M) personnel, who will be responsible for assessing USAE adherence to these SOPs and performing quality assurance (QA) activities. These SOPs are required to be implemented by all personnel involved in the project field operations, and are required to be posted onboard all work vessels.

Vessel Operations

- All project related watercrafts should travel at no wake speed within shallow waters (10 feet or less) and/or when 150 feet from the coastline.
- All vessels will preferentially follow deep water routes whenever possible.
- Vessel operators will review nautical charts and use onboard depth sounders to prevent vessel contact with the seafloor and coral colonies that extend toward the sea surface.
- If anchoring is necessary, vessels will be anchored preferentially on sandy bottom whenever possible. If anchoring on sandy bottom is not possible, vessels may be anchored on vegetated bottom that consists of seagrass and/or algae (seaweed). Vessels will not be anchored on hardbottom that contains hard and/or soft coral, regardless of the percentage of coral cover present. The type of bottom present will be confirmed by divers, onboard using a glass-bottom bucket, or by other appropriate means, prior to anchoring.
- If the vessel is anchored on vegetated bottom (seagrass/algae), the anchor will be removed from the seafloor in a manner that minimizes disturbance to the vegetation, for example, by attaching a secondary anchor line to the rear of any plow-type anchor (danforth, union, bruce) and pulling the anchor free from the seafloor before lifting to the surface.

Protection of Federally Listed Species

- Prior to initiating work, all field personnel will receive training or briefings regarding the potential presence of federally listed threatened or endangered species that may be encountered, their physical characteristics, preferred habitats, how they can be identified, actions to take if sighted, and avoidance measures to be followed. This training or briefing will be prepared and offered by qualified personnel (e.g., biologist, marine biologist, environmental scientist, among others). All personnel will be advised that there are civil and criminal penalties for harming, harassing, killing, or otherwise altering the natural behavior or condition of threatened or endangered species protected under the Endangered Species Act (ESA). The ESA gives both the United States Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) responsibility for enforcing its provisions.
- The following federally listed species and critical habitat have the potential to occur in the work areas:

Sea Turtles

- Hawksbill sea turtle (*Eretmochelys imbricata*) - Endangered
- Green sea turtle (*Chelonia mydas*), North and South Atlantic distinct population segments (DPSs) - Threatened

- Leatherback sea turtle (*Dermochelys coriacea*) - Endangered
- Loggerhead sea turtle (*Caretta caretta*), Northwest Atlantic DPS - Threatened

Corals

- Elkhorn coral (*Acropora palmata*) - Threatened
- Staghorn coral (*Acropora cervicornis*) - Threatened
- Pillar coral (*Dendrogyra cylindrus*) - Threatened
- Rough cactus coral (*Mycetophyllia ferox*) - Threatened
- Lobed star coral (*Orbicella annularis*) - Threatened
- Mountainous star coral (*Orbicella faveolata*) - Threatened
- Boulder star coral (*Orbicella franksi*) - Threatened

Marine Mammals

- West Indian manatee (*Trichechus manatus*) - Threatened
- Fin whale (*Balaenoptera physalus*) - Endangered
- Sei whale (*Balaenoptera borealis*) - Endangered
- Sperm whale (*Physeter microcephalus*) - Endangered
- Blue whale (*Balaenoptera musculus*) - Endangered

Marine Fish

- Nassau grouper (*Epinephelus striatus*) - Threatened
- Scalloped hammerhead shark (*Sphyrna lewinii*), Central and Southwest Atlantic DPS - Threatened
- Giant manta ray (*Manta birostris*) - proposed as Threatened (January 12, 2017)
- Oceanic whitetip shark (*Carcharhinus longimanus*) - proposed as Threatened (December 29, 2017)

Critical Habitat

- Critical habitat is established for elkhorn coral and staghorn coral, and includes all areas surrounding the islands of the Commonwealth of Puerto Rico (which includes Vieques), 98 feet (30 meters) in depth and shallower. Critical habitat for these species also includes having the essential feature of substrate of suitable quality and availability (that is, natural consolidated hard substrate or dead coral skeleton free from algal or sediment cover) to support larval settlement and recruitment, and reattachment and recruitment of asexual fragments.

- All sightings of the above federally listed species will be documented in a log to be provided to the Navy, NMFS, USFWS, and Puerto Rico Department of Natural and Environmental Resources (PRDNER) at the end of the project. The following information shall be collected and recorded in the log for all listed species sightings:
  - Sighted species
  - Date and time of sighting
  - GPS coordinates of sighting location
  - One or more photographs if possible
  - Any action taken to minimize potential impacts to species (see the following)
- While underway, all personnel onboard work vessels are responsible for observing for the presence of near surface sea turtles, marine mammals, and protected fish species. While on station, work areas will be routinely monitored for the presence of these species, both underwater and above water.
- If a whale is sighted, maintain a distance of 100 yards or greater between the whale and the vessel whenever possible.
- If a sea turtle, manatee, or protected fish species is sighted, maintain a distance of 50 yards or greater between the animal and the vessel whenever possible.

- If a whale is sighted while a vessel is underway (e.g., bow-riding), attempt to remain parallel to the animal's course. Avoid excessive speed or abrupt changes in direction until the whale has left the area.
- Reduce vessel speed to 10 knots or less when mother/calf pairs, groups, or large assemblages of whales are sighted near an underway vessel, when safety permits. A single whale at the surface may indicate the presence of submerged animals in the vicinity. The vessel should attempt to route around the animals, maintaining a minimum distance of 100 yards whenever possible.
- Sea turtles and marine mammals may surface in unpredictable locations or approach slowly moving vessels. When an animal is sighted in the vessel's path or in close proximity to a moving vessel, reduce speed and shift the engine to neutral. Do not engage the engines until the animal is clear of the area.
- Personnel on work vessels will visually survey the Exclusion Zone (EZ) for the presence of sea turtles, marine mammals, and protected fish species (and vessels) prior to all remote movements of MEC/MPPEH items. Remote movements of MEC/MPPEH items will be conducted only after confirmation there is no sign of these species (or vessels) inside the EZ.
- Any collision with and/or injury to a sea turtle or marine mammal will be reported immediately to NMFS and PRDNER. Work personnel should report sightings of any injured or dead sea turtle or marine mammal immediately to NMFS, regardless of whether the injury/death is caused by the work personnel.
- Report sea turtles to the NMFS Southeast Regional Office: (727) 824-5312 and to the PRDNER Ranger Corps: (787) 724-5700 or (787) 771-1124.
- Report marine mammals to the Southeast U.S. Stranding Hotline: (877) 433-8299 and the DNER Marine Mammal Rescue Program: (787) 645-5593 or (787) 538-4684. Any incidents involving manatees must be reported immediately to the DNER Manatee Stranding Coordinator at (787) 645-5593, the USFWS Caribbean Field Office at (787) 851-7297 ext. 220, and to the Vieques National Wildlife Refuge at (787) 741-2138.
- If the injury or death of a sea turtle or marine mammal is caused by a vessel collision or other work activity, the responsible parties will remain available to assist the respective response personnel as needed.

Protection of Coral and Benthic Habitats

- All underwater work personnel will be familiar with the identification of federally listed coral species, hardbottom habitat (including critical habitat), and vegetated bottom habitat that have the potential to occur in the work areas, and the procedures to be followed to prevent impacts to these species or habitats during work activities.
- The following general "best diving practices" will be followed:
  - The dive team lead will make sure that underwater conditions (e.g., visibility, current speeds) and weather are suitable for diving to ensure safety of divers and for ability to avoid damaging sensitive underwater species or habitats.
  - The point of entry and exit will be carefully selected to avoid damaging coral.
  - Divers will make sure that all equipment is well secured before entering the water.
  - Divers will make sure that they are neutrally buoyant at all times.
  - Contact with coral species described in this SOP shall be avoided.
  - Good finning practice and body control will be followed to avoid accidental contact with coral or stirring up the sediment.
  - Divers will not stand or rest on corals or other sessile benthic invertebrates.
- Divers will limit physical contact with the benthic environment to the minimum extent needed to effectively conduct the work. As standard practice, impacts to any hard or soft coral species shall be avoided to the greatest extent practicable.

- Turbidity (sediment suspension) will be minimized to the extent possible during all underwater work activities. Although excessive turbidity is not expected to be generated by the underwater work activities, turbidity will be visually monitored and prudent measures will be taken to minimize turbidity generation.
- Staghorn and elkhorn corals have "take" prohibitions established, while the other five ESA-listed coral species may have "take" prohibitions in the future. If any federally listed coral is inadvertently impacted during the NTCRA, whatever activity that caused the impact will be stopped and the following Information will be collected:
  - Time, date, and coordinates of the impact
  - Name and type of vessel involved, and vessel speed
  - A description of the incident (if vessel-related: name, type, and speed of vessel)
  - Water depth
  - Environmental conditions, including water visibility, waves, and wind speed and direction)
  - The coral species impacted and description of the damage

  This information will be immediately reported to the National Oceanic and Atmospheric Administration (NOAA) Office of Law Enforcement at (800) 853-1964, NMFS in Boquerón at (787) 851-3700, and PRDNER at (787) 645-5593.
- UXO divers will determine the most appropriate method for removing an MEC/MPPEH item, with input from the scientific divers, and the measures to be taken to minimize potential impacts to the natural environment based on the following factors:
  - Physical condition of each item
  - The type of benthic habitat at each item
  - The distance of the nearest colonies of listed and non-listed corals from each item
  - Water depth and predominate sea conditions (e.g., wave action) at each item
  - Logistical considerations
- Seagrass or non-listed coral species may be relocated by CH2M scientific divers prior to item removal as a measure to prevent potential impacts.
  - Any seagrass that is inadvertently impacted during the project will be inspected by CH2M scientific divers who will determine the type of restoration measures, if necessary, that should be implemented. All seagrass restoration will occur in the area impacted and will be conducted by scientific divers who have experience in seagrass restoration techniques. Any void created on the seafloor by an inadvertent impact will be backfilled with adjacent sediment so the grade of the impacted area is approximately flush with the surrounding grade. The methods used to restore seagrass will be specific to the condition of the impacted seagrass and the seagrass species involved. Turtle grass (*Thalassia testudinum*) has deeper rhizomes/roots than shoal grass (*Halodule wrightii*), manatee grass (*Syringodium filiforme*), and paddle grass (*Halophila decipiens*). Divers will attempt to maintain the integrity of the root/rhizome structure of any seagrass that is uprooted or otherwise impacted; the techniques used will depend on the impact condition and species involved. Use of biodegradable stakes to secure replanted seagrass will be evaluated in the field with respect to its suitability based on field conditions.
  - Any non-listed hard or soft corals that are inadvertently impacted during the project will be inspected by CH2M scientific divers who will determine the type of restoration measures, if necessary, that should be implemented. All coral restoration will be conducted by scientific divers who have experience in coral restoration techniques. Restoration measures would primarily involve reattaching any non-listed coral that is inadvertently broken in the work area or is attached and can be safely removed from a MEC/MPPEH item. The affected coral would be relocated to a suitable nearby location (or similar offsite location if necessary) and reattached onto suitable substrate via cement or marine epoxy using established NOAA methodology. General guidance on coral reattachment is provided in the following two videos:

http://www.youtube.com/watch?v=_XaUttAUHv4 (NOAA, 2009)

http://www.youtube.com/watch?v=qRlfOu7fERw (NOAA, 2011)

- If an underwater item that may have historic or archaeological value is encountered, the item will not be disturbed in any way. The item will be photographed, GPS coordinates of the location will be collected, and the Navy will be notified. The Navy will coordinate the collected information with the Puerto Rico State Historic Preservation Office in compliance with the National Historic Preservation Act.

STANDARD OPERATING PROCEDURE

Underwater Operations

1. Purpose

This Standard Operating Procedure (SOP) will be used to provide the minimum procedures and safety and health requirements applicable to the conduct of underwater (UW) operations on a site contaminated with munitions and explosives of concern or material potentially presenting an explosive hazard (MEC/MPPEH). In the event that a procedure is needed that is not described in this SOP or that deviates from the approved Work Plan (WP) for the project, the unexploded ordnance (UXO) team will develop the procedures and/or steps, with the approval of the Senior UXO Supervisor (SUXOS) and UXO Safety Officer (UXOSO). The Navy will then be contacted for concurrence and approval.

2. Scope

This SOP applies to all site personnel, including contractor and subcontractor personnel, involved in the conduct of UW operations on an MEC/MPPEH contaminated site. This SOP is not intended to contain the requirements needed to ensure complete compliance, and should be used in conjunction with approved project plans and other applicable guidance. UXO divers will identify the MEC/MPPEH item to determine whether the item is acceptable to move by hand or if the item is not acceptable to move by hand. The final determination will be made by the SUXOS and UXOSO. It is anticipated that the MEC/MPPEH items to be encountered are deteriorated 5-inch rockets, based on items that were found on the Island of La Chiva during a previous investigation and what was seen on video and photographs.

3. Underwater Operations

Underwater operations can be performed by one or a few different methods. The determination as to which method will work best for each item will be made on site at each item's location by the UXO team. The decision as to what will work best will be based on several factors, not limited to but including how accessible the item is, water depth, sea state, current, and visibility. Once the item is located and identified on the seafloor, the UXO diver will complete the risk analysis as described in the Dive Plan (DP). The risk analysis will take into account the threatened and endangered (T&E) marine habitat on and within a 25-foot radius of the item and the condition of the MEC/MPPEH item. The Risk Analysis also guides the team in deciding which operation is completed next. Items determined as acceptable to move, with no T&E marine habitat, will be moved by hand. If the item is determined to be not acceptable to move by hand and it has no T&E marine habitat affixed or adjacent to it, the item will be rigged for remote movement. Remote movement may be accomplished by completing the following tasks:

- Exclusion Zone (EZ) is established.
- Divers attach bridle and lifting balloon to the MEC.
- Tow line is attached to the bridle.
- Buoy is attached to the MEC (not to the balloon, bridle, or tow line) for a visual reference should the MEC/MPPEH break free or is detached from the bridle during the tow. The length of the line attached to the buoy must be 25% longer than the deepest depth in which the munitions will be towed across.
- The tow line is passed from the dive boat to the tow boat.
- Dive boat with biologist inspects area for turtles and marine mammals then exits out of the EZ and supports as security boat.

- While staying outside of the fragmentation distance for the depth of water in which the MEC is suspended under the balloon, the tow boat remotely inflates the balloon and the balloon lifts the MEC to the surface. If the MEC does not release from the sea floor, the tow boat remains outside of the fragmentation distance and a remote pull is initiated to break the munitions from the sea floor.
- The balloon comes to the surface. If the balloon does not come to the surface and the MEC cannot be separated from the seafloor a specified wait time should be established before divers reenter the water and free the lifting balloon from the MEC.
- Confirm the MEC is suspended underneath the balloon by observing either the balloon is partially submerged under the weight of the MEC or observe the scope of the buoy line attached to the MEC through binoculars.
- Begin tow activities.
- Tow boat reaches the designated beaching area, passes the tow (via reference buoy or other method) to the beach crew while maintaining the fragmentation distance. The beach crew takes over the tow and pulls the MEC and lifting balloon up on the beach.

All MEC/MPPEH items recovered will be turned over to the terrestrial team working at the former Vieques Naval Training Range (VNTR) and certified as Material Documented as Safe (MDAS).

3.1 Items Acceptable to Move by Hand, No T&E Habitat

Items that have been determined as acceptable to move and that have no T&E marine habitat on or near them, as described above, will be moved by hand. These items will be removed from the seafloor by one of two means. The UXO diver picks the item up and carries it to the surface or the diver places the item into a basket, or a suitable substitute, and the item is brought to the surface by the topside team on the vessel.

3.2 Items Not Acceptable to Move by Hand, No T&E Habitat

Items that have been determined as not acceptable to move by hand, that have no T&E marine habitat on or near them, as described above, must be remotely moved. Remotely moving an item UW can be accomplished utilizing one or a combination of the methods described below.

3.2.1 Attachment to the Item

The UXO diver will need to attach a bridle or line directly to the item in order to remotely move the item. The attachment will be done by hand, depending on how the item lies on the seafloor. When the UXO diver is making the attachment to the item, all efforts will be made not to disturb the item. The attachment can be made using zip ties, a line tied directly to the item, a clamp tightened to the item, an UW marine adhesive/epoxy, or a suitable substitute to adhere the line or bridle to the item.

3.2.2 Pull Line

The pull line directly attached to the item may be used when a remote movement is necessary and there is no T&E marine habitat in the vicinity of the item, as described above. A pull line can also be used in conjunction with buoys or pulleys to direct the line of pull or it can be used in conjunction with the systems described below. The pull line will be made of polypropylene. Polypropylene is positively buoyant and will not sink, ensuring it can be seen on the surface. Attachment of a pull line for a remote movement can be done by utilizing a knot that will not slip off the item or off the attachment point, a locking carabiner tied to the pull line or a suitable replacement to attach the line. Once the pull line is attached, the diver will return to the boat to be recovered.

3.2.3 Lift Bag/Balloon

In the event the lift bag/balloon is utilized, the SUBSALVE Bomb Recovery System (BRS)-100 (refer to Figure 3-1) or a suitable substitute will be used. The BRS-100 may be used when the water depth allows, typically in greater than 4 feet of salt water (FSW) and when there is no T&E marine habitat directly on the item or within a 10-foot radius of the item. The lift bag/balloon will be attached directly to the item or to the attachment point

already in place. The pull line may be attached to the lift bag/balloon if the sea state is calm, but otherwise the pull line will be attached after the lift bag/balloon is attached to the item. The diver will return and attach the pull line to the item or bag/balloon. Once the attachments are made the diver will return to the boat to be recovered.

Figure 3-1: Bomb Recovery System-100

3.2.4 Tripod System

The tripod system may be used when an item is in less than 6 FSW and the item has T&E marine habitat within 3 feet of the item but not attached to the item. The tripod system will be set up to ensure it has a straight line of pull over the item. If this system is used, the utmost care will be taken to ensure the legs of the tripod are not placed on or otherwise harming any T&E marine habitat. The tripod will utilize a similar connection as shown below in Figure 3-2. The legs will be constructed from three pieces of, not less than 1-1/2 inch sturdy material, such as steel or aluminum round pipe, or suitable replacement. This will allow it to be cut to size, keep it lightweight and easy to construction and place. The connections will be locked into place using a combination of fittings and fasteners.

Figure 3-2: Tripod Top Assembly

3.3 Remote Movement

With the item rigged for a remote pull, the vessel/s in the vicinity will slowly move out of the EZ, paying out the line as they go. Once outside of the EZ, the SUXOS/DS will take a head count and visually survey the area for other vessels and marine animals. The SUXOS/DS will give the approval to remotely move the item, after confirmation there is no sign of vessels or marine animals inside the EZ. Any slack in the line will be pulled into the vessel and the pull line will be secured on the vessel's cleat, Sampson post, or suitable substitute. From the vessel, either a remote movement will be made using the forward movement of the vessel or the balloon will be filled with air to complete a remote movement. Once the item has been remotely moved, a 5-minute wait time will be observed. Once the 5 minutes has elapsed, the team will return to the item/s location, assess the level of disturbance, identify new or potential hazards, and take control of the item.

3.4 Post Remote Movement

The contractor will remove all equipment and material that was put in place to remotely move the item and ensure the only change to the marine environment was the removal of the MEC/MPPEH item. All subsequent items requiring a remote movement will be handled in the same manner described previously.

4. Equipment Description

The type of equipment utilized for UW operations in the remote movement of an item, will depend on the operation being conducted. In general, the equipment selected should be capable of moving the MEC/MPPEH item in a safe and efficient manner. Once identified, the User Manual and Operator Guide for the equipment will be reviewed with all personnel who will operate the equipment, and will be available onsite.

5. General Safety Procedure

All personnel, including subcontractor personnel, involved in UW operations on MPPEH contaminated sites will be familiar with the potential safety and health hazards, and with the work practices and control techniques used to reduce or eliminate these hazards. The equipment User Manual and Operator Guide will be used to identify equipment specific safety concerns. In addition, the following general procedures are provided to ensure the safe and effective completion of UW operations.

- In-water voice communication systems between the diver and topside personnel will be used during all UW operations.
- Underwater operations will be completed at a slow and methodical pace, especially in limited visibility conditions.
- Operations will cease at any time when safety concerns develop in relation to UW conditions.
- As required, utilize chase boats, marker buoys, U.S. Coast Guard assets, and local law enforcement agencies to establish and maintain the EZ when work is being conducted and during a remote move.
- Prior to making any attempt to remotely move an item, all personnel and vessels will be outside the EZ and accounted for.
- All associated pull lines should be secured and routed to avoid trip hazards. Detailed operating and safety procedures will depend on the operating location and specific equipment and can be found in the equipment operating manuals and SOPs found within the DP.

6. Special Requirements for Underwater Excavations

The presence of sensitive marine habitats or protected marine species may exist in the area where excavations are intended. It is imperative that site personnel are aware of applicable regulations regarding sensitive marine habits and that they comply with all guidelines. Refer to specific site-related information outlined in the associated work plans or provided by other guidance documents.

7. References

Applicable sections and paragraphs in the documents listed below will be used as references for the conduct of UW excavations:

- Contractor Corporate Safety and Health Program
- Basic Safety Concepts and Considerations for Ordnance and Explosives Operations, EP 385-1-95a
- OSHA 29 CFR 1910, Subpart T- Commercial Diving Operations
- USACE EM 385-1-1, Safety and Health Requirements Manual
- Selected equipment User’s Manual and Operations Checklist/s

Attachment B
Final Responses to Regulator Comments

Final Responses to EPA Comments on the Draft UXO 16 Nearshore Munitions Non-Time Critical Removal Action Work Plan Dated November 2017

Atlantic Fleet Weapons Training Area- Vieques Former Naval Ammunition Support Detachment and Former Vieques Naval Training Range Vieques, Puerto Rico

Presented below are review comments on the Draft UXO 16 Nearshore Munitions Non-Time Critical Removal Action Work Plan, Atlantic Fleet Weapons Training Area- Vieques, Former Vieques Naval Ammunition Support Detachment and Former Naval Training Range, Vieques, Puerto Rico; dated November 2017 (hereinafter referred to as the Draft UXO 16 NSM NTCRA WP).

GENERAL COMMENTS

1. The Draft UXO 16 NSM NTCRA WP does not mention obtaining a photographic record of each munitions-related item removed and its immediate surroundings to document the physical conditions before and after removal of the potential Munitions and Explosives of Concern (MEC)/Material Potentially Presenting an Explosive Hazard (MPPEH) items. This information will provide a visual record of the effect(s) of the removal actions on the local habitat and sensitive species. Revise the Draft UXO 16 NSM NTCRA WP to include taking "before" and "after" pictures of each of the MEC/MPPEH removal locations.

   Navy Response: As agreed upon during the May 10, 2018 Technical Subcommittee meeting, pre- and post-removal photographs of munitions will be collected to document that each munitions item has been removed (i.e., has achieved the removal action objective); however, photographs will not be collected to document the local habitat and sensitive species, as per direction from National Marine Fisheries Services (NMFS). At least until the programmatic biological assessment has been completed and NMFS has issued its biological opinion, all items to be removed as part of this interim action will be those for which a “No Effects” determination under Section 7 of the Endangered Species Act will have been made. As stated in the Work Plan, for any item considered for removal, but ultimately left in place, the reason for leaving it in place will be documented.

   The following has been added as the fourth sentence of the second paragraph of Section 2.3: “Pre-removal photographs of munitions will be collected.” Additionally, the following has been added as the last sentence of the first paragraph of Section 2.4: “Post-removal photographs of munitions will be collected and used with the pre-removal photographs to document that each munitions item has been removed (i.e., that the removal action objective for that item has been achieved).”

2. Although Section 2.3, Assess MEC/MPPEH Items and Surrounding Underwater Environment, does note that any MEC left in place will be recorded and the reason for non-removal cited, this should be initially noted in the appropriate portion of Section 1, Introduction. Additionally, it is noted that no sediment samples will be collected to assess potential ecological risks resulting from the MEC; however, the Draft UXO 16 NSM NTCRA WP does not identify the lack of samples or provide rationale the lack of need for collection of samples at this time. Revise Section I to include this information.

   Navy Response: As agreed upon during the May 10, 2018 Technical Subcommittee meeting, munitions constituents sampling would be considered in the future RI for UXO 16; the RI will take into consideration munitions that were removed as part of this NTCRA. The last sentence of Section 1.1 has been revised as follows: “Chemical constituent characterization will not be part of this NTCRA, but will be considered as

part of the UXO 16 RI, as warranted." The following has been added as the last sentence of Section 1.1: "For any item not identified for removal, the item location and reason for leaving it in place will be documented."

SPECIFIC COMMENTS

1. **Section 1.1, Objective, Page 1-1:** There is a typo on the third line of the second paragraph "... is important to note that it is not necessary to **removal** all nearshore items... " Please correct. Also in the second to last sentence of the same paragraph, intent to establish the removal action criteria, however, it seems too broad, or not clear what these criteria may be. Please clarify.

   Navy Response: The "removal" typo on the third line of the second paragraph of the second paragraph has been corrected to "remove."

   The following sentence has been added before the last sentence of the second paragraph (the paragraph after the bullet) of Section 1.1: "A more detailed listing of the selection criteria is provided in Section 2.1."

2. Section 1.2.2, UXO 16, Page 1-2: The Anchorage Areas subsection does not note that these areas will not be investigated during the NTCRA. This is stated on Figure 1-3, UXO 16 Conceptual Site Model, but is not noted in the Draft UXO 16 NSM NTCRA WP narrative. Revise the cited section to include this information.

   Navy Response: The notation in the figure has been removed to provide the flexibility to potentially address potential munitions within the Anchorage Areas as part of the NTCRA.

3. **Section 1.2.2, UXO 16, Page 1-3:** The Explosives Safety Arcs and Artillery Safety Fans adjacent to the Former VNTR subsection states that "The explosives safety arc provides a maximum primary fragment distance (3,219 feet as measured from the shoreline) for an MK83 high explosive filled bomb, primarily in the area of the LIA (Figure 1-2)." It is unclear as to the reason for the use of the term "maximum primary fragment distance" to describe the required distance and the source of the 3,219-foot distance. Department of Defense Explosives Safety Board (DDESB) Technical Paper 16, Methodologies for Calculating Primary Fragment Distances, lists in the associated Fragmentation Data Review Forms the following fragment distances for the MK83 Bomb:

   - HFD (hazardous fragment distance): 816 feet
   - MFD-H (maximum fragment distance-horizontal: 3,447 feet
   - MFD-V (maximum fragment distance-vertical: 2.727 feet

   As the MFD-H (often simply referred to as the MFD) is the distance that should be used, revise the cited section to replace the term ""maximum primary fragment distance" with the term "maximum fragment distance-horizontal" (or with MFD if desired). Also, replace the 3,219 feet distance with 3,447 feet. If there is some existing reason for the use of the 3,219- foot distance, revise the narrative to provide the rationale.

   Navy Response: Section 1.2.2 summarizes information included in historical reports. For the cited sentence, the information was from the VNTR operational history report, but the sentence is not necessary for this work plan since it was just informational, so it has been deleted.

4. **Section 2.4, Remove MEC/MPPEH Items, Page 2-3:** The Lift Bag/Balloon Method paragraph of the Remote Removal of Items subsection refers to the "Sub-Salve Bomb Recovery System (BRS)-100." The name of the company producing this device is "SUBSALVE-USA" and their devices are all listed as "SUBSALVE" on their website. For clarity, replace the word "Sub-Salve" with "SUBSALVE."

   Navy Response: The text "Sub-Salve" has been replaced with "SUBSALVE" throughout the document.

Final Responses to EQB Technical Evaluation
Navy's Draft UXO 16 Nearshore
Non-Time Critical Removal Action Work Plan

Atlantic Fleet Weapons Training Area – Vieques
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

SPECIFIC COMMENTS:

Specific comments are presented below:

1. Section 1.4:

   Please add: The MEC/MPPEH data collected from the NTCRA will be included in the Conceptual Site Models (CSM) for the appropriate UXO sites Site Investigation (SI), Remedial Investigations, Feasibility Studies (FS) and removal actions work plans and reports. The NTCRA results will be used as a data source to be included in the site characterization for nature and extent for UXO 16 RI/FS reports.

   Navy Response: The following has been added to the end of Section 1.4: "The results of the NTCRA will be used to develop/update the CSMs for use in future investigations, removals, and/or remedial actions, and associated documentation, as warranted.

2. Section 2.1:

   Using the subsection "Potential for Complete Exposure Pathways" as a reference define the priorities in which MEC/MPPEH will be removed. Establishing priorities by the highest exposure levels would be the most protective approach to the community.

   Removal of MEC by priority:

   a. Known MEC/MPPEH in beach areas should receive the highest priority for removal.

   b. Beach areas with georeferenced anomalies identified by previous investigations or surveys that have the potential to be MEC but have not been confirmed as MEC/MPPEH should be considered the next highest priority.

   c. Known MEC/MPPEH or georeferenced anomalies suspected to be MEC/MPPEH at frequented recreational dive sites.

   By providing prioritization by exposure to the hazard the Remedial Action Objective (RAO) is met with the most severe hazard areas addressed first.

   Stating priorities in such a fashion can be easily communicated to the community and executed by the field teams to the best of their abilities.

   Planning contingencies and considerations such as the "Type and Condition of Munitions", and "Physical Characteristics at UXO 16" can be applied during the field operations and should be internal to the Navy and its contractors. Listing them in the WP is appropriate as they are part of the Conceptual Site Model (CSM) for UXO 16 and demonstrates all the variables which may influence TCRA operations but should not be part of the initial prioritization.

   Navy Response: As discussed during the May 10, 2018 Technical Subcommittee meeting, the criteria used to make a determination for any particular item is not an exact and neither are the contingencies. Therefore, the listing in Section 2.1 contains the appropriate level of specificity regarding the selection criteria. Please also see the response to EPA Specific Comment #1.

The Navy acknowledges that fully exposed munitions located on the beach areas within UXO 16 may present the greatest potential for exposure to an explosive hazard; however, the type and condition and/or physical characteristics of the area are far more than just a contingency or consideration when planning a NTCRA. Specifically, the munition type will determine how the munition is designed to function and the possible types and sensitivity of fuzing, both of which could make even a small munition of greater concern, even when not located on a beach, than a large projectile or bomb that is fully visible within 50 yards of the beach but unfuzed.

3. Section 2.1, last paragraph:

   Community and Regulator involvement should be completed during the NTCRA WP review. There should be a consensus on the removal action priorities and the methods employed. Once the priorities and field methods are agreed too, there is less of a need to reengage with the community and regulators except with project updates or if there is a site condition change that alters the agreed to NTCRA WP.

   Navy Response: As discussed in the last paragraph of Section 2.1, the Navy will consider regulatory and community input to select and prioritize munitions at UXO 16. However, as discussed during the May 10, 2018 Technical Subcommittee meeting, the Navy will require flexibility in prioritization due to many factors and, therefore, will ultimately retain the authority for the final determination of removal priorities. Further, the Navy will continue to engage community and regulatory involvement during the NTCRA activities.

4. Section 2.3:

   Recommend adding the Shark Marine underwater Global Positioning System (GPS) as an additional option to the circle line approach. The basic steps for using the Shark Marine GPS system follow: 1) A mark is put into the water to provide a reference to the divers and boat Captain. 2) The divers enter the water and use the Shark Marine tablet to navigate to the target. Once at the target they mark the seafloor with a weight as reference point and search the area employing analog and visual methods.

   Navy Response: The recommendation is noted and will be considered.

5. Section 2.3, Page 2-2:

   Magnetometers are referenced. If non-ferrous MEC are anticipated or if DGM was used to identify the anomalies which will be targeted for investigation then all-metals detectors should be used. Change Magnetometers to all-metal detectors.

   Navy Response: All-metals detectors, if available, may be utilized. However, only munitions clearly visible on the sea floor will be removed as part of this NTCRA. The munitions that are anticipated to be removed during this NTCRA will be similar to those located in the terrestrial areas, so a magnetometer will be sufficient.

6. Section 2.3, Page 2-3, First Bullet:

   Change to “The item is acceptable to move”

   Navy Response: In order to remain consistent with all other documents and the intent of that bullet, the language will remain as is to emphasize that the item must be deemed safe to move in order for it to be considered for removal.

7. Section 2.4:

   Remove “items” when referring to MEC/MPPEH (see MEC/MPPEH Items) adding “items” is redundant and is not needed when referring to MEC/MPPEH. Also replace all instances where “items” is used when MEC/MPPEH is being implied (e.g. “Items determined to be acceptable to move…”, etc.).

   Navy Response: The word “items” has been removed where it follows “MEC/MPPEH.” Similarly, the word “items” has been replaced with “munitions” throughout the document.

8. Section 2.4, “Remote Removal of Items”, last sentence:

   The purpose for attaching a buoy to the MEC/MPPEH (not to the bridle or tow line) is for a visual reference should the MEC/MPPEH break free or is detached from the bridle during the tow. The length of the line attached to the buoy must be 25% longer than the deepest depth in which the munitions will be towed across.

   Navy Response: Specific language related to the lifting/movement of MEC/MPPEH has been removed from the document and included in the SOP. The requested information has been included in the SOP.

9. Section 2.4, Lift Bag/Balloon Method, second paragraph:

   The sequence of events and the language used to describe the method for using the lifting balloon and commencing a tow should be clarified. This section is difficult to follow. The basic steps follow:

   a. Exclusion Zone (EZ) is established
   b. Divers attach bridle and lifting balloon to the MEC.
   c. Tow line is attached to the bridle.
   d. Buoy is attached to the MEC (not to the balloon, bridle or tow line)
   e. The tow line is passed from the dive boat to the tow boat
   f. Dive boat with biologist inspects area for turtles and marine mammals then exits out of the EZ and supports as security boat.
   g. While staying outside of the fragmentation distance for the depth of water in which the MEC is suspended under the balloon, the tow boat remotely inflates the balloon and the balloon lifts the MEC to the surface. If the MEC does not release from the sea floor, the tow boat remains outside of the fragmentation distance and a remote pull is initiated to break the munitions from the sea floor.
   h. The balloon comes to the surface. If the balloon does not come to the surface and the MEC cannot be separated from the seafloor a specified wait time should be established before divers reenter the water and free the lifting balloon from the MEC.
   i. Confirm the MEC is suspended underneath the balloon by observing either the balloon is partially submerged under the weight of the MEC or observe the scope of the buoy line attached to the MEC through binoculars.
   j. Begin tow activities.
   k. Tow boat reaches the designated beaching area, passes the tow (via Reference Buoy or other method) to the beach crew while maintaining the fragmentation distance. The beach crew takes over the tow and pulls the MEC and lifting balloon up on the beach.

   Navy Response: Specific language related to the lifting/movement of MEC/MPPEH has been removed from the document and included in the SOP. The requested information has been included in the SOP.

10. Table 3-1:

    Add the following Defined Features of Work (DFOW) to the table: Establish an analog instrument check strip and Material Documented as Safe (MDAS) Management. MPPEH may be determined to be MDAS upon inspection so a DFOW for MDAS is appropriate.

    Navy Response: Details regarding specific DFOWs for MDAS and instrument validation are included in the Master MEC Work Plan (Table 9-1); a reference for this Master MEC Work Plan has been added to Table 3-1.

    All retrieved MEC and/or MPPEH that may ultimately be determined to be MDAS will be handed over to the qualified demolition team for disposal and/or MDAS processing. The quality section of the work plan covering disposal by open detonation and MDAS processing contains the associated DFOWs.

11. Table 3-1, Instrument Validation:

    Specify the analog instruments are tested at a test strip daily and the GPS are compared for accuracy daily.

    Navy Response: Please see the response to the previous comment.

EQB Technical Review of the Navy's Draft UXO 16 Non-Time-Critical Removal Action Work Plan

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

After the evaluation of the above mentioned document, PREQB submits the following minor comments:

GENERAL COMMENTS:

1. Please confirm that safety procedures/requirements for handling/removing MEC/MPPEH items during implementation of the Non-Time-Critical Removal Action (NTCRA) is included in the newly incorporated Standard Operating Procedure (SOP) or include a subsection under Section 2 addressing these items. Please refer to plans and/or documents that will be prepared and used as guidance to ensure that the NTCRA is implemented safely.

   Navy Response: All safety procedures/requirements are found within the Explosives Safety Submission and the contractor's Master Work Plan/QAPP. References to these documents have been included in the Work Plan (WP).

2. Please include a subsection under Section 2.0 addressing management of Investigation-Derived Waste (IDW).

   Navy Response: No IDW will be generated during this NTCRA; all items retrieved will be treated and disposed of as MEC/MPPEH as described in Section 2.5 of the WP.

PAGE-SPECIFIC COMMENTS:

1. Page 1-1, Section 1.1 – Objective:

   a. PREQB recognizes that some munitions items may not be removed as part of the NTCRA; however, as noted in the text, the CERCLA process at UXO 16 is ongoing and a remedy has yet to be selected. Potential remedies could include removal of some munition items left in place during the NTCRA. On this basis, PREQB requests that the first sentence of the third paragraph be revised as follows: *"As noted above, there is no intention to remove all known underwater munitions items at part of the interim action. However, additional underwater munitions items not removed during the interim action may be removed at a later date, depending on the final remedy selected for UXO 16. The objective of the interim action is…"*

      Navy Response: Text modified as requested.

   b. The last paragraph in Section 1.1 states that items will, "*first be evaluated via reconnaissance to determine if each item is indeed munitions.*" Please elaborate in the text on what the reconnaissance activities, instrumented or otherwise, will entail or reference the newly included Standard Operating Procedure (SOP) as applicable.

      Navy Response: Reconnaissance may include use of underwater video/photographs of potential items to be removed utilizing remotely operated vehicles (ROVs)/pole mounted cameras to help determine if an item can/should be removed. If underwater video/photographs utilizing ROVs/pole mounted cameras do not provide the level of detail necessary to determine if removal can/should be completed, divers may be used to inspect an item to help make the determination. This information has been added to the WP.

2. Page 1-2, Section 1.2.2 – UXO 16: UXO 16 is comprised of separate components that are described in this section. It would be useful to know the approximate size of each of these areas. Please identify, to the extent possible, the approximate acreage of each of these components.

   Navy Response: The approximate size of each area listed below has been added to the document and Figure 1-2 has been revised to distinguish the various areas, as described in Section 1.2.2:

   - Anchorage Areas: approximately 413 acres
   - Mosquito Pier: approximately 60 acres
   - Offshore of SWMU 4: approximately 196 acres
   - Explosive Safety Arcs and Artillery Safety Fans: approximately 9,013 acres
   - Other Offshore Areas: approximately 1,185 acres
   - Cayo La Chiva: approximately 36 acres

3. Page 1-7, Section 1.4 – Nature and Extent of MEC/MPPEH Contamination: Please revise the third sentence to state, "*This additional information will be incorporated as warranted and in consultation with the regulatory agencies into the NTCRA activities…*"

   Navy Response: Additional information regarding the locations of potential nearshore munitions obtained that is incorporated as warranted will be communicated to the regulatory agencies. The text has been changed to read *"This additional information will be incorporated as warranted into the NTCRA activities and communicated to the regulatory agencies …"*

4. Page 3-1, Section 3.1 – Quality Control/Quality Assurance Plan: Although implicit in the Work Plan, PREQB requests that the nonconformances, and associated corrective actions, and work that is required to be redone be included in the routine NTCRA status updates and associated documentation.

   Navy Response: The following text has been added to the end of the first paragraph of Section 3.1: Any nonconformances, and associated corrective actions, and work that is required to be redone will be included in routine NTCRA status updates and associated documentation.

Responses to PRDNER Comments on: Vieques NPL, UXO 16 Nearshore Munitions, Non-Time-Critical Removal Action (NTCRA), Draft Work Plan; November 2017
Comments Made by PRDNER on February 12, 2018

PDF Pg. #	Doc. Pg. #	Doc. Section Heading / #	Document Text / Summary of Content [Section Heading (if Applicable) in Brackets]	DNER Comments	Navy Response
5	1-1	Introduction	[1.1 Objective]: Therefore, the decision whether or not to conduct a removal action on any identified MEC/MPPEH item will be based on a number of criteria, such as known or potential use, water depths, potential natural resources impact, etc.	Please clarify whether, in this context, the phrase "potential natural resources impact" refers to the potential impact of leaving the item in place (e.g., harm to natural resources from the potential explosive hazard), or the potential impact of removing the item (e.g., potential for damage to corals during removal operations). If the latter, please clarify whether the removal decision for an individual MEC/MPPEH item will take into account the potential for greater damage to natural resources if removal is deferred or delayed (e.g., if such a delay or deferral would allow the item to become further/more encrusted with coral).	"…, potential natural resources impact" refers to damage during removal operations. It does not consider the potential future effects on natural resources of leaving an item in place since the objective of the NTCRA is limited to reducing the potential explosive hazard to people performing recreational/commercial activities. The sentence has been adjusted as follows: "Therefore, the decision whether or not to conduct a removal action on any identified MEC/MPPEH will be based on a number of criteria, such as known or potential use, water depths, potential natural resources impact during removal operations, etc."
5	1-1	Introduction	[1.1 Objective]: Chemical constituent characterization will not be part of this NTCRA.	If the NTCRA results in removal of cracked or breached MEC/MPPEH items, will the location(s) and condition(s) of those cracked or breached MEC/MPPEH items be recorded for future sampling and/or other chemical constituent characterization activities as part of subsequent investigations and/or final remedial actions for UXO 16?	As stated in Section 2.3, the location of each item removed (first paragraph) and condition of each item (last set of bullets) will be recorded.
8	1-4	Site Background	[1.2.3 Physical Characteristics]: The tides of the Caribbean Sea are mostly mixed, with two unequal occurrences of high and low water in each tidal day. Some areas exhibit primarily semi-diurnal tides and other areas are dominated by diurnal tides (Nanal et al., 2012).	The name of the lead author for the study cited here is Cassandra Nanlal (not Nanal as cited); please correct the parenthetical literature citation here, as well as the citation in the References section of the Work Plan.	The requested citation correction has been made where applicable throughout the document.
22	2-2	Technical Management Plan	[2.1 Selection of MEC/MPPEH Items for Removal]: *Type and Condition of Munitions:* Proximity to threatened and endangered species or sensitive habitat – Can the munitions item be removed in a manner that is appropriately protective of federally listed threatened and endangered species and sensitive habitat?	Please add the following sentence after the quoted text: "Since all corals are protected under Puerto Rico Law 147 (Act for the Protection, Conservation and Management of the Coral Reefs in Puerto Rico), is the item encrusted with live coral(s) that would require detachment and transplantation/reattachment to suitable substrate (in accordance with procedures outlined in Attachment A)?"	Puerto Rico Law 147 contains only administrative requirements and therefore it cannot be included as an ARAR. However, coral and sensitive species and habitats will be protected in accordance with Attachment A. Therefore, no changes to the text are warranted.
22	2-2	Technical Management Plan	[2.1 Selection of MEC/MPPEH Items for Removal]: *Physical Characteristics at UXO 16:* Seafloor Condition – What is the condition of seafloor? Will the munition item likely remain at a location where sediment/sand will get deposited over the top of it or will algae, seagrass, and coral grow around and/or over the item or is the munition item likely to be influenced by currents, tides, and storm events?	How will these considerations affect removal decisions? Specifically, will an item that is likely to be covered/buried by sand or sediment (or covered/encrusted by algae, seagrass, and/or coral) be removed, since leaving it in place to be buried, covered, and/or encrusted may make it more difficult to locate, reacquire and remove the item as part of other investigations and remedial actions? Or, will such items be left in place since their perceived immobility results in a diminished exposure risk and correspondingly lower explosive hazard?	Only munitions clearly visible on the seafloor are planned to be removed as part of this NTCRA. If a munition is in an area that may lead to the munition being buried this will be included as part of the overall evaluation, with consideration of other relevant criteria. As noted in the May 2018 Technical Subcommittee meeting, there is not an exact protocol for selection of any particular munition for removal because it will take in multiple, variable factors and therefore, flexibility in the decision process is necessary.

PDF Pg. #	Doc. Pg. #	Doc. Section Heading / #	Document Text / Summary of Content [Section Heading (if Applicable) in Brackets]	DNER Comments	Navy Response
33	A-3	Attachment A, SOPs for Protection of Listed Species	[Protection of Coral and Benthic Habitats]: All underwater work personnel will be familiar with the identification of federally listed coral species, hardbottom habitat (including critical habitat), and vegetated bottom habitat that have the potential to occur in the work areas, and the procedures to be followed to prevent impacts to these species or habitats during work activities.	Please add the following sentence after the quoted text: "All underwater work personnel will also be advised that all corals within Puerto Rico territorial waters are protected under Puerto Rico law, and will be familiar with procedures to prevent, avoid or minimize impacts to coral from project activities."	Please see the response to the 4th comment above.

Final Responses to Fish and Wildlife Service Comments on the Draft UXO 16 Nearshore Munitions Non-Time- Critical Removal Action Work Plan

We offer the following comments concerning the document.

1. It is not clear from the document whether the beaches on the Vieques National Wildlife Refuge (NWR) that are currently open to the public will need to be closed during removal actions in that area. Please clarify whether it will be necessary and for how long the closure might be needed.

   Navy Response: It is possible that a limited number of munitions might be selected, based on the criteria presented in the work plan, for removal from the nearshore environment of a beach that is currently opened to the public. The safety-based exclusion zones associated with such an effort may require that an area, including the adjacent beach, be closed for a period of a few days to a week while work is completed in that area. Once the munitions items are selected for removal, if any beach closure will be necessary, the Navy will coordinate the activity with FWS.

2. Section 2.5. Transport and Dispose MEC/MPPEH Items. The document discusses how the munitions will be removed from the water and that they will be transported to an approved disposal area within the former VNTR. Please clarify how these munitions will be brought ashore and whether this process might adversely affect threatened and endangered species such as nesting sea turtles and their nests. The SOPs included in the document deal with these species while in the water. It is not clear whether potential impacts might include bringing munitions on shore over sandy beach areas.

   Navy Response: The munition item, once free from the floor of the location where encountered, will be rigged into a tow configuration behind a small boat suitable for the nearshore water, and transported to a beaching location in the restricted portion of the VNTR in a predetermined area that has been monitored and prepared in accordance with existing guidance (Biological Assessments/Biological Evaluations) to ensure no damage to resources occur. Once at the beaching location, the tow line will be transferred to qualified personnel on shore who will bring the munition item onto the beach using approved procedures. The item will be retrieved by the demolition team once on the beach, secured in a suitable vehicle, and transported to the demolition location where it will be destroyed by open detonation during the next planned demolition event.