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FINAL RECORD OF DECISION SOLID WASTE MANAGEMENT UNIT 4 (SWMU 4) ATLANTIC FLEET WEAPONS TRAINING AREA, FORMER NAVAL AMMUNITION SUPPORT DETACHMENT VIEQUES PUERTO RICO (ENGLISH VERSION)

09/01/2019

CH2M HILL

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Atlantic
Norfolk, Virginia

Final

Record of Decision
Solid Waste Management Unit 4
(English Version)

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

September 2019

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Record of Decision

Solid Waste Management Unit 4

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Former Naval Ammunition Support Detachment
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1 Declaration

1.1 Site Name and Location

This Record of Decision (ROD[1]) documents the selected remedy for an operable unit referred to as Solid Waste Management Unit (SWMU) 4, located on the former Naval Ammunition Support Detachment (NASD) in Vieques, Puerto Rico. SWMU 4 comprises approximately 450 acres and is a former open burn/open detonation (OB/OD) site used for destruction of retrograde munitions, fuels, and propellants from 1969 to 1979. The NASD is part of the former Atlantic Fleet Weapons Training Area – Vieques (also known as AFWTA-Vieques), which was placed on the National Priorities List (NPL) on February 11, 2005 (Superfund Enterprise Management System [SEMS] identification number: PRN000204694). SWMU 4 is also known as Operable Unit (OU) 7. SWMU 4 is part of the Vieques National Wildlife Refuge, which is managed by the United States Fish and Wildlife Service (USFWS), a bureau of the United States Department of the Interior (DOI).

SWMU 4 is a site where munitions and explosives of concern (MEC) were found as a result of OB/OD activities and where munitions response actions (MEC removal) were conducted. Although MEC removal was conducted in areas of planned future recreational use and where OB/OD operations occurred, it is possible that some MEC may still be present at SWMU 4 and groundwater contamination attributable to historic OB/OD activities exists. Because a future land user (e.g., recreational user, maintenance worker, or construction worker) may encounter MEC at SWMU 4, and because groundwater contamination poses a potable-use risk, a Remedial Investigation/Feasibility Study (RI/FS) was conducted to assess the nature and extent of MEC and groundwater contamination and evaluate remedial alternatives to address potential MEC explosive hazard and groundwater potable-use risk to future land users.

1.2 Statement of Basis and Purpose

The remedy described in this ROD was selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The Department of the Navy (Navy), Naval Facilities Engineering Command (NAVFAC) Atlantic, United States Environmental Protection Agency (EPA) Region 2, Commonwealth of Puerto Rico, and DOI entered into a Federal Facilities Agreement (FFA) in 2007, as a result of the NPL listing and pursuant to CERCLA. The FFA establishes the procedural framework and schedule for implementing CERCLA response actions for Vieques.

This decision is undertaken pursuant to the President's authority under CERCLA Section 104, as delegated to EPA and the Navy in accordance with Executive Order 12580, and in compliance with the process set

[1] This acronym, and all the others used in this document, can be found in alphabetical order in Section 4 of this document.

out in CERCLA Section 120. The selection of the remedy is authorized pursuant to CERCLA Section 104, and the selected remedy will be carried out in accordance with CERCLA Section 121. The Navy is the lead response agency for AFWTA-Vieques and is responsible for taking all appropriate CERCLA response actions necessary to protect public health, welfare, and the environment.

This remedy is being jointly selected by the Navy and EPA, with concurrence of DOI and the Puerto Rico Department of Natural and Environmental Resources (PRDNER). This decision is based on information contained in the Administrative Record file for SWMU 4. Information not specifically summarized in this ROD or its references, but contained in the Administrative Record, has been considered and is relevant to the remedy selection for SWMU 4. Thus, the ROD is based upon and relies on those portions of the Administrative Record file that pertain to SWMU 4 in making this decision. This ROD was prepared in accordance with EPA ROD guidance, specifically *A **Guide**[1] to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents* (EPA, 1999) and ***Toolkit**[2] for Preparing CERCLA Records of Decision* (EPA, 2011), a supplement to the 1999 guidance for producing higher quality and more user-friendly RODs. The result is a ROD format that is conducive for the general public to read and understand the information upon which the decision for SWMU 4 was made, including providing links to the technical details presented in the Administrative Record for this OU.

1.3 Scope and Role of Response Action

Munitions removal conducted in 2000, 2002/2003, 2009/2010, and 2015 eliminated over 6,500 MEC along with numerous munitions debris (MD) from 165 acres that included the OB/OD pits and planned public use areas within SWMU 4. Although a significant number of munitions were removed, there is potential explosive hazard posed by MEC that may remain at SWMU 4. Therefore, the selected munitions remedy will address the potential remaining explosive hazards to ensure SWMU 4 can be used as planned.

In addition, based on investigations conducted between 2000 and 2014, no chemical contamination was identified posing unacceptable human health or ecological risks associated with current or planned use. No potable groundwater use is anticipated at SWMU 4 because all potable water on Vieques is supplied by the main island of Puerto Rico, because this type of use is not part of USFWS long-term land use plan, and because of the saline conditions of groundwater at the site. Nonetheless, as part of the evaluation process under CERCLA, potable groundwater use is conservatively considered and, as such, perchlorate concentrations in groundwater pose potentially unacceptable human health risk. While past munitions removal activities eliminated a significant source of the perchlorate, the selected groundwater remedy will be protective of human health by monitoring the continued effectiveness of the historical munitions removal on perchlorate groundwater concentrations.

SWMU 4 is one of 19 munitions response sites associated with AFWTA-Vieques that have been or currently are being evaluated in accordance with CERCLA under the Navy's Munitions Response Program (MRP). The Site Management Plan for Vieques further details the investigation history and the schedule for CERCLA investigations/response activities at the former AFWTA-Vieques, and it is updated annually. The response action selected in this ROD is intended to be the final remedy for SWMU 4 and does not include or affect any other OUs at AFWTA-Vieques under the CERCLA process. The final determinations for the other OUs within AFWTA-Vieques have been documented in past decision documents or will be documented in future decision documents. SWMU 4 is the third MRP site within AFWTA-Vieques for which a final remedy determination has been made.

1.4 Description of Selected Remedy

The selected remedy for SWMU 4 is Land Use Controls (LUCs) to address MEC that potentially remains onsite and Natural Attenuation (NA) and LUCs for perchlorate in groundwater, as described in Sections 2.9 and 2.10. This remedy reflects the significant munitions removal from the OB/OD pits and planned public use areas conducted as part of investigations and removal actions, further reduces potential explosive hazards, preserves important ecological habitat, is protective of human health, and supports public access under the USFWS land use plan.

The components of the selected remedy are:

- Implementing LUCs (e.g., signage and administrative mechanisms, such as special use permits) to influence/control future access and intrusive activities and restrict potential groundwater use.
- An MEC Long-term Monitoring (LTM) program, including periodic site inspections for trespassing, erosion, MEC/MD recurrence in public-access areas, and the integrity and effectiveness of physical LUCs. Any MEC/MD discovered during implementation of the LTM program will be removed.
- A groundwater LTM program with periodic groundwater level measurement and sampling of wells for perchlorate and natural attenuation parameters.

1.5 Statutory Determination

The selected remedy for SWMU 4 meets the statutory requirements of CERCLA Section 121 and is protective of human health and the environment, complies with Federal and Commonwealth regulations that are applicable or relevant and appropriate to the remedial action, and is cost-effective.

Because perchlorate groundwater contamination and MEC posing explosive hazards may remain at SWMU 4 following implementation of the remedial action, in addition to this remedy the Navy will conduct statutorily required reviews every five years to ensure that the remedy remains protective of human health and the environment.

1.6 Navy Authorizing Signature for the Record of Decision for SWMU 4, Atlantic Fleet Weapons Training Area – Vieques

24 Jan 2019

J. R. Cirvello
Environmental Business Line Manager
Naval Facilities Engineering Command, Atlantic

Date

1.7 EPA Authorizing Signature for the Record of Decision for SWMU 4, Atlantic Fleet Weapons Training Area – Vieques

Pat Evangelista
Acting Director, Superfund and Emergency Management Division
Environmental Protection Agency, Region 2

9/25/19
Date

1.8 DOI Concurrence Signature for the Record of Decision for SWMU 4, Atlantic Fleet Weapons Training Area – Vieques

Susan Combs

Sept. 12, 2019

Susan Combs
Assistant Secretary – Policy, Management and Budget
United States Department of the Interior

Date

1.9 PRDNER Concurrence Signature for the Record of Decision for SWMU 4, Atlantic Fleet Weapons Training Area – Vieques

JAN 16 2019

Tania Vázquez Rivera
Secretary
Puerto Rico Department of Natural and Environmental Resources

Date

2 Decision Summary

2.1 Site Description and History

Vieques is approximately 7 miles southeast of the eastern tip of the main island of Puerto Rico (**Figure 1**). Aside from mainland Puerto Rico, Vieques is the largest island in the Commonwealth of Puerto Rico, encompassing 33,088 acres (51 square miles).

The Navy purchased large portions of Vieques in the early 1940s to conduct activities related to military training. Operations within the former NASD (located on the western one-third of Vieques) consisted mainly of ammunition loading and storage, vehicle and facility maintenance, OB/OD, and some training. **Figure 2** shows the location of SWMU 4 within the former 8,114-acre NASD.

The Navy ceased facility-wide operations on the former NASD in April 2001, in accordance with the Presidential Directive to the Secretary of Defense dated January 30, 2000, and the land was apportioned and transferred to the DOI, the Municipality of Vieques (MOV), and the Puerto Rico Conservation Trust (PRCT) in accordance with Public Law 106–398. The property owned by DOI (approximately 3,158 acres), which includes SWMU 4, is managed by USFWS as part of the Vieques National Wildlife Refuge. On February 11, 2005, the AFWTA–Vieques was added to the NPL, which required all subsequent environmental restoration activities for Navy sites on Vieques to be conducted under CERCLA. On September 7, 2007, the Navy, DOI, EPA, and the Commonwealth of Puerto Rico finalized an FFA that established the procedural framework and schedule for implementing the CERCLA activities for Vieques. The Navy retains the primary responsibility under the FFA for conducting the environmental investigations and cleanup of the property, as warranted.

SWMU 4, also known as OU 7, is approximately 450 acres in size and is located on the western end of Vieques (**Figure 2**). The adjacent waters are part of a separate operable unit (OU 17, also known as UXO 16 [the portion adjacent to SWMU 4 is UXO 16.1]), which is not being addressed under this ROD. SWMU 4 was used for the destruction of retrograde and surplus munitions, fuels, and propellants from 1969 through 1979 and may have periodically been used for this purpose as far back as the late 1940s. The OB/OD operations were conducted in 16, man-made earthen-bermed pits. Fuels, propellants, and explosive waste material were burned and/or detonated in the pits.

2.2 Site Characteristics

SWMU 4 includes a beach along the westernmost portion, a 73-acre lagoon (Laguna Boca Quebrada), ephemeral streams, dense vegetation of thorny shrubs, and mangroves around the edge of the lagoon. The topography ranges from sea level along the western portion to 164 feet above mean sea level at the slope of Mount Pirata within the southeastern portion of SWMU 4 (**Figure 3**). Numerous wildlife species exist at SWMU 4, including abundant insects, reptiles, and birds, with a relatively small population and diversity of fish species within Laguna Boca Quebrada due to the absence of direct ocean access (**Figure 4**). Several cultural and archeological resources were identified during investigations at SWMU 4.

The western portion of Vieques, where SWMU 4 is located, averages approximately 43 inches of rainfall per year. Laguna Boca Quebrada was hydrologically connected to the Caribbean Sea through an inlet on the western side of the lagoon; however, over time, this connection naturally filled in with sand and is no longer a direct hydrologic connection, and the lagoon is likely recharged via precipitation and groundwater discharge. Ephemeral streams drain surface water from Mount Pirata through SWMU 4, where surface

water is intermittent, present only during and immediately following significant precipitation events except at the terminus of the main ephemeral stream. Here, surface water is continually present because the terminus of the ephemeral stream is blocked from discharge (except during infrequent breaches caused by major storms) by natural deposition of sand along the beach.

The near-surface geology beneath much of SWMU 4 is characterized by saprolite, a clay-rich, decomposed rock that is formed in place by chemical weathering of volcanic rocks in tropical climates (**Figure 4**). At depth, more competent quartz diorite is encountered. A relatively narrow strip of sand is found along the beach, and organic-rich clays are found around the lagoon fringe.

Groundwater occurs within weathered bedrock, and the lateral groundwater flow is complex due to the fractured and weathered nature of the bedrock. Groundwater flows generally westward within the saprolite and bedrock toward the coastline with the estimated horizontal groundwater velocity ranging from 34 to 142 feet per year. Based on SWMU 4's proximity to the ocean and chemical characteristics determined during historical investigations, groundwater at SWMU 4 is brackish and unsuitable for potable use unless treated. There is currently no public access allowed, and there is no current, planned, or likely groundwater use within SWMU 4.

Figure 1 - Regional Location Map

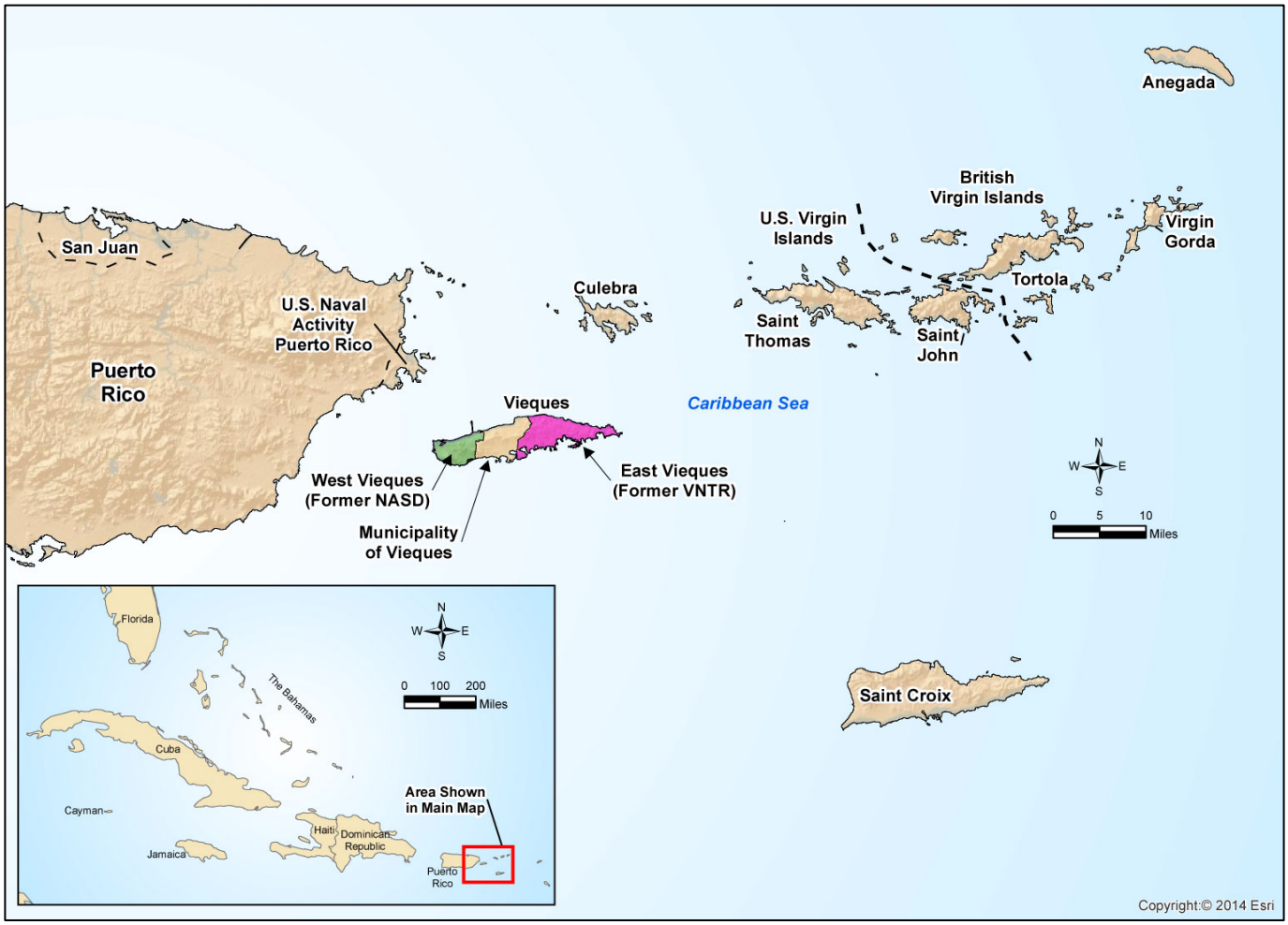


Figure 2 - SWMU 4 Site Location Map

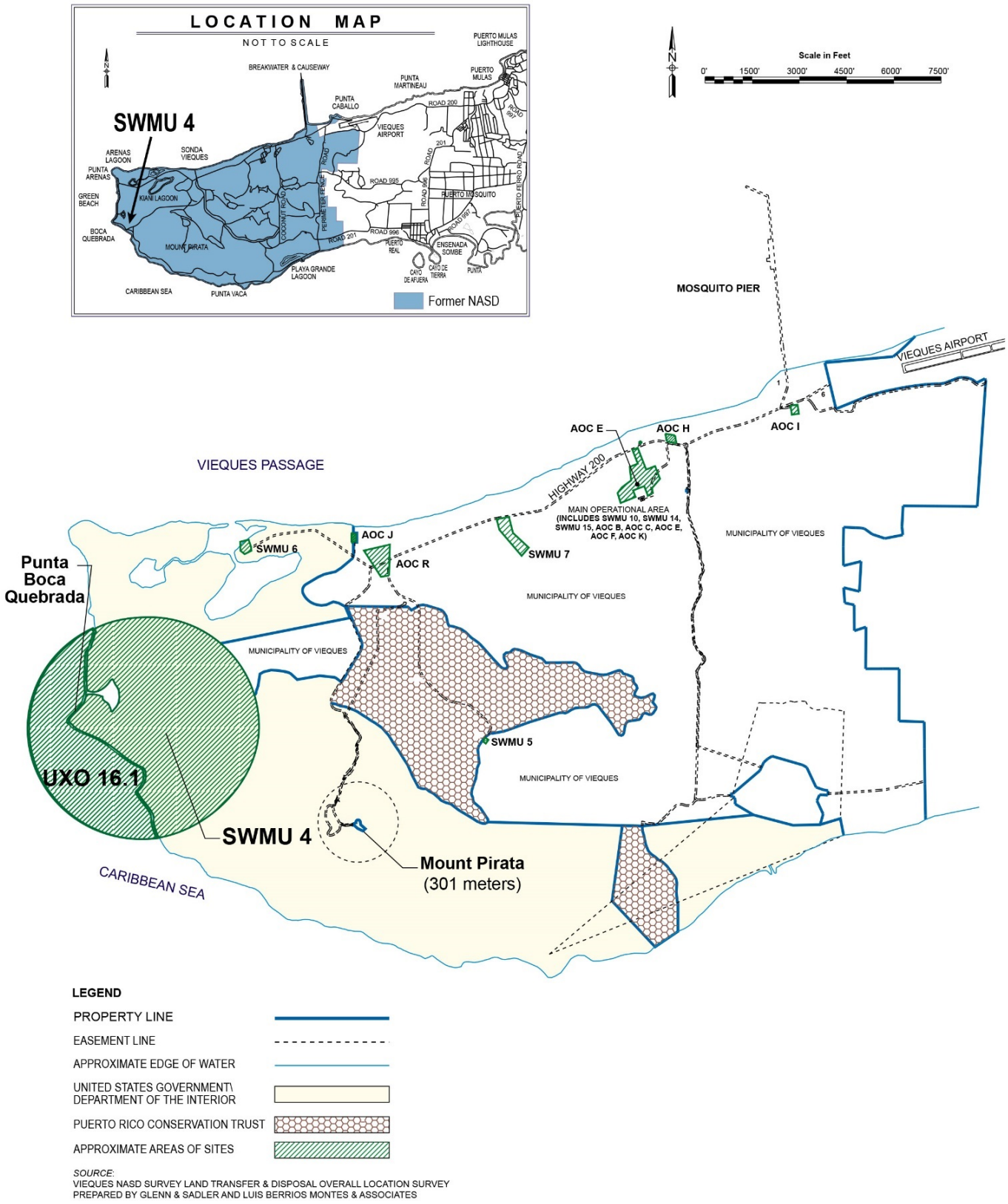


Figure 3 - SWMU 4 Topographic Map

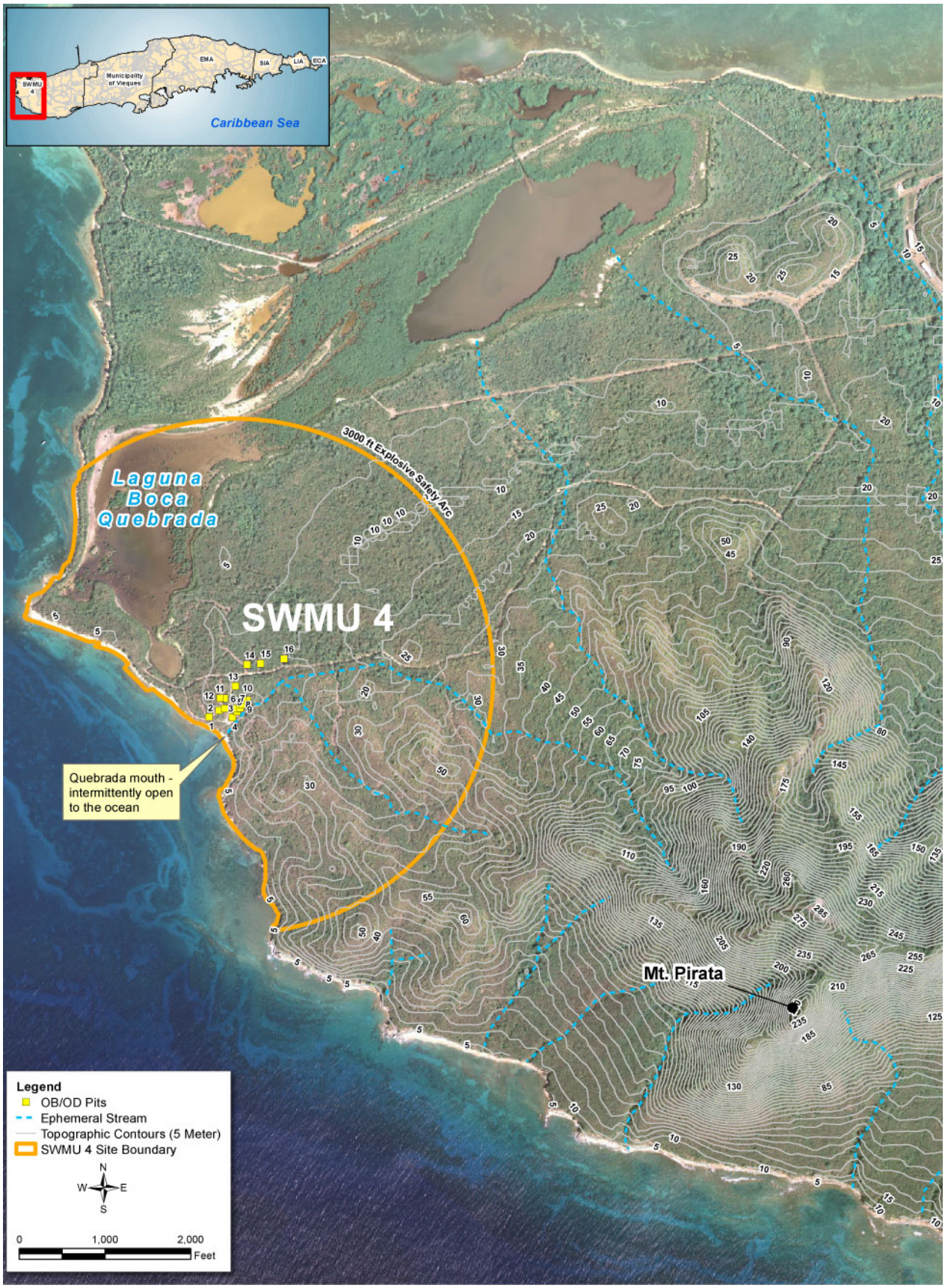
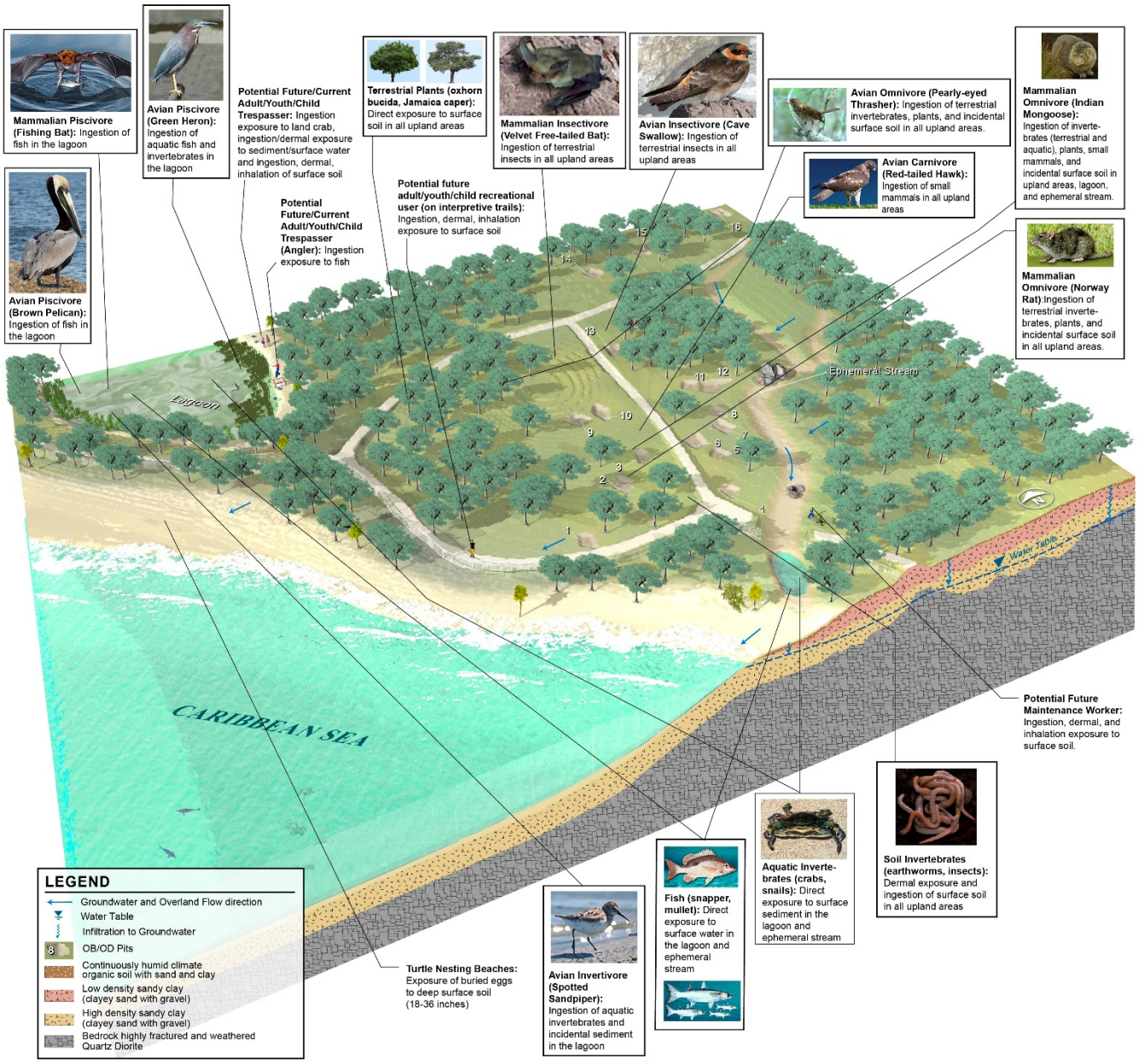


Figure 4 - SWMU 4 Conceptual Site Model



2.3 Summary of Previous Investigations

Environmental investigations of the former NASD that are relevant to SWMU 4 have been conducted since 1984, and investigations/munitions removal activities were performed specific to SWMU 4 since 2000. **Table 1** summarizes the purpose, scope, and pertinent results of previous investigations and munitions removal activities performed at or relevant to SWMU 4.

Table 1 - Previous Investigations and Munitions Removal Activities

Previous Investigation*	Date	Investigation Activities
Initial Assessment Study	1984	An **Initial Assessment Study**[3] (IAS; Greenleaf, 1984) was conducted in 1984 to identify and assess sites posing potential threats to human health or the environment. SWMU 4 was designated as Site 19, the West Explosive Ordnance Disposal (EOD) Range.
Phase II RCRA Facility Assessment	1988	A **Phase II Resource Conservation and Recovery Act (RCRA) Facility Assessment**[4] (RFA; Kearney, 1988) was conducted in 1988 to evaluate past, present, or potential future releases of hazardous waste or hazardous constituents from any unit or activity that involved management of solid waste. The Phase II RFA Report recommended soil, groundwater, and surface water sampling at SWMU 4.
Expanded Preliminary Assessment/Site Investigation	2000	An **Expanded Preliminary Assessment/Site Investigation**[5] (PA/SI; CH2M, 2000) was conducted in 2000 to determine if a release of hazardous constituents had occurred because of site-related activities, and to assess whether SWMU 4 required further investigation. Munitions found during transect inspections were removed. Based on the results of the Expanded PA/SI, an RI was recommended to delineate the nature and extent of MEC and environmental impacts in soil, and to complete a background study for soil and groundwater.
Background Investigation	2000	A **Background Investigation**[6] (CH2M, 2002) was conducted in 2000 for the former NASD to develop a set of background concentrations for inorganic constituents in soil to help distinguish inorganic concentrations that occur in soil from those that may be present because of a site-related release.
Environmental Baseline Survey	2000	An **Environmental Baseline Survey**[7] (PMC, 2000) was completed in 2000 to disclose information regarding the environmental condition of the Navy property. The information was used as a basis for determining the environmental suitability of the property for transfer.
Remedial Investigation/Feasibility Study	2002-2009	A **Remedial Investigation/Feasibility Study**[8] (RI/FS; CH2M, 2012) was conducted to assess the nature and extent of MEC and environmental media contamination, to assess potential risks to human health and environment, and evaluate remedial alternatives for SWMU 4. It was concluded that although MEC is potentially present across SWMU 4, the highest densities were located within and immediately around the former OB/OD area, with decreasing density with distance. As part of the RI, munitions removal occurred across 87 acres. The RI also identified potentially unacceptable human health risk associated with hypothetical potable use of groundwater contaminated with perchlorate and hypothetical fish and aquatic crab (biota) consumption from Laguna Boca Quebrada. There were **no unacceptable risks to human health or the environment**[9] posed by constituent concentrations in soil, sediment, or surface water. The FS evaluated potential remedial alternatives to address potential MEC remaining at SWMU 4 and potentially unacceptable human health risk associated with hypothetical groundwater and fish and crab (biota) consumption. A more detailed description of the FS is presented in Section 2.9.
Non-Time Critical Removal Action	2009-2010	A **Non-Time-Critical Removal Action**[10] (NTCRA) was conducted to remove munitions across all roads and the beach at SWMU 4 to reduce the potential explosive hazard associated with areas intended for public use. The NTCRA area comprised 24 acres: 17 acres of roads (to a maximum depth of 2 feet below ground surface [bgs]) and 7 acres of beach (to a maximum depth of 4 feet bgs).

Table 1 - Previous Investigations and Munitions Removal Activities

Previous Investigation*	Date	Investigation Activities
Supplemental Remedial Investigation	2014	A **Supplemental RI**[11] (CH2M, 2017) was conducted in 2014 during which additional biota (fish and blue crab) samples were collected from Laguna Boca Quebrada and used to update the human health risk assessment (HHRA). Based on the concentrations of constituents in biota samples collected during the Supplemental RI, it was determined there is no unacceptable fish/crab consumption risk attributable to past OB/OD activities; therefore, no remedial action for biota was determined to be necessary. An additional round of groundwater samples was collected for perchlorate analysis to provide up-to-date data. Perchlorate levels in groundwater were found to be comparable to the 2009 levels.
Non-Time-Critical Removal Action	2015	An NTCRA was conducted over an additional 54 acres in 2015 to further reduce the potential explosive hazard associated with the areas intended for public use. The NTCRA focused on the following four areas: • OB/OD pits and Planned Observation Tower Area – munitions removal to the total depth of any subsurface anomaly detected at the OB/OD pits and to a maximum depth of 2 feet bgs at the planned observation tower area (approximately 6 acres). • Planned Parking and Picnic Areas – munitions removal to a maximum depth of 2 feet bgs (approximately 5 acres). • Lagoon Fringe Area – munitions removal to a maximum depth of 1 foot bgs within areas likely accessed for land crabbing around the lagoon fringe (approximately 19 acres). • Investigation "Spokes" Area – munitions removal to a maximum depth of 1 foot bgs within the planned hunting area (approximately 24 acres).
Feasibility Study Addendum	2016	The **FS Addendum**[12] (CH2M, 2017) provides further clarification of the costs and associated assumptions used to evaluate the MEC remedial alternatives.
* Documentation associated with the listed activities is available in the Administrative Record and provides detailed information used to support the remedy selection for SWMU 4. The relevant referenced information is also accessible by the hyperlinks in this document.		

2.4 Nature and Extent of Contamination

Most of the MEC recovered from SWMU 4 have been 20-millimeter (mm) projectiles that contained or may have contained an explosive filler, tracers, fuzes, or a combination of each. Incendiary devices, including white phosphorous, flares, fuzes, and small cartridges were also detonated. MEC occurred most frequently near the OB/OD pits with less frequent occurrences with increasing distance from the OB/OD pits. MEC was not identified beyond approximately 2,000 feet from the OB/OD area, except for one item found along the road, but it is likely the location of this item was the result of road grading activities when the OB/OD unit was active. All MEC discovered during the RI and NTCRAs were destroyed through controlled detonation.

Soil, groundwater, surface water, and sediment samples were collected and analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), explosives, and inorganics. Some SVOCs, PCB, explosives, and inorganics were detected in soil at levels exceeding screening criteria (**Table 2**). However, the SVOC and PCB detections were isolated and/or not munitions-related. Perchlorate was the most frequently detected explosive and, in general, was detected at lower concentrations with distance from the OB/OD pits. Detections of inorganics were either

isolated, not munitions-related, the result of natural processes (i.e., volcanic nature of the soils, brackish conditions of the surface water, etc.), and/or not observed above background levels.

Similar to soil, some VOCs, SVOCs, pesticides, explosives, and inorganics were detected in groundwater at levels exceeding screening criteria (**Table 2**). The VOC detections were isolated and not detected in soil. The SVOC detections were also isolated, were detected in background samples, and/or observed in laboratory quality assurance/quality control samples. Pesticide detections were isolated and likely the result of normal pesticide application. Perchlorate was the only explosive frequently detected in groundwater samples at levels exceeding its screening criterion. During the RI (2007), perchlorate was detected at a maximum concentration of 160 micrograms per liter (µg/L). However, when the wells were resampled as part of the Supplemental RI (2014), the highest perchlorate concentration detected was 95 µg/L. There is no Commonwealth groundwater standard or federal maximum contaminant level (MCL) for perchlorate; the EPA risk-based regional screening level (RSL) for tap water is 14 µg/L. Inorganics detections were either isolated, not munitions-related, naturally occurring, and/or not observed above background levels.

Various SVOCs, pesticides, and inorganics were detected in surface water and sediment at levels exceeding screening criteria (**Table 2**). As in groundwater, the SVOC, pesticide, and inorganics detections were not associated with a site-related release or were attributable to background.

Biota (fish and blue crab) samples were collected from Laguna Boca Quebrada and analyzed for explosives and inorganics. No explosives were detected in any of the biota samples and although some inorganics were detected at concentrations above screening criteria, they were attributable to natural conditions.

Table 2 - Soil, Groundwater, Surface Water, Sediment, and Biota Exceedances for SWMU 4

Environmental Media	COPC	Maximum Concentration Detected Above Screening Criteria and Background	West Vieques Background Value (Qa)	Screening Criteria			
				SSL DAF 6.2	June 2011 RSL for Residential Soil, Adjusted	June 2011 RSL for Industrial Soil, Adjusted	Ecological Criteria
Soil	***Semivolatile Organic Compounds (µg/kg)***						
	Benzo(a)pyrene	41	--	8,000	15	210	--
	2,4-dinitrotoluene (2,4-DNT)	1,980J	--	0.79	1,600	5,500	11,000
	Pesticides/PCBs (µg/kg)						
	Aroclor-1254	230J	--	120	110	740	--
	Explosives (µg/kg)						
	Perchlorate	9,950	--	160	55,000	720,000	1
	RDX	7,800J	--	6	5,500	24,000	1,000
	Total Inorganics (mg/kg)						
	Aluminum	32,800J	18,000	1,000,000	7,700	99,000	--
	Arsenic	4.9	1.2	1.7	0.39	1.6	18
	Barium	3,179	190	450	1,500	19,000	330
	Cobalt	28.5	13	3.1	2.3	30	13
	Copper	107	47	280	310	4,100	70
	Iron	30,500	28,000	4,100	5,500	72,000	--
	Lead	95.3J	6.9	22	400	800	120
	Manganese	5,120	1,200	360	180	2,300	220
	Mercury	0.21	0.024	0.2	2.3	31	0.1
	Nickel	60.5J	18	210	150	2,000	38
	Selenium	7.5	0.73	2.1	39	510	0.52
	Silver	6.8	0.076	4	39	510	560
	Thallium	1.10J	0.46	0.8	0.51	6.6	1
	Vanadium	113	80	1,600	39	520	2
	Zinc	128	53	3,200	2,300	31,000	120

Table 2 - Soil, Groundwater, Surface Water, Sediment, and Biota Exceedances for SWMU 4

Environmental Media	COPC	Maximum Concentration Detected Above Screening Criteria	Screening Criteria		
			June 2011 RSL for Tap Water, Adjusted	Maximum Contaminant Level	2010 Puerto Rico Water Quality Standards, Class SG
Groundwater	***Dissolved Inorganics (µg/L)***				
	Arsenic	20.2	0.045	10	10
	Barium	904	730	2,000	--
	Cadmium	4.30J	1.82	5	5
	Cobalt	6.20J	1.1	--	--
	Manganese	7,210	88	--	--
	Mercury	0.28	1.1	2	0.05
	Selenium	34.9J	18	50	50
	Total Inorganics (µg/L)				
	Aluminum	8,580J	3,700	--	--
	Arsenic	6.6J	0.045	10	10
	Barium	952	730	2,000	--
	Cadmium	4.6J	1.82	5	5
	Chromium	14.7	11	100	100
	Cobalt	9.80J	1.1	--	--
	Manganese	7,380	88	--	--
	Mercury	0.2	1.1	2	0.05
	Selenium	34.3J	18	50	50
	Thallium	3.1J	0.24	2	0.24
	Volatile Organic Compounds (µg/L)				
	Chloroform	0.2J	0.19	80	57
	1,2-dibromo-3-chloropropane	0.6	0.00032	0.2	--
	Vinyl chloride	0.2J	0.016	2	0.25
	Semi-Volatile Organic Compounds (µg/L)				
	Naphthalene	0.42J	0.14	--	--
	Benzo(a)anthracene	0.04J	0.029	--	0.038
	chrysene	0.04J	2.9	--	0.038

Table 2 - Soil, Groundwater, Surface Water, Sediment, and Biota Exceedances for SWMU 4

Environmental Media	COPC	Maximum Concentration Detected Above Screening Criteria	Screening Criteria		
			June 2011 RSL for Tap Water, Adjusted	Maximum Contaminant Level	2010 Puerto Rico Water Quality Standards, Class SG
Groundwater	2,2'-oxybis(1-chloropropane)	17	0.32	--	--
	3-nitroanaline	7.7J	3.65	--	--
	4-nitrophenol	3.7J	0.12	--	--
	Pesticides/PCBs (µg/L)				
	Gamma-chlordane	0.014J	0.19	--	0.008
	Alpha-BHC	0.025J	0.011	--	0.026
	Explosives (µg/L)				
	Perchlorate	160	26	--	--

Table 2 - Soil, Groundwater, Surface Water, Sediment, and Biota Exceedances for SWMU 4

Environmental Media	COPC	Maximum Concentration Detected Above Screening Criteria	Screening Criteria		
			2010 RSL for Tap Water, Adjusted	Marine Ecological Screening Criteria	2010 Puerto Rico Water Quality Standards, Class SB/SC
Surface Water	***Dissolved Inorganics (µg/L)***				
	Arsenic	25.5	0.045	1.4	10
	Barium	635	730	200	--
	Copper	434	150	3.1	--
	Manganese	3,510	88	100	--
	Mercury	0.075J	1.1	0.94	0.05
	Selenium	96.6	18	71	5
	Total Inorganics (µg/L)				
	Aluminum	7,060	3,700	--	--
	Antimony	7.7J	1.5	4,300	5.6
	Arsenic	31.4	0.045	1.4	10
	Total Inorganics (µg/L)				
	Barium	556	730	200	--

Table 2 - Soil, Groundwater, Surface Water, Sediment, and Biota Exceedances for SWMU 4

Environmental Media	COPC	Maximum Concentration Detected Above Screening Criteria	Screening Criteria		
			2010 RSL for Tap Water, Adjusted	Marine Ecological Screening Criteria	2010 Puerto Rico Water Quality Standards, Class SB/SC
Surface Water	Copper	201	150	3.73	--
	Iron	19,500J	2,600	50	--
	Manganese	3,740	88	100	--
	Mercury	0.077J	1.1	0.051	0.05
	Selenium	84.3	18	71.1	5
	Vanadium	30	18	50	--
	Semi-Volatile Organic Compounds (µg/L)				
	Naphthalene	0.69	0.14	1.4	--
	Pesticides/PCBs (µg/L)				
	4-4'-DDD	0.032J	0.28	0.001	0.001

Table 2 - Soil, Groundwater, Surface Water, Sediment, and Biota Exceedances for SWMU 4

Environmental Media	COPC	Maximum Concentration Detected Above Screening Criteria	Screening Criteria	
			June 2011 RSL for Residential Soil, Adjusted	Ecological Screening Level
Sediment	***Total Inorganics (mg/kg)***			
	Aluminum	60,500	7,700	18,000
	Arsenic	4.4J	0.39	8.2
	Barium	213	1,500	48
	Cobalt	9.8J	2.3	10
	Copper	45.6J	310	34
	Iron	35,200	5,500	220,000
	Manganese	879J	180	260
	Mercury	0.18J	2.3	0.15
	Selenium	2J	39	1

Table 2 - Soil, Groundwater, Surface Water, Sediment, and Biota Exceedances for SWMU 4

Environmental Media	COPC	Maximum Concentration Detected Above Screening Criteria	Screening Criteria	
			June 2011 RSL for Residential Soil, Adjusted	Ecological Screening Level
Sediment	Silver	8.9	39	1
	Vanadium	86.6	39	57
	Zinc	217	2,300	150
	Semi-Volatile Organic Compounds (µg/kg)			
	Butylbenzylphthalate	260J	260,000	63
	Di-n-butylphthalate	1,200	610,000	58
	bis(2-Ethylhexyl)phthalate	240J	35,000	182
	Pesticides/PCBs (µg/kg)			
	4,4'-DDD	2.5J	2,000	2
	4,4'-DDE	7.3	1,400	2.2
	4,4'-DDT	3.3J	1,700	1.58
	Dieldrin	1.5J	30	0.2
	Explosives (µg/kg)			
	Tetryl	100J	24,000	72

Notes:

The semi-volatile organic compound 2,4-DNT is used in the production of explosives

µg/kg = micrograms per kilogram
µg/L = micrograms per liter
MCL = Maximum Contaminant Level
mg/kg = milligrams per kilogram
RSL = Regional Screening Level (corresponding to risk of $1x10^{-6}$ and an adjusted hazard quotient [HQ] of 0.1, as applicable). The June 2011 RSLs were available during the Remedial Investigation; although several RSLs (as well as various other screening levels) have been updated since that time, the updated values do not alter the human health risk assessment conclusions.
SSL = soil screening level

Table 2 - Soil, Groundwater, Surface Water, Sediment, and Biota Exceedances for SWMU 4

Environmental Media	COPC	Maximum Concentration Detected Above Screening Criteria	Screening Criteria		
			Adjusted RSL Calculator Output - Adult Fish/Blue Crab Consumer	Adjusted RSL Calculator Output - Youth Fish/Blue Crab Consumer	RSL Calculator Output - Child Fish/Blue Crab Consumer
Blue Crab Biota	***Total Inorganics (mg/kg)***				
	Arsenic	2.84	1.06E-02	5.81E-03	4E-03
	Chromium	0.226	52.9	29.1	19.7
	Copper	27.4	1.41	0.775	0.526
	Arsenic, Inorganic	0.038	0.0106	5.81E-03	3.95E-03
	Lead	0.041	0.296	0.296	0.296
	Methyl mercury	0.0494	3.52E-03	1.94E-03	1.32E-03
	Nickel	0.13J	0.705	0.388	0.263
	Selenium	0.33	0.176	9.69E-02	6.58E-02
	Silver	0.028J	0.176	9.69E-02	6.58E-02
	Zinc	20.2	10.6	5.81	3.95
Fish Biota	***Total Inorganics (mg/kg)***				
	Arsenic	1.57	1.06E-02	5.81E-03	4E-03
	Chromium	0.074J	52.9	29.1	19.7
	Copper	0.86	1.41	0.775	0.526
	Lead	0.123	0.296	0.296	0.296
	Methyl mercury	0.0973J	3.52E-03	1.94E-03	1.32E-03
	Selenium	0.31	0.176	9.69E-02	6.58E-02
	Zinc	21.2	10.6	5.81	3.95

Notes:

EPA's RSL calculator (EPA, 2015a) was used to calculate the screening levels for fish and blue crab.

The screening level for arsenic is the noncarcinogenic-based screening level. The carcinogenic screening level for arsenic was calculated separately using an age-adjusted scenario as described in the SWMU FS Addendum (CH2M, 2017).

Screening levels for lead were calculated using the EPA's Integrated Exposure Uptake Biokinetic (IEUBK) Model and Adult Lead Methodology (ALM) (EPA, 2009a; 2010).

2.5 Current and Potential Future Land and Resource Uses

The land that includes SWMU 4 is under the jurisdiction of DOI, to be managed by USFWS as part of the Vieques National Wildlife Refuge, as mandated by legislation. Accordingly, USFWS prepared a Comprehensive Conservation Plan/Environmental Impact Statement (CCP/EIS) for the Vieques National Wildlife Refuge that provides long term guidance for the management and public use of these lands for recreational purposes (USFWS, 2007). USFWS has identified and mapped locations of planned future recreational features and public use areas, including an observation tower for nature observation and areas/trails for hunting, land crabbing, hiking, birdwatching, parking, and picnicking. These planned public use areas are shown in **Figure 5**; however, it should be noted that all areas of SWMU 4 will be accessible with proper munitions awareness (e.g., "3Rs") LUCs.

There is currently no public access allowed, and no current or planned groundwater use within SWMU 4. Potable water supply on Vieques is derived from the Rio Blanco on the main island of Puerto Rico and supplied to Vieques via pipeline by the Puerto Rico Aqueduct and Sewer Authority (PRASA).

2.6 Summary of Site Risks

The results of the HHRA and Ecological Risk Assessment (ERA) conducted for SWMU 4 during the RI and Supplemental RI are discussed in the following subsections and summarized in **Table 3**. The complete HHRA and ERA are provided in the RI/FS and FS Addendum Reports, which are available in the Administrative Record File.

Figure 5 - USFWS Planned Land Use at SWMU 4

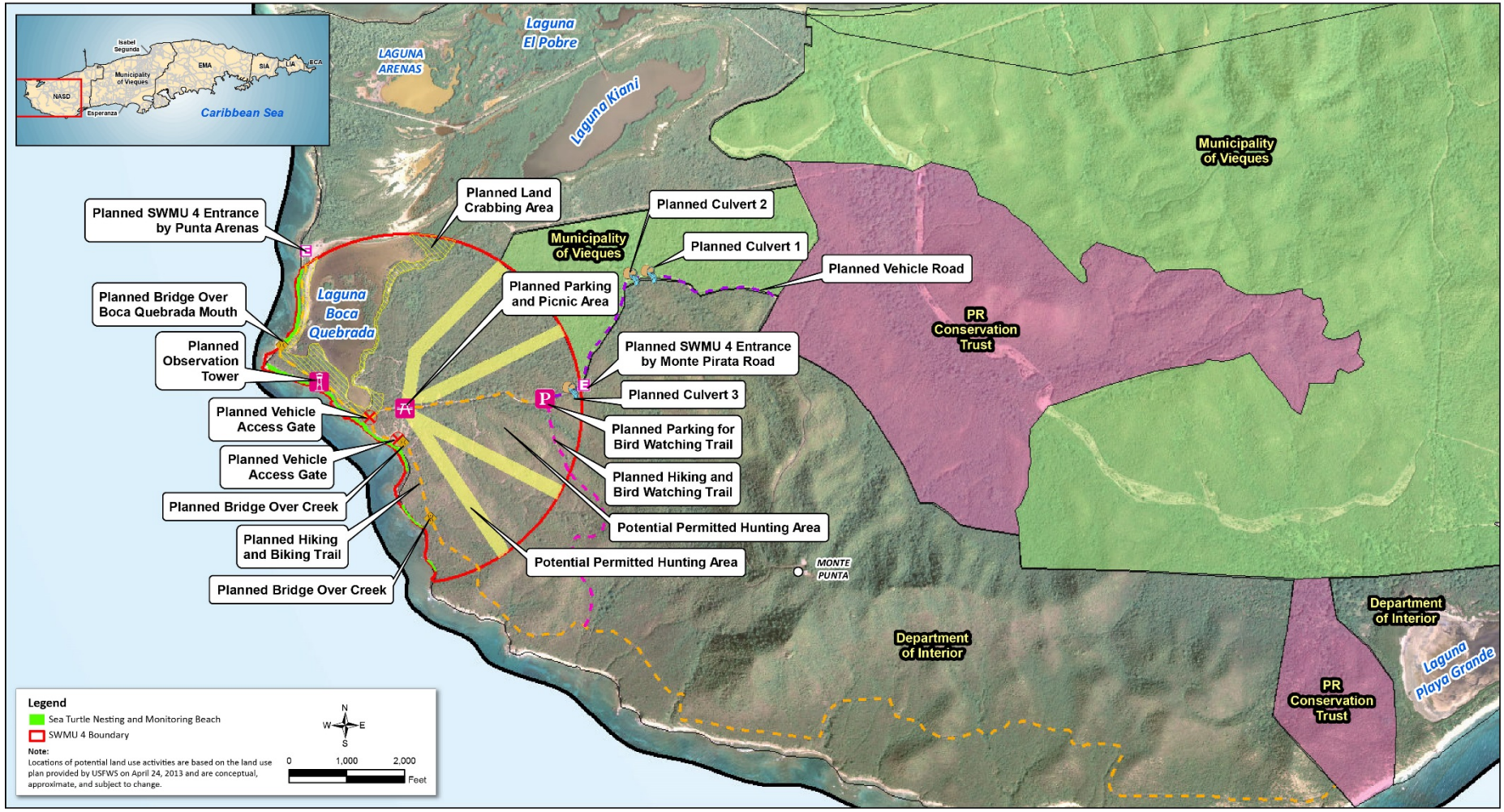


Table 3 - SWMU 4 Risk Assessment Results

Receptors	Human Health Risk
Current/Future Recreational Users/Trespassers	Adult – ELCR = 9 x 10-6 and HI < 1.0 Youth – ELCR = 6 x 10-6 and HI < 1.0 Child – ELCR = 7 x 10-6 and HI < 1.0 **Acceptable**
Hypothetical Future Residents	Adult/Child – ELCR = 7 x 10-5 (cumulative); 4 x 10-6 (soil); 7 x 10-5 (groundwater) and HI < 1.0 (soil); HI > 1.0 (groundwater) **Acceptable for soil; unacceptable for groundwater***
Potential Future Maintenance Workers	ELCR < 1 x 10-6 and HI < 1.0 **Acceptable**
Potential Future Construction Workers	ELCR < 1 x 10-6 and HI < 1.0 **Acceptable**
Hypothetical Future Industrial Workers	ELCR = 4 x 10-5 and HI < 1.0 (soil); HI > 1.0 (groundwater) **Acceptable for soil; unacceptable for groundwater***
Potential Current/Future Fish Consumers	Adult – ELCR < 1 x 10-6 and HI > 1.0 Youth – ELCR < 1 x 10-6 and HI > 1.0 Child – ELCR < 1 x 10-6 and HI > 1.0 **Although calculations indicate unacceptable non-cancer hazards, inorganics concentrations responsible for calculated unacceptable HI values are attributable to natural conditions; therefore, no unacceptable risk associated with past site-related activities**
Potential Current/Future Land Crab Consumers	Adult – ELCR = 3 x 10-5 and HI > 1.0 Youth – ELCR = 3 x 10-5 and HI > 1.0 Child – ELCR = 2 x 10-5 and HI > 1.0 **Although calculations indicate unacceptable non-cancer hazards, inorganics concentrations responsible for calculated unacceptable HI values are attributable to natural conditions; therefore, no unacceptable risk associated with past munitions-related activities**
Media	**Ecological Risk**
	All Receptors
Soil, Surface Water, Sediment, Food Web Exposures	**Acceptable**

For there to be unacceptable cancer risk, the ELCR would need to be higher than 1 x 10^{-4}

For there to be unacceptable non-cancer hazard, the HI would need to be higher than 1

ELCR = excess lifetime cancer risk
HI = hazard index

*Due to perchlorate concentrations in groundwater (maximum concentration detected = 160 µg/L versus tap water RSL of 14 µg/L)

2.6.1 Human Health Risk Assessment

The HHRA was conducted to evaluate potential human health risks associated with exposure to chemicals detected in soil, groundwater, surface water, sediment, and biota (fish and blue crab). Maximum detected concentrations of chemicals were compared to risk-based screening levels (that is, RSLs), and if there were exceedances, chemicals of potential concern (COPCs) were identified based on those exceedances of screening levels. Section 2.4 identifies the constituents detected above risk-based screening levels; these constituents were therefore identified as COPCs for quantitative evaluation.

Human health risks were quantitatively evaluated for current and potential future human receptors exposed to COPCs in site media under reasonable maximum exposure (RME) scenarios. Exposure scenarios evaluated for site media comprised current and likely potential future recreational users and trespassers (adult, youth, and child exposure to soil, surface water, and sediment) and maintenance and construction workers (adult exposure to soil), as well as hypothetical residents (adult and child exposure to soil, groundwater, and indoor air) and industrial workers (adult exposure to soil, groundwater, and indoor air). Additionally, potential ingestion of fish and crab by adult, youth, and child consumers was evaluated. The potential non-cancer hazards, expressed as the hazard index (HI), and cancer risk estimates, expressed as the excess lifetime cancer risk (ELCR), were calculated using RME assumptions.

Contaminants of concern (COCs) were not identified for soil, surface water, sediment, or biota (fish and blue crab) because either risk estimates for site-related chemicals were below threshold values (the upper end of EPA's acceptable ELCR range of 10^{-4} and non-cancer HI of 1) or constituents detected at levels resulting in potentially unacceptable risks are attributable to natural background levels. The only COC identified in the HHRA was perchlorate in groundwater based on the hypothetical use of groundwater for drinking water. However, future groundwater use at SWMU 4 is unlikely because groundwater is not currently used, nor is there a planned or likely potable use of groundwater at the site. As noted previously, the land containing the site is mandated to be part of the Vieques National Wildlife Refuge where groundwater use is not anticipated, and groundwater at the site is also likely too brackish (salty) to be used for drinking water based upon the site's groundwater data and its close proximity to the ocean. However, to be conservative, perchlorate in groundwater will be addressed as part of the remedial action for SWMU 4.

Table 3 provides the risk and hazard results for the five demographics analyzed that are potentially or likely to engage in recreational use of, or construction or maintenance work at, SWMU 4. **Table 3** also provides the risk and hazard results of two demographics hypothetically engaged in industrial or residential use of SWMU 4.

2.6.2 Ecological Risk Assessment

The ERA was conducted to evaluate potential ecological (plants and animals) risks associated with exposure to constituents detected in surface soil, surface water, and surface sediment at SWMU 4. The ERA was conducted in accordance with the Master Standard Operating Procedures, Protocols, and Plans (CH2M, 2010) and the Master Ecological Risk Assessment Protocol for Vieques Environmental Restoration Program – Update 1 (CH2M, 2010) and used established ecological effects values to assess risks from direct exposure to organisms as well as via the food chain. SWMU 4 is heavily vegetated and provides suitable terrestrial and aquatic (Laguna Boca Quebrada and an ephemeral stream) habitats for a variety of plant, invertebrate, reptile, bird, and mammalian communities. No unacceptable risks to plants and animals and other wildlife potentially feeding on those plants and animals were identified (**Table 3**).

2.6.3 Explosive Hazard

Munitions response actions have been completed at SWMU 4, including the planned public access areas, significantly reducing the potential risks to human health and the environment from explosive hazards associated with MEC. However, potential explosive hazard remains at SWMU 4, associated with the possible presence of additional MEC in the subsurface, with surface MEC in areas not previously cleared, and from MEC that may become exposed on the surface as a result of erosion.

2.6.4 Basis for Response Action

In cooperation with EPA, DOI, and the Commonwealth, and in accordance with applicable guidance, the Navy performed investigations and removal actions at SWMU 4 to evaluate the nature and extent of MEC and potentially associated contamination, to assess the potential risks to human health and the environment from exposure to SWMU 4 media, to reduce explosive hazard in planned public use areas, and to evaluate remedial alternatives for their suitability to further reduce possible explosive hazards remaining at the site.

No unacceptable ecological risks from exposure to chemicals in SWMU 4 media were identified and the only potentially unacceptable human health risk identified was due to hypothetical exposure to perchlorate in groundwater if used as drinking water. Additionally, although MEC and MD were removed from the ground surface and subsurface in areas planned for public use, the Navy evaluated remedial alternatives and ultimately selected a response action to address groundwater perchlorate contamination and potential explosive hazards remaining because there is the potential for MEC to be present in certain areas, or where it may become exposed over time from erosion.

2.7 Principal Threat Waste

MEC, specifically discarded military munitions (DMM) or unexploded ordnance (UXO), if any, that remains present at SWMU 4 may constitute a principal threat waste (PTW) due to the potential for it to pose an explosive hazard if the material is moved, handled, or disturbed. The selected remedy includes LUCs and inspections to limit the potential for people to encounter MEC. During historical investigations and removal actions, over 6,500 MEC were removed from SWMU 4. If potential MEC is later found at SWMU 4, Department of Defense (DoD) explosive ordnance disposal personnel or similarly qualified personnel will evaluate the material to determine if it poses an explosive hazard. Material that is determined to pose an explosive hazard will normally be treated on site or removed for destruction per applicable DoD explosives safety standards and environmental laws and regulations. In these cases, the Navy, EPA, DOI, and the Commonwealth will consult, in accordance with the terms of the Vieques FFA, to make a determination as to whether the material should, as defined by CERCLA, the NCP, and EPA guidance, be classified as PTW. If the material is deemed to be PTW, the Navy will conduct the actions necessary to ensure protectiveness of human health and the environment to address unacceptable risks posed by the material designated as PTW.

2.8 Remedial Action Objectives

Remedial Action Objectives (RAOs) are cleanup objectives that specify contaminants to be cleaned up, the cleanup standard, the area of cleanup, and the time required to achieve cleanup, for the purpose of protecting human health and the environment. The following RAOs were developed to be protective of current, potential future, and hypothetical receptors, in accordance with the current and anticipated future recreational land use for SWMU 4:

- Reduce or prevent the explosive hazard associated with MEC to be compatible with current and anticipated land use.
- Reduce or prevent the potential for unauthorized access to certain portions of SWMU 4.
- Reduce or prevent the potential for exposure to perchlorate in groundwater at concentrations that pose a potentially unacceptable human health risk until the perchlorate concentrations reach the drinking water standard or, in the absence of a drinking water standard, an acceptable risk level.

2.9 Description and Comparative Analysis of Remedial Alternatives

Remedial alternatives were developed based on site-specific considerations related to the potential explosive hazard, site conditions (including groundwater), and planned recreational site use.

2.9.1 Description of Remedial Alternatives

Table 4 summarizes the alternatives included in the evaluation, including a listing and description of the major components and estimated cost of each alternative.

The following four remedial alternatives were developed to address potential MEC explosive hazards:

- Alternative M-1 – No Action
- Alternative M-2 – Land Use Controls
- Alternative M-3 – Surface Clearance of Terrestrial Area Not Already Surface-cleared and Land Use Controls
- Alternative M-4 – Surface and Subsurface MEC Removal from the Entire Terrestrial Area Not Already Cleared and Land Use Controls

The following three remedial alternatives were developed to address potential risk associated with the COC (perchlorate) identified in groundwater:

- Alternative G-1 – No Action
- Alternative G-2 – Natural Attenuation and Land Use Controls
- Alternative G-3 – Enhanced In Situ Bioremediation (EISB)

Consistent with the NCP, a no action alternative was evaluated for each hazard as a baseline for the comparative analysis. The additional alternatives were evaluated for their potential to meet the RAOs.

2.9.2 Comparative Analysis of Remedial Alternatives

Each remedial alternative for SWMU 4 was evaluated with respect to the nine evaluation criteria[13] provided in the NCP. The alternatives were then compared to one another with respect to each NCP criterion. The RI/FS Report (CH2M, 2012) and FS Addendum (CH2M, 2017) provide details and a comparison of the remedial alternatives considered.

The remedial alternatives summarized in **Table 4** and shown in **Figure 6** (Alternative M-2), **Figure 7** (Alternative M-3), **Figure 8** (Alternative M-4), **Figure 9** (Alternative G-2), and **Figure 10** (Alternative G-3) were selected for detailed evaluation and comparative analysis. To support evaluation of the alternatives, USFWS identified locations of planned future recreational features and public use areas, including the beach, tower for nature observation, hiking trails, and picnic, parking, land crabbing, and hunting areas.

Table 4 - Remedial Alternatives

Alternative	Components	Details	Cost
M-1. No Action No action and no restriction on activities	- N/A	- No action	**Total Present-Worth Cost: $0**
M-2. Land Use Controls Manages MEC explosive hazards by reducing the potential for unauthorized access to portions of the site and guiding site users to areas intended for access	- Physical demarcation and administrative processes (e.g., special use permits) - LTM and O&M	- Implementing LUCs (e.g., signage and administrative mechanisms, such as special use permits) to influence/ control future access and intrusive activities. LUC requirements, including the associated checklist, will be included in an LTM plan associated with the remedy that will be submitted for regulatory review. - Implementing a MEC LTM program, including periodic (assumed annual; actual frequency to be specified by remedial action work plan) inspections for trespassing, erosion, MEC/MD recurrence in public-access areas, and the integrity and effectiveness of physical LUCs. Any MEC/MD discovered during implementation of the LTM program would be removed.	Capital Cost: $2,242,000 Present Value of Future LTM and O&M Costs: $668,000 **Total Present-Worth Cost: $2,910,000** Assumed Timeframe: 30 years
M-3. Surface Clearance of Terrestrial Area Not Already Surface-cleared; Land Use Controls Manages MEC explosive hazards by removing additional surface MEC, reducing the potential for unauthorized access to portions of the site, and guiding site users to areas intended for access	- Surface MEC clearance - LUCs (as described under Alternative M-2) - LTM and O&M (as described under Alternative M-2)	- Habitat survey and vegetation clearance with MEC avoidance support for the remaining 212-acre terrestrial area - Surface clearance of MEC for the remaining 212-acre terrestrial area where surface clearance has not taken place - Implementing LUCs as described under Alternative M-2 - Implementing an MEC LTM program similar to that described under Alternative M-2	Capital Cost: $12,909,000 Present Value of Future LTM and O&M Costs: $760,000 **Total Present-Worth Cost: $13,669,000** Assumed Timeframe: 30 years
M-4. Surface and Subsurface MEC Removal from Entire Terrestrial Area Not Already Cleared and Lagoon; Land Use Controls Manages MEC explosive hazards by removing additional surface and subsurface MEC, reducing the potential for unauthorized	- Surface and subsurface MEC clearance - LUCs (as described under Alternative M-2) - LTM and O&M (as described under Alternative M-2)	- Habitat and vegetation clearance with MEC avoidance support for the 342-acre terrestrial area where subsurface has not already taken place to a maximum depth of 2 feet - Surface and subsurface MEC removal to a maximum depth of 2 feet bgs for the remaining 342-acre terrestrial area, which includes the 87-acre area previously cleared to 1 foot bgs during the RI, the 24-acre investigation spoke area previously cleared to 1 foot bgs during the 2015 NTCRA, the 19-acre lagoon fringe previously cleared to 1 foot bgs, and the remaining 212-acre terrestrial area not cleared of MEC	Capital Cost: $62,377,000 Present Value of Future LTM and O&M Costs: $635,000 **Total Present-Worth Cost: $63,012,000** Assumed Timeframe: 30 years

Table 4 - Remedial Alternatives

Alternative	Components	Details	Cost
access to portions of the site and guiding site users to areas intended for access		- Surface and subsurface MEC removal to a maximum depth of 2 feet bgs would be performed for the 73-acre lagoon area after dewatering - Implementing LUCs as described under Alternative M-2 - Implementing an MEC LTM program similar to that described under Alternative M-2-	
G-1. No Action No action and no restriction on activities	- N/A	- No action	**Total Present-Worth Cost: $0**
G-2. Natural Attenuation and Land Use Controls Based on source removal performed during previous munitions removal activities, groundwater sampling to evaluate perchlorate concentrations	- Physical demarcation and administrative processes (e.g., special use permits) - Natural attenuation - LTM	- Implementing administrative mechanisms to restrict potential groundwater use - Implementing a groundwater LTM program with periodic (assumed once every 5 years; actual frequency to be specified in Remedial Action Work Plan) groundwater level measurement and sampling of up to 12 wells for perchlorate and up to 3 wells for natural attenuation parameters (actual monitoring protocol to be specified in Remedial Action Work Plan)	Capital Cost: $159,000 Present Value of Future LTM Costs: $411,000 **Total Present-Worth Cost: $570,000** Assumed Timeframe: 30 years
G-3. Enhanced In Situ Bioremediation Groundwater injections to treat perchlorate in groundwater and sampling to evaluate perchlorate concentrations	- EISB - LUCs (as described under Alternative G-2) - LTM	- Installation of 8 injection wells along 200-foot bio-barrier wall and injection of substrate (actual treatment protocol to be specified in Remedial Action Work Plan) - Groundwater LTM program with periodic (assumed once every year; actual frequency to be specified in Remedial Action Work Plan) groundwater level measurement and sampling of up to 12 wells for perchlorate and up to 3 wells for natural attenuation parameters (actual monitoring protocol to be specified in Remedial Action Work Plan) - Implementing LUCs as described under Alternative G-2	Capital Cost: $673,000 Present Value of Future LTM Costs: $464,000 **Total Present-Worth Cost: $1,137,000** Assumed Timeframe: 10 years
N/A = not applicable O&M = operations and maintenance			

Figure 6 – Alternative M-2

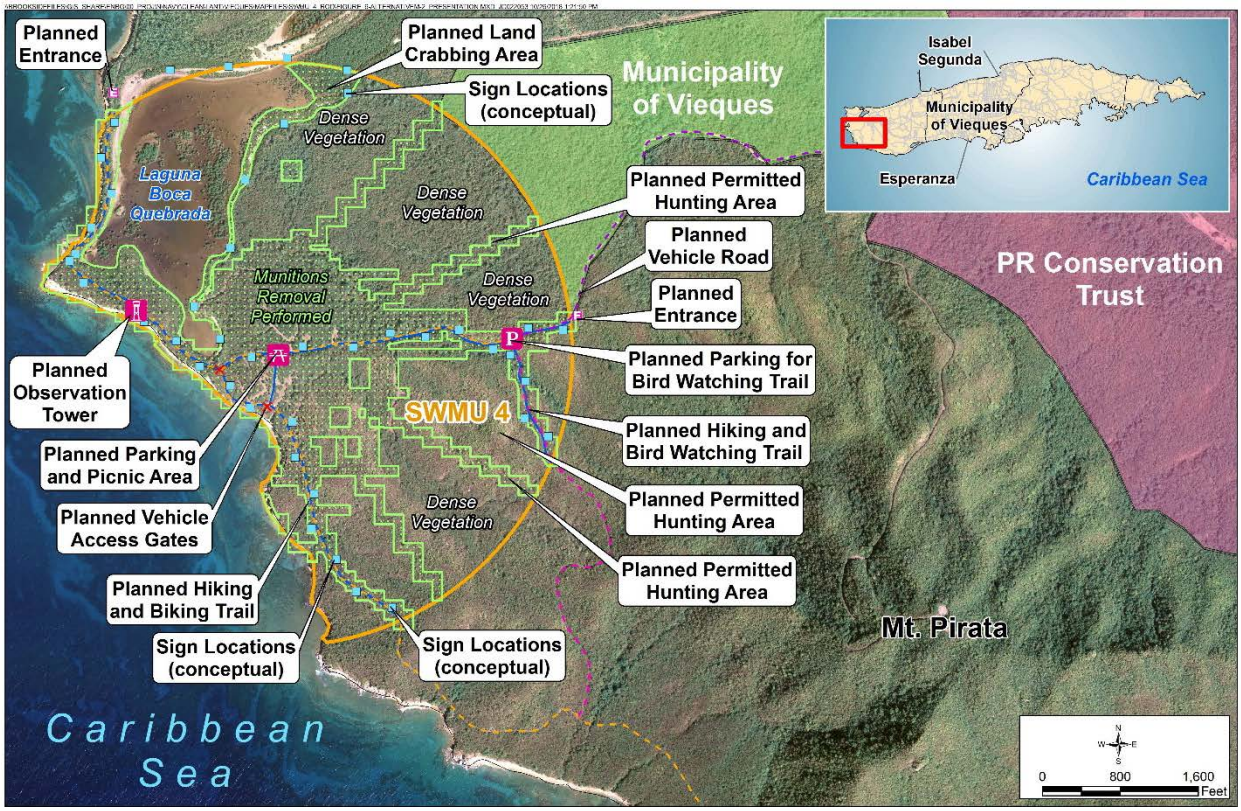


Figure 7 – Alternative M-3

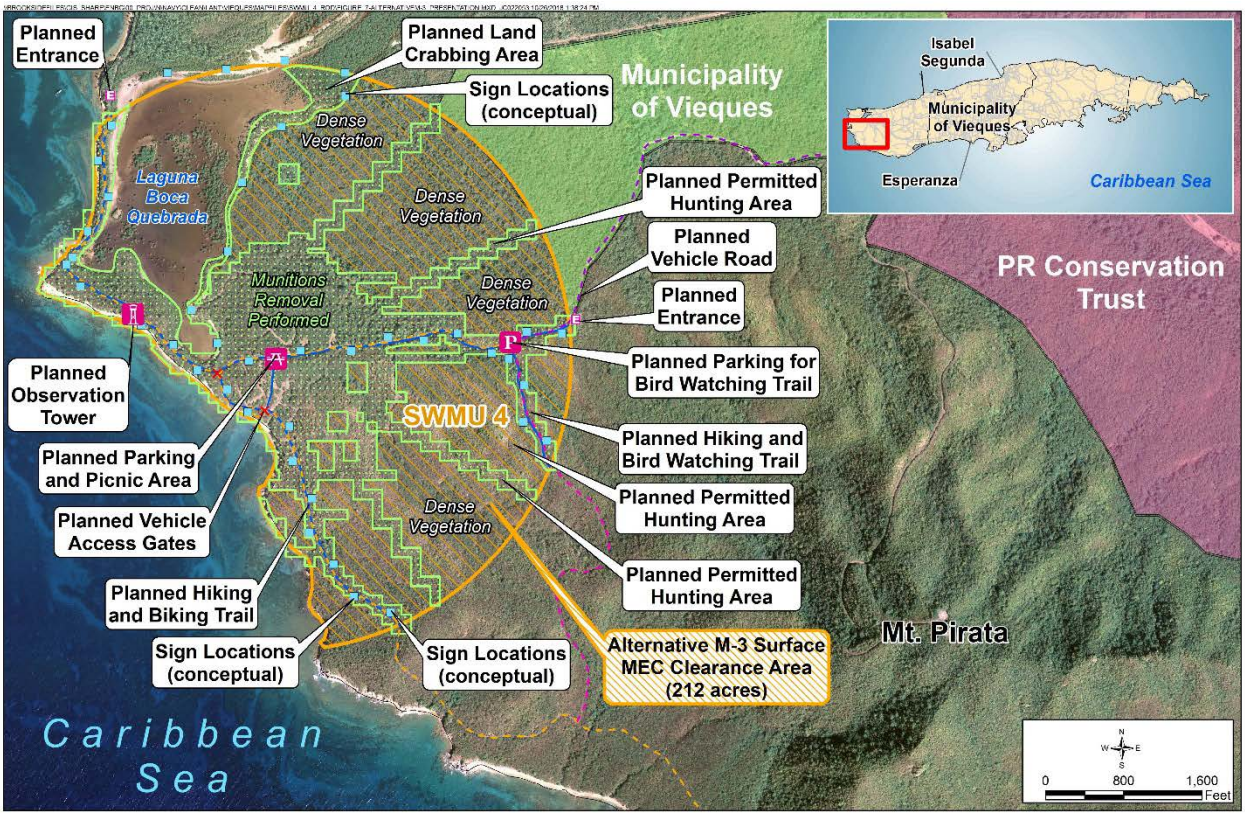


Figure 8 – Alternative M-4

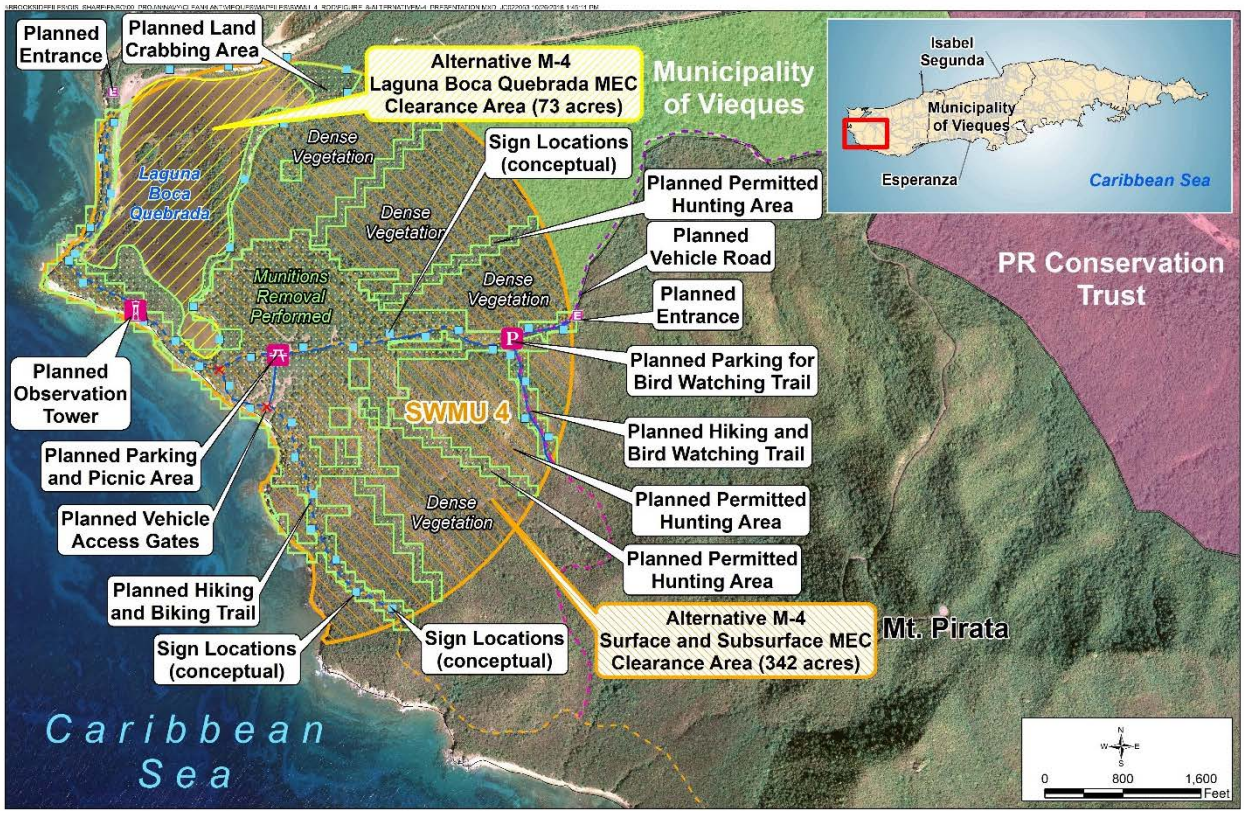


Figure 9 – Alternative G-2

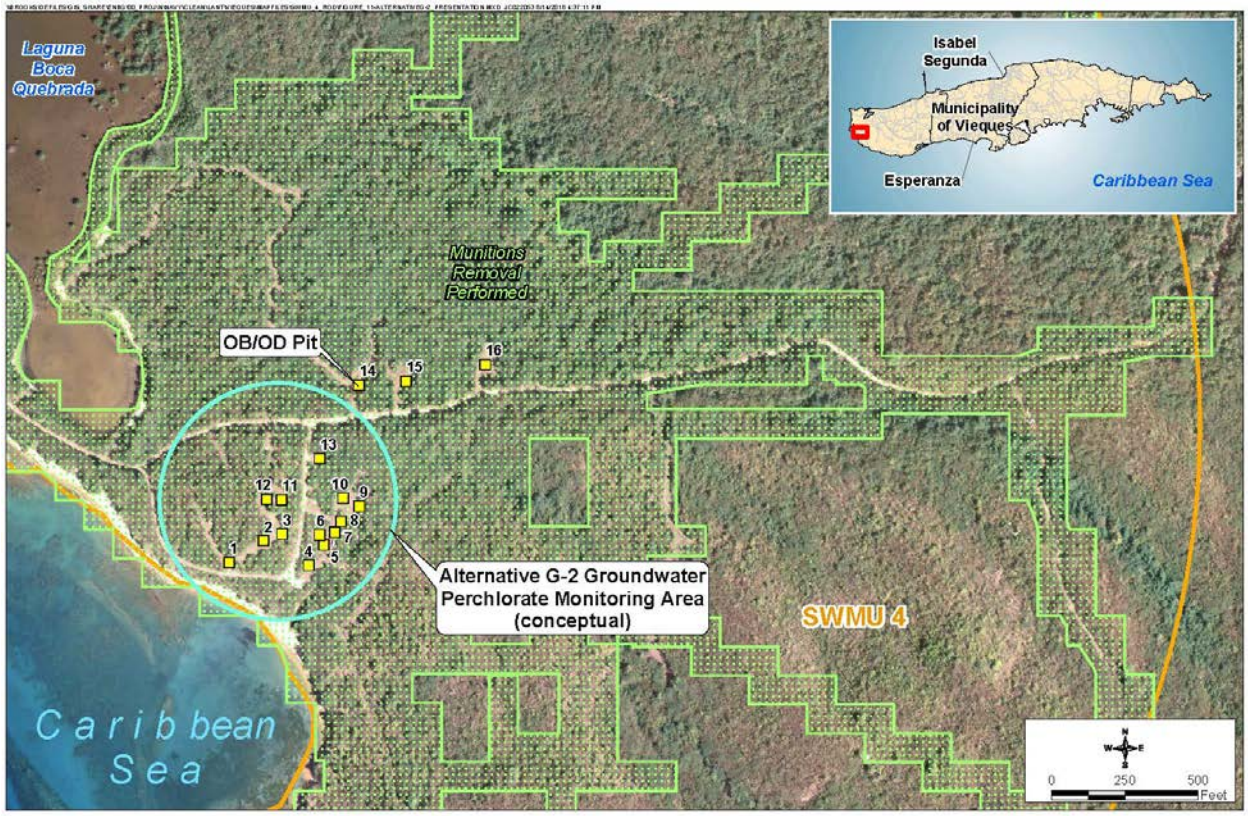
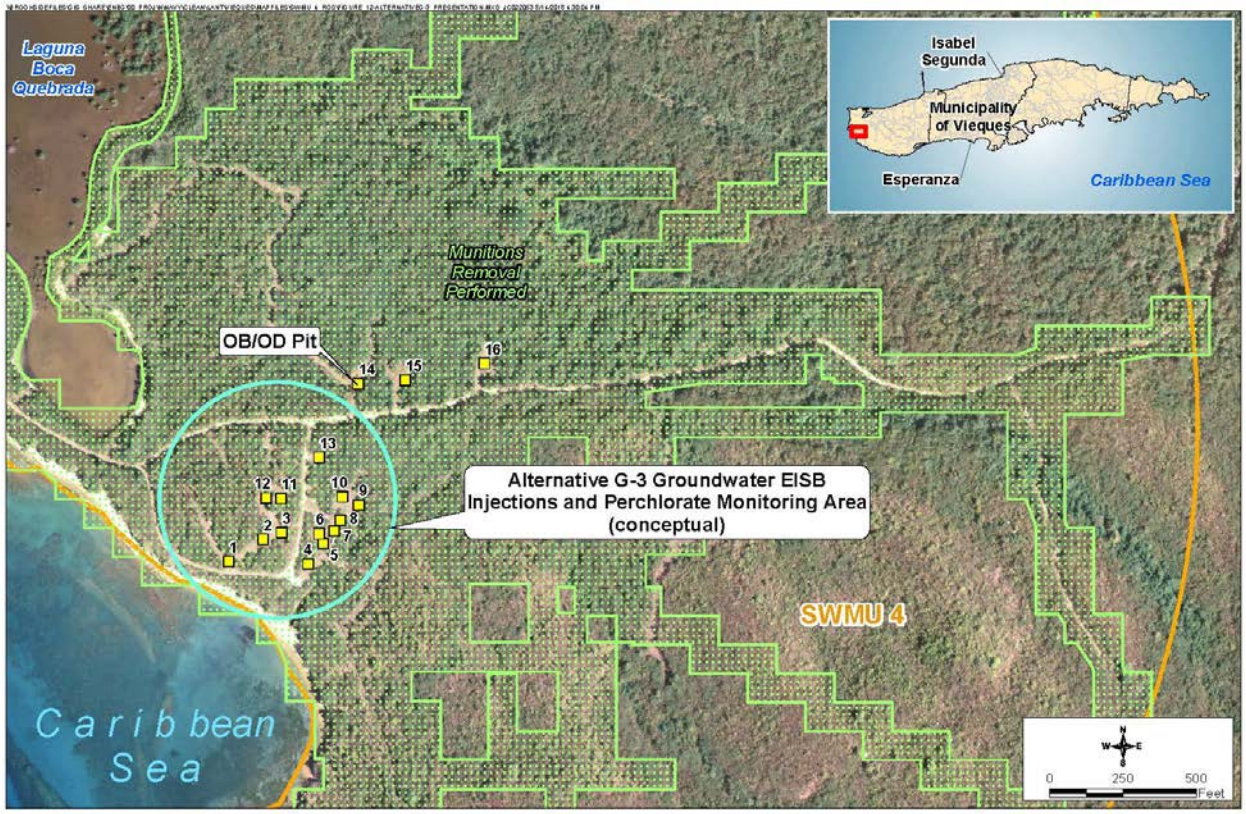


Figure 10 – Alternative G-3



2.9.3 Threshold Criteria

The two threshold criteria below are statutory requirements that the chosen alternative must satisfy. Alternatives that do not meet the threshold criteria are not eligible for selection as the final remedy.

Overall Protection of Human Health and the Environment

MEC

Alternative M-1 (no action) does not achieve the RAOs. The remaining alternatives are protective of human health and the environment and reduce the exposure to MEC by controlling land use and access, limiting intrusive activities, and performing relative degrees of MEC removal.

Groundwater

Alternative G-1 (no action) does not achieve the RAOs. The remaining alternatives are protective of human health and the environment and prevent exposure to groundwater perchlorate concentrations posing a potentially unacceptable human health risk.

Compliance with Applicable Relevant and Appropriate Requirements (ARARs)

A complete list of the ARARs[14], comprising a chemical-specific ARAR (that govern surface water standards for receiving waters), location-specific ARARs (such as those that govern activity in a coastal zone), and action-specific ARARs (such as those that govern the management of munitions), are included in **Attachment A**.

MEC

Based on the MEC removal completed during the RI and NTCRAs, Alternatives M-1, M-2, and M-3 can comply with the ARARs, which consist of a Commonwealth Chemical-specific ARAR that addresses surface water quality, Federal Location-specific ARARs that address coastal zones and bird migratory areas, and Federal and Commonwealth Action-specific ARARs that address land disturbance and munitions management. Alternative M-4 may not comply with the ARARs because the lagoon habitats would be impacted.

Groundwater

Alternative G-1 does not comply with the ARARs, which are the same as those listed previously for MEC and included in **Attachment A**, excluding the Chemical-specific ARAR. The remaining alternatives can comply with the ARARs.

2.9.4 Primary Balancing Criteria

The five primary balancing criteria below are used to identify major benefit trade-offs among the alternatives. These trade-offs are balanced to help identify the preferred alternative.

Long-term Effectiveness and Permanence

MEC

Each of the alternatives, with the exception of Alternative M-1, is expected to achieve long-term effectiveness and permanence. Although Alternative M-1 does not provide any additional long-term effectiveness, substantial MEC removal has already occurred within the high-density areas and areas planned for public use. Alternatives M-2, M-3, and M-4 can provide long-term effectiveness and permanence using LUCs and/or additional MEC removal. Relative to the other alternatives, Alternative M-4 provides the highest level of long-term effectiveness and permanence by clearing MEC to 2 feet bgs across the remainder of SWMU 4.

Groundwater

Each of the alternatives, with the exception of Alternative G-1, is expected to achieve long-term effectiveness and permanence. Alternative G-1 does not include LUCs and monitoring to verify remedy effectiveness. While Alternative G-3 would theoretically achieve the remediation goal in a shorter timeframe, the relatively low concentrations of perchlorate that currently exist and the particular hydrogeologic conditions at SWMU 4 may make attainment of cleanup goals with Alternative G-3 impractical. Additionally, Alternatives G-2 and G-3 are similarly effective in the long-term as they utilize LUCs to prevent hypothetical exposure to groundwater if it were to be used for potable water. In addition, groundwater monitoring will be implemented to evaluate remedy effectiveness. This remedy is likely to be successful in part because groundwater use is not allowed or anticipated at SWMU 4. As noted above, groundwater is not currently used as potable water, and is likely not suited for that purpose. Further, with respect to the perchlorate remediation goal, natural attenuation is anticipated to attain this goal in a reasonable timeframe relative to Alternative G-3. The NCP indicates a reasonable timeframe for a natural attenuation remedy to achieve the remediation objective is a “timeframe comparable to that which could be achieved through active restoration.” As noted above, the already low perchlorate concentrations and the complex hydrogeologic conditions at SWMU 4 (i.e., heterogeneous matrix, low permeability) likely make attainment of the perchlorate remediation goal by Alternative G-3 (i.e., active groundwater treatment) technically impractical. For SWMU 4, the timeframe for perchlorate to decline to below its risk-based concentration via natural attenuation is estimated to

be between 25 and 30 years. This timeframe is based on methodology endorsed by EPA for calculating natural attenuation durations using site-specific contaminant concentrations and the concept of first-order decay, which assumes a contaminant concentration declines at a constant attenuation rate. While it is not possible to know the exact timeline for natural attenuation of perchlorate in groundwater to reach its remediation goal, other factors that demonstrate the timeframe is reasonable for Alternative G-2 are: (1) source control (i.e., removal of munitions from OB/OD pits and other high-density areas) was implemented; (2) groundwater at the site is not used nor anticipated to be used as a potable source; (3) potable use of groundwater at the site would not likely be practicable, especially without treatment, due to salinity and low yield; (4) groundwater use controls and long-term monitoring can be reliably implemented over time due to land ownership and planned use.

Reduction in Toxicity, Mobility, or Volume through Treatment

MEC

While Alternative M-1 and M-2 do not result in any additional reduction in toxicity, mobility, or volume (TMV), the MEC removal completed during the RI and NTCRAs contributed significantly to TMV reduction. Alternative M-4 results in the greatest reduction in TMV, followed by Alternative M-3. However, the reduction in TMV in Alternatives M-3 and M-4 from the additional MEC removal comes with significantly more habitat damage and/or destruction to the vegetated areas and, in the case of Alternative M-4, the lagoon such that it may prove to be less protective of the environment, at least in the short-term.

Groundwater

Alternatives G-1, G-2, and G-3 would result in reduction in TMV via natural attenuation processes. Alternative G-3 may have higher reduction in TMV, although likely minimal relative to Alternative G-2, because the NTCRA is believed to have already removed the primary source of perchlorate contamination, and the existing perchlorate concentrations are already relatively low.

Short-term Effectiveness

MEC

Alternative M-1 has the least short-term impacts because no remedial construction activities are associated with the alternative. Alternative M-2 can be implemented soon after a ROD and remedial action work plan are finalized because it comprises installation of LUCs, which has the least short-term construction impacts. Alternatives M-3 and M-4 will require a longer time to complete because of additional MEC removal and increased construction activities compared to Alternative M-2. Alternatives M-3 and M-4 could have some impact on the community located within the adjacent MOV because of increased construction activity associated with MEC removal.

Groundwater

There are no short-term impacts on workers, the community, or the environment for Alternative G-1. Short-term impacts to workers and the environment primarily associated with sampling activities are insignificant under Alternative G-2. Alternative G-3 has more short-term impacts on workers and the environment, primarily associated with vegetation clearance, the installation of injection wells, and injection and sampling activities. There would likely be minimal impacts to the community for Alternatives G-2 and G-3.

As part of the short-term effectiveness evaluation, a green remediation analysis was conducted for each of the four MEC and three groundwater remedial alternatives. Green remediation is focused on energy

conservation, reduction of greenhouse gases, waste minimization, and re-use and recycling of materials. Alternatives M-1 and G-1 would have no short-term construction impacts and the lowest environmental footprint because there would be no remedial construction activities. The other alternatives would include construction activities with varying levels of potential impacts to construction workers, the community, and the environment. The amount of impact would be proportional to the amount of vegetation clearance, habitat disturbance, erosion, lagoon dewatering, size of the areas undergoing MEC removal, sampling activities, and/or injection well installation. Based on this, Alternatives M-1 and G-1 would have the lowest environmental footprint based on the green remediation analysis. For the MEC alternatives, the next higher environmental footprint would be for Alternative M-2, followed by Alternative M-3, and then Alternative M-4; Alternatives M-3 and M-4 having significant land disturbance due to the substantial level of vegetation and habitat damage or destruction necessary for implementation of these two alternatives. For the groundwater alternatives, the next higher environmental footprint would be Alternative G-2 followed by Alternative G-3, mainly due to natural resource consumption associated with water use for injections and larger area requiring vegetation removal for remedy implementation.

Implementability

MEC

Alternative M-1 would not obtain administrative approval because it does not meet the RAOs. Alternative M-2 is the most implementable among the active alternatives because it is technically and administratively feasible and facilitates public access in the areas intended for this use by USFWS. Alternative M-3 is technically and administratively feasible because the services, equipment, and materials required are readily available, but would be considerably more logistically challenging than Alternative M-2. Alternative M-4 would be the most complex alternative to implement because of the much larger scale of vegetation clearance, challenges associated with dewatering the lagoon, and surface/subsurface MEC removal safety. A pilot study for the lagoon dewatering and MEC removal would likely be required to assess the feasibility of this alternative. In addition, Alternative M-4 would likely not obtain regulatory approval (and thus not be implementable) due to the extensive habitat destruction it would require. Both Alternatives M-3 and M-4 would likely impact cultural resources because they include munitions removal from all remaining areas of SWMU 4.

Groundwater

No significant technical or administrative difficulties are associated with the implementation of Alternative G-2 because the services, equipment, and materials required are readily available. Implementation of Alternative G-3 would be considerably more complex as a result of technical challenges of substrate delivery in fractured and heavily weathered rock.

Cost

MEC

Alternative M-1 has no cost associated with it, but it does not meet the RAOs. Alternatives M-2, M-3, and M-4 meet the RAOs and have present-worth costs of $2,910,000, $13,669,000, and $63,012,000, respectively.

Groundwater

Alternative G-1 has no cost associated with it, but it does not meet the RAOs. Alternatives G-2 and G-3 meet the RAOs and have a present-worth cost of $570,000 and $1,137,000, respectively.

2.9.5 Modifying Criteria

The modifying criteria represent the level of Commonwealth and community acceptance of the proposed remedial alternative.

Commonwealth Acceptance. Commonwealth involvement has been continual throughout the CERCLA process for SWMU 4, and PRDNER supports and concurs with the preferred alternative.

Community Acceptance. The Proposed Plan was issued for public review from July 16, 2018 to August 14, 2018 and was discussed at a public meeting held on August 8, 2018. Several clarifying questions were asked and addressed at the meeting. Substantive public comments were documented and addressed in the Responsiveness Summary (**Attachment B**).

2.10 Selected Remedy

The selected remedy for SWMU 4 is Alternative M-2 – Land Use Controls and Alternative G-2 – Natural Attenuation and Land Use Controls. This selected remedy is the preferred alternative that was presented in the Proposed Plan.

2.10.1 Rationale for Selected Remedy

Based on the evaluation of the data, information currently available, including the anticipated land use provided by USFWS, and the comparative analysis, the preferred alternative meets the statutory requirements of CERCLA for protection of human health and the environment under current and projected future land use as a recreational area.

2.10.2 Description of Selected Remedy

Alternative M-2 – Land Use Controls involves implementing LUCs and an MEC LTM program to facilitate public recreational use and ensure the remedy remains effective in the long-term. The details of Alternative M-2 are provided in **Table 4**.

Alternative G-2 – Natural Attenuation and Land Use Controls involves implementing LUCs and a groundwater LTM program to monitor the effectiveness of source removal on groundwater perchlorate concentrations and ensure groundwater is not used while levels remain above an acceptable level. The details of Alternative G-2 are provided in **Table 4**.

The statutorily-required 5-year reviews will also be performed to assure that human health and the environment are being protected by the selected remedy.

Key elements that make Alternatives M-2 and G-2 the selected alternatives are:

- Meet the RAOs and are compatible with the planned USFWS land use
- Reflects significant munitions removal conducted as part of historical investigations and removal actions from the OB/OD pits and planned public use areas
- Prior munitions removal and implementation of LUCs appropriately address the explosive hazard associated with planned recreational use
- Preserves vegetation and ecological habitat and eliminates the erosion potential that would be produced by large-scale removal of vegetation and ecological habitat associated with site-wide MEC removal (Alternatives M-3 and M-4) that would not substantively further reduce explosive hazard

- Avoids the heightened dangers to which the workers would be subjected by implementing site-wide MEC removal (Alternatives M-3 and M-4)
- Ensures groundwater remains unused as a potable source while monitoring the effectiveness of source removal on perchlorate concentrations
- Minimizes the potential for unauthorized access to portions of SWMU 4

2.10.3 Expected Outcomes of the Selected Remedy

The expected outcome of the selected remedy is that the RAOs for SWMU 4 will be met, that potential explosive hazards will be reduced to levels appropriately supportive of the planned land use, and groundwater perchlorate contamination will be present and require LUCs and associated LTM until levels attenuate to acceptable levels.

Within 90 days following selection of the remedy, the Navy will prepare, in accordance with EPA guidance, and submit to EPA, DOI, and PRDNER for review and concurrence, the SWMU 4 Remedial Action Work Plan that includes an LUC Plan and LTM Plan. Details of the LUCs, including performance metrics, will be included in the LUC Plan. While potential explosive hazards and groundwater perchlorate concentrations above an acceptable level are present, the Navy is responsible for implementing, maintaining, inspecting, reporting on, and enforcing the LUCs in accordance with the ROD and associated LUC and LTM Plans.

2.10.4 Statutory Determinations

In accordance with the NCP, the selected remedy meets the following statutory determinations:

- **Protection of Human Health and the Environment -** The selected remedy is protective of human health and the environment by controlling land use and access, limiting intrusive activities, guiding access to areas planned for public use, performing removal of any MEC identified during LTM or public use, and preventing hypothetical exposure to perchlorate in groundwater above an acceptable level.
- **Compliance with ARARs -** The selected remedy will comply with Federal and Commonwealth ARARs presented herein (**Attachment A**, Tables A-1 through A-6).
- **Cost-Effectiveness -** The selected remedy provides the best value relative to the planned land use.
- **Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable** - The selected remedy represents the maximum extent to which permanent solutions and alternative treatment technologies can be used in a practicable manner at SWMU 4 because any MEC found during public use or LTM will be removed and treated (detonated) and the effectiveness of past source removal on groundwater perchlorate concentrations will be monitored.
- **Preference for Treatment as a Principal Element -** The selected remedy results in additional reduction in TMV through focused MEC removal (if found) and treatment (detonation), and past munitions removal eliminated significant MEC as the source of perchlorate contamination in groundwater.

2.11 Community Participation

The Navy, in consultation with the EPA, Commonwealth, and USFWS, established a community relations program for the Vieques Environmental Restoration Program in 2001. The program promotes communication regarding various OU investigations and response activities between the stakeholder agencies (Navy, EPA, Commonwealth, and USFWS) and the public. The community relations program

formed a Restoration Advisory Board (RAB) in 2004 to further encourage community involvement. RAB meetings are held approximately every 3 months and are open to the public for participation. A summary of the community participation activities associated with this action are discussed in the next section.

3 Responsiveness Summary

The Responsiveness Summary is a concise summary of substantive comments received from the public during the public comment period and the associated responses. The Responsiveness Summary was prepared in accordance with guidance in Community Relations in Superfund: A Handbook[15] (EPA, 1992) after the public comment period ended on August 14, 2018.

3.1 Overview

The Proposed Plan presented to the public identified that Alternative M-2 - Land Use Controls and Alternative G-2 - Natural Attenuation and Land Use Controls are warranted at SWMU 4 to protect human health and the environment.

3.2 Community Involvement Process

In accordance with CERCLA Section 117(a), the Navy issued the SWMU 4 Proposed Plan for public comment starting July 16, 2018 and ending August 14, 2018. The Navy and EPA held a public meeting[16] to discuss the Proposed Plan on Wednesday, August 8, 2018, at Jorge's Ice House in Isabel Segunda, Vieques, Puerto Rico.

The Proposed Plan and previous investigation reports for SWMU 4 were available during the public comment period and are currently available in the Administrative Record for this remedial decision. The Administrative Record is accessible to the public via:

https://go.usa.gov/xRHxY

3.3 Summary of the Public Comment Period

During the SWMU 4 Proposed Plan public comment period, written comments were received from one individual. In addition, comments were made during the public meeting. The responses to public comments by the Navy and EPA, in consultation with DOI and PRDNER, are presented in the responsiveness summary, which is included as **Attachment B** of this ROD.

4 Acronyms

µg/L	microgram(s) per liter
AFWTA	Atlantic Fleet Weapons Training Area
ARAR	Applicable or Relevant and Appropriate Requirement
bgs	below ground surface
CCP/EIS	Comprehensive Conservation Plan/Environmental Impact Statement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
COC	contaminant of concern
COPC	chemical of potential concern
DMM	discarded military munitions
DoD	Department of Defense
DOI	Department of the Interior
EISB	enhanced in situ bioremediation
ELCR	excess lifetime cancer risk
EOD	explosive ordnance disposal
EPA	Environmental Protection Agency
ERA	Ecological Risk Assessment
FFA	Federal Facilities Agreement
FS	Feasibility Study
HHRA	Human Health Risk Assessment
HI	hazard index
IAS	Initial Assessment Study
LTM	long-term monitoring
LUC	land use control
MCL	maximum contaminant level
MD	munitions debris
MEC	munitions and explosives of concern
mm	millimeter
MOV	Municipality of Vieques
MRP	Munitions Response Program

NA	natural attenuation
NASD	Naval Ammunition Support Detachment
NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
NTCRA	Non-Time-Critical Removal Action
OB/OD	open burn/open detonation
O&M	operations and maintenance
OU	Operable Unit
PA/SI	Preliminary Assessment/Site Investigation
PCB	polychlorinated biphenyl
PRCT	Puerto Rico Conservation Trust
PRASA	Puerto Rico Aqueduct and Sewer Authority
PRDNER	Puerto Rico Department of Natural and Environmental Resources
PTW	principal threat waste
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RI	Remedial Investigation
RME	reasonable maximum exposure
ROD	Record of Decision
RSL	regional screening level
SEMS	Superfund Enterprise Management System
SVOC	semi-volatile organic compound
SWMU	Solid Waste Management Unit
TMV	toxicity, mobility, or volume
USFWS	United States Fish and Wildlife Service
UXO	unexploded ordnance
VOC	volatile organic compound

5 References

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record and/or Hyperlinked to this ROD
Ref. 1	Guide	Section 1.1	EPA. 1999. *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents.*
Ref. 2	Toolkit	Section 1.2	EPA. 2011. *Toolkit for Preparing CERCLA Records of Decision.* September.
Ref. 3	Initial Assessment Study	Section 2.3	Greenleaf/Telesca Planners, Engineers, Architects, Inc. and Ecology and Environment, Inc. (Greenleaf). 1984. *Initial Assessment Study of Naval Station Roosevelt Roads, Puerto Rico.* NEESA 13-051. September.
Ref. 4	Phase II Resource Conservation and Recovery Act (RCRA) Facility Assessment	Section 2.3	A.T. Kearney, 1988. *Phase II RCRA Facility Assessment of the Naval Ammunition Facility, Vieques Island, Puerto Rico.* October.
Ref. 5	Expanded Preliminary Assessment/Site Investigation	Section 2.3	CH2M HILL, Inc. (CH2M). 2000. *Expanded Preliminary Assessment/Site Investigation, U.S. Naval Ammunition Support Detachment, Vieques Island, Puerto Rico*. October.
Ref. 6	Background Investigation	Section 2.3	CH2M. 2002. *Western Vieques Background Soil Inorganics Investigation Report, Former Vieques Naval Training Range, Vieques, Puerto Rico.* October.
Ref. 7	Environmental Baseline Survey	Section 2.3	Program Management Company (PMC). 2003. *Environmental Baseline Survey, Naval Ammunition Support Detachment Vieques, Vieques Island, Puerto Rico.* October.
Ref. 8	Remedial Investigation/ Feasibility Study	Section 2.3	CH2M. 2012. *Remedial Investigation/Feasibility Study Report, Solid Waste Management Unit 4 (SWMU 4), Former Naval Ammunition Support Detachment, Vieques, Puerto Rico.* May.
Ref. 9	no unacceptable risks to human health or the environment	Section 2.3	CH2M. 2012. *Remedial Investigation/Feasibility Study Report, Solid Waste Management Unit 4 (SWMU 4), Former Naval Ammunition Support Detachment, Vieques, Puerto Rico.* May.
Ref. 10	Non-Time-Critical Removal Action	Section 2.3	CH2M. 2016. *Solid Waste Management Unit 4, Non-Time-Critical Removal Action, After Action Report, Atlantic Fleet Weapons Training Area - Vieques, Former Naval Ammunition Support Detachment, Vieques, Puerto Rico*. November.

Item	Reference Phrase in ROD	Location in ROD	Identification of Referenced Document Available in the Administrative Record and/or Hyperlinked to this ROD
Ref. 11	Supplemental RI	Section 2.3	CH2M. 2017. *SWMU 4 Feasibility Study Addendum, Atlantic Fleet Weapons Training Area—Vieques, Former Naval Ammunition Support Detachment, Vieques, Puerto Rico.* April.
Ref. 12	FS Addendum	Section 2.3	CH2M. 2017. *SWMU 4 Feasibility Study Addendum, Atlantic Fleet Weapons Training Area—Vieques, Former Naval Ammunition Support Detachment, Vieques, Puerto Rico.* April.
Ref. 13	nine evaluation criteria	Section 2.9.2	CH2M. 2017. *SWMU 4 Feasibility Study Addendum, Atlantic Fleet Weapons Training Area—Vieques, Former Naval Ammunition Support Detachment, Vieques, Puerto Rico.* April.
Ref. 14	ARARs	Section 2.9.3	CH2M. 2017. *SWMU 4 Feasibility Study Addendum, Atlantic Fleet Weapons Training Area—Vieques, Former Naval Ammunition Support Detachment, Vieques, Puerto Rico.* April.
Ref.15	Community Relations in Superfund: A Handbook	Section 3	EPA. 1992. *Community Relations in Superfund: A Handbook*
Ref. 16	public meeting	Section 3.2	Proposed Remedial Action Plan for SWMU 4, Former Vieques Naval Training Range, Vieques, Puerto Rico, Public Meeting Transcript. August 8, 2018.

Attachment A
Applicable Relevant and Appropriate Requirements

TABLE A-1
Federal Chemical-Specific ARARs
SWMU 4 Feasibility Study Addendum
Former NASD, Vieques, Puerto Rico

Media	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
No Federal Chemical-Specific ARARs apply.						

References

EPA, 1998. CERCLA Compliance with Other Laws Manual: Interim Final. Office of Emergency and Remedial Response. EPA/540/G-89/006.
EPA, 1998. CERCLA Compliance with Other Laws Manual: Part II. Clean Air Act and Other Environmental Statutes. Office of Emergency and Remedial Response. EPA/540/G-89/009.
EPA, 1998. RCRA, Superfund & EPCRA Hotline Training Manual. Introduction to Applicable or Relevant and Appropriate Requirements. EPA540-R-98-020.

TABLE A-2

Puerto Rico Chemical-Specific ARARs

SWMU 4 Feasibility Study Addendum

Former NASD, Vieques, Puerto Rico

Media	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
Surface Water	Sets surface water standards for receiving waters	Discharging of surface water from the lagoon to adjacent surface water body	Rule 1303C, 1303.1A, B, D, E, and H	M-4	Applicable	Applicable to surface water discharges associated with dewatering the lagoon. Investigation did not identify COCs in surface water, therefore it is assumed that existing concentrations of any substances are equivalent to background and further testing is not required.

References

EPA, 1998. CERCLA Compliance with Other Laws Manual: Interim Final. Office of Emergency and Remedial Response. EPA/540/G-89/006.

EPA, 1998. CERCLA Compliance with Other Laws Manual: Part II. Clean Air Act and Other Environmental Statutes. Office of Emergency and Remedial Response. EPA/540/G-89/009.

EPA, 1998. RCRA, Superfund & EPCRA Hotline Training Manual. Introduction to Applicable or Relevant and Appropriate Requirements. EPA540-R-98-020.

TABLE A-3
Federal Location-Specific ARARs
SWMU 4 Feasibility Study Addendum
Former NASD, Vieques, Puerto Rico

Location	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
Coastal Zone Management Act						
Coastal zone or area that will affect the coastal zone	Federal activities must be consistent with, to the area that will affect maximum extent practicable, State coastal zone management programs. Federal agencies must supply the State with a consistency determination.	Activity taking place in a wetland, flood plain, estuary, beach, dune, barrier island, coral reef, and fish and wildlife and their habitat, within the coastal zone.	15 CFR 930.33(a)(1)(c); .36(a), (b); 39(b), (c)	All	Applicable	Activities at SWMU 4 that will affect Puerto Rico's coastal zone will be consistent to the maximum extent practicable with Puerto Rico's enforceable policies. Activities performed onsite and in compliance with CERCLA are not subject to adminsitrative review; however the substantive requirements of making a consistency determination will be met.
Migratory Bird Treaty Act						
Migratory bird area	Protects almost all species of native birds in the United States from unregulated taking.	Presence of migratory birds.	16 USC 703	All	Applicable	The site is located in the Atlantic Americas Migratory Flyway. If migratory birds, or their nests or eggs, are identified at the site, operations will not destroy the birds, nests, or eggs.

CFR = Code of Federal Regulations
USC = United States Code

References

EPA, 1998. CERCLA Compliance with Other Laws Manual: Interim Final. Office of Emergency and Remedial Response. EPA/540/G-89/006.
EPA, 1998. CERCLA Compliance with Other Laws Manual: Part II. Clean Air Act and Other Environmental Statutes. Office of Emergency and Remedial Response. EPA/540/G-89/009.
EPA, 1998. RCRA, Superfund & EPCRA Hotline Training Manual. Introduction to Applicable or Relevant and Appropriate Requirements. EPA540-R-98-020.

TABLE A-4

Puerto Rico Location-Specific ARARs

SWMU 4 Feasibility Study Addendum

Former NASD, Vieques, Puerto Rico

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

References

EPA, 1998. CERCLA Compliance with Other Laws Manual: Interim Final. Office of Emergency and Remedial Response. EPA/540/G-89/006.

EPA, 1998. CERCLA Compliance with Other Laws Manual: Part II. Clean Air Act and Other Environmental Statutes. Office of Emergency and Remedial Response. EPA/540/G-89/009.

EPA, 1998. RCRA, Superfund & EPCRA Hotline Training Manual. Introduction to Applicable or Relevant and Appropriate Requirements. EPA540-R-98-020.

TABLE A-5
Federal Action-Specific ARARs
SWMU 4 Feasibility Study Addendum
Former NASD, Vieques, Puerto Rico

Action	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
Performing activities that will disturb greater than one acre of land	Requires the development and implementation of best management practices and erosion and sedimentation control measures during construction activity.	Implementation of construction activities that will disturb more than one acre of land	one to five acres: 40 CFR 122.26(a)(1)(ii), (a) (9)(i)(b), (b)(15); 122.44(k)(2) and (s)(1) five acres or more: 40 CFR 122.26(a)(1)(ii), (a)(9)(i)(b), (b)(14)(x); 122.44(k)(2) and (s)(2)	M-3 and M-4	Applicable	If any of the selected remedies or the combination thereof disturb greater than one acre of land a Storm Water Pollution Prevention Plan will be prepared and implemented. Since activities are taking place onsite and in compliance with CERCLA, the substantive requirements will be met, but a permit will not be requried.
Discharge of dredge-and-fill material	No discharge of dredged or fill material will be allowed unless appropriate and practicable steps are taken that minimize potential adverse impacts of the discharge on the aquatic ecosystem.	Discharges of dredged or fill material to surface waters, including wetlands.	40 CFR 230.10(d); 33 CFR 320.4(a), (b), (d), (p), (r)	M-4	Applicable	Construction of a cover for the lagoon will require fill material to be placed over existing wetland areas. Since this is an onsite CERCLA response action, the substantive requirements will be met, but a permit will not be required. A Compensatory Mitigation Plan will be prepared and compensatory mitigation will be performed if required.
Management of military munitons	Specifies management requirements for those military munitons that are no longer exempt from the definition of solid waste.	Management of unused military munitions that have been disposed of or fired/used military munitions that have been removed from the range.	40 CFR 266.202(b) and (c) ;205 (a) and (b)	all	Applicable	If any military munitions lose their exemption from the definition of solid waste they will be handled in accordance with these rules.
Storage of fuels and oils (petroleum and non-petroleum) onsite	If storage capacity limits are exceeded a Spill, Prevention, Control, and Countermeasures (SPCC) Plan must be prepared and implemented with procedures, methods, equipment, and other requirements to prevent the discharge of into or upon the navigable waters of the U.S.	Total onsite storage capacity exceeding 1,320 gallons in containers that are 55 gallons or larger in size. Empty or partially filled containers must still have their entire volume included in the summation.	40 CFR 112.1(b) through (d), 112.3 [excluding paragraph f], 112.5 through 8, and 12	G-3; M-4	Applicable	It is anticipated that fuels or other treatment chemicals will be stored onsite. If the storage capacity in containers that are 55 gallons or greater is equal to or exceeds 1,320 gallons an SPCC Plan must be prepared and implemented. Containers include oil (including those oils used for enhanced biodegredation) and fuel reservoirs in equipment.

CFR = Code of Federal Regulations

References

EPA, 1998. CERCLA Compliance with Other Laws Manual: Interim Final. Office of Emergency and Remedial Response. EPA/540/G-89/006.
EPA, 1998. CERCLA Compliance with Other Laws Manual: Part II. Clean Air Act and Other Environmental Statutes. Office of Emergency and Remedial Response. EPA/540/G-89/009.
EPA, 1998. RCRA, Superfund & EPCRA Hotline Training Manual. Introduction to Applicable or Relevant and Appropriate Requirements. EPA540-R-98-020.

TABLE A-6
Puerto Rico Action-Specific ARARs
SWMU 4 Feasibility Study Addendum
Former NASD, Vieques, Puerto Rico

Action	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
Land disturbance	A Control of Erosion and Sediment (CES) Plan and a Work Plan must be prepared for any activities that involve the alteration of ground or soil conditions that have not been specifically excluded.	Disturbance of more than 40 cubic meters of soil during construction activity.	Puerto Rico Regulation 5754.1230(B), (C)	M-3 and M-4	Applicable	Remedial alternatives involve the disturbance of more than 40 cubic meters of soil. A CES and Work Plan will be prepared for this activity.
Production of Fugitive Dust	Dust control measures must be implemented during construction activities to prevent emissions beyond the property boundary. These include, but are not limited to, the use of water or other chemicals on road ways to control dust, covering haul trucks, and cleaning tracked soil off of paved roads.	Construction activity causing particulate matter to become airborne.	Puerto Rico Regulation 5300.404(A)(2), (4), (7); (B)	M-3 and M-4	Applicable	Applicable to activities that produce fugitive dust. Dust control measures will be implemented.
Performing construction activities that generate noise	No construction activity may be performed at night or in such a way that vibrations are produced that can be felt beyond the property boundary. If equipment used in construction is not manufactured in accordance with EPA standards for newly manufactured equipment then it may not produce noise that exceeds 70 dBA.	Construction activity including earthwork.	Puerto Rico Regulation 3418.3.1.5(A),(C);3.1.10; 3.1.13; and 4.1	M-3 and M-4	Applicable	The site is considered to be in Zone II (Commercial) for noise production. Noise pollution during MEC clearance and demolition, dewatering, and earthwork activities will be prevented.
Underground injection	Establishes construction and operation standards for underground injection wells.	Construction of any dug hole or well that is deeper than its largest surface dimension, where the principal function of the hole is the subsurface emplacement of fluids. Fluids include both liquids and gasses.	Puerto Rico Underground Injection Regulations 304.A.2.a, b, d, e; 304.A.4, 304.B.1, C.2.a, b; C.3.c	G-3	Applicable	Applicable to injection of substrate; substantive compliance would be required, although actual permit would not be. Injections of substrate would be accomplished with Class V type B7 wells.
Management of non-hazardous solid waste onsite in containers and piles	Non-hazardous solid waste staged onsite must not create a hazard or public nuisance.	Generation of non-hazardous solid waste that is managed onsite in containers or in piles.	Puerto Rico Non-Hazardous Solid Waste Regulation 531.H	M-2, M-3, and M-4; G-2, G-3	Applicable	It is anticipated that non-hazardous solid wastes will be generated during the implementation of these alternatives. IDW will be sampled to confirm characterization prior to disposal. It will be assumed that MDAS is regulated as scrap metal.

References

EPA, 1998. CERCLA Compliance with Other Laws Manual: Interim Final. Office of Emergency and Remedial Response. EPA/540/G-89/006.
EPA, 1998. CERCLA Compliance with Other Laws Manual: Part II. Clean Air Act and Other Environmental Statutes. Office of Emergency and Remedial Response. EPA/540/G-89/009.
EPA, 1998. RCRA, Superfund & EPCRA Hotline Training Manual. Introduction to Applicable or Relevant and Appropriate Requirements. EPA540-R-98-020.

Attachment B
Responsiveness Summary for SWMU 4

Responsiveness Summary

Proposed Plan
Solid Waste Management Unit 4 (Former Open Burn/Open Detonation Site)
Atlantic Fleet Weapons Training Area – Vieques
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

1. Introduction

This responsiveness summary provides a summary of the substantive comments submitted by the public on the Solid Waste Management Unit (SWMU) 4 Proposed Plan issued by the United States Navy, Naval Facilities Engineering Command (NAVFAC) Atlantic, the United States Environmental Protection Agency (EPA), and the United States Department of the Interior (DOI), in consultation with the Puerto Rico Environmental Quality Board (PREQB), which consulted with the Puerto Rico Department of Natural and Environmental Resources (PRDNER). The responsiveness summary was prepared in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), at 40 CFR 300.430(f)(3)(F), Section 117(b) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and EPA Office of Solid Waste and Emergency Response (OSWER) Directive 9230.0-06 (Superfund Responsiveness Summaries).

The SWMU 4 Proposed Plan was issued for public comment from July 16, 2018 to August 14, 2018. The Navy, EPA, and the United States Fish and Wildlife Service (USFWS, a bureau of DOI), the Vieques National Wildlife Refuge administrator, held a public meeting to discuss the Proposed Plan on Wednesday August 8, 2018, at Jorge's Ice House in Isabel Segunda, Vieques, Puerto Rico, during which questions and comments regarding the proposed remedial alternative, as well as other alternatives, were made, for which the Navy and other stakeholder agencies provided feedback. In addition, one comment was submitted in writing to NAVFAC Atlantic. A summary of the comments/questions and the associated responses is provided in Section 3 of this Responsiveness Summary.

As detailed in the Proposed Plan, the Navy and EPA identified the following preferred remedial alternatives to address the potential explosive hazards and groundwater contamination remaining at the site:

Alternative M-2 (to address potential explosive hazards) – Land Use Controls (LUCs)

Alternative G-2 (to address residual groundwater perchlorate contamination) – Natural Attenuation and LUCs

These alternatives were determined to be appropriate because they are protective of human health and the environment based on planned land use, especially considering munitions removal was previously performed across 165 acres of SWMU 4, including the roads, beach, open burn/open detonation (OB/OD) areas, and all other areas intended for public use.

Key elements of Alternatives M-2 and G-2 are:

- Planned recreational use of the portion of SWMU 4 that has already undergone munitions removal
- No planned groundwater use
- Ecological habitat preservation
- LUCs, inspections/groundwater monitoring, and removal of munitions identified during inspections or future use

2. Community Involvement Activities Associated with SWMU 4

This section summarizes the community involvement activities associated with investigation and munitions cleanup at SWMU 4. The community involvement activities discussed herein were designed to ensure the community is informed and has opportunity to provide feedback and input throughout the investigation and cleanup process.

Community Involvement Plan: The Navy, EPA, PREQB, PRDNER, and DOI/USFWS, collectively referred to as the stakeholder agencies, worked jointly to update the Community Involvement Plan (CIP) in 2015 with input from community members and stakeholders via interviews, surveys, and agency-community meetings. The CIP defines the mechanisms used to facilitate communication between the community and the agencies involved in the cleanup of former Navy lands in Vieques. As such, the CIP is designed to foster two-way communication whereby the community can provide input into the site characterization and cleanup activities and the stakeholder agencies can keep the community informed about the cleanup progress. In recognition of the large number of Spanish-speaking residents, the Navy translated the CIP into Spanish.

Information Repositories: The Navy maintains an information repository where the public can review documents associated with SWMU 4. The repository is located at: https://go.usa.gov/xRHxY. In addition, the Navy submitted the following key documents to the Vieques Restoration Advisory Board (RAB) to solicit community comment and input prior to issuing the final versions of the documents and placing them in the Administrative Record:

- Environmental Remedial Investigation Work Plan, Solid Waste Management Unit (SWMU) 4 (2007) – Described the approach to determine the nature and extent of contamination and associated human health and ecological risks at SWMU 4.
- Work Plan for Munitions and Explosives of Concern Subsurface Interim Removal Action, Beaches and Selected Roadways, Solid Waste Management Unit 4 (2008) – Described the approach for removing munitions from the roads and beach at SWMU 4, which was performed in 2009.
- Remedial Investigation/Feasibility Study Report, Solid Waste Management Unit 4 (SWMU 4) (2012) – Described the results of the Remedial Investigation and remedial alternatives evaluation to address hazards associated with potential munitions and perchlorate groundwater contamination present at SWMU 4.
- Solid Waste Management Unit 4 (SWMU 4) Monitoring Wells and Laguna Boca Quebrada Biota Sampling to Support Feasibility Study Alternative Evaluation Sampling and Analysis Plan (2014) – Described the approach to determine potential risks associated with biota in Laguna Boca Quebrada and to collect up-to-date groundwater perchlorate data.
- Non-Time Critical Removal Action Work Plan, Former Open Burn/Open Detonation Site Solid Waste Management Unit 4 (SWMU 4) (2014) – Described the approach for removing munitions from the OB/OD pits and areas planned for public use at SWMU 4, which was performed in 2015.
- Solid Waste Management Unit 4 (SWMU 4) Non-Time Critical Removal Action After Action Report (2016) – Describes the results of the 2009 and non-time critical removal action.
- Solid Waste Management Unit 4 Feasibility Study Addendum (2017) – Updated the feasibility study remedial alternatives evaluation based on the results of the 2016 non-time critical removal action and 2014 biota and groundwater sampling.

In addition to the documents provided to the RAB listed previously, the following Engineering Evaluation/Cost Analyses for non-time-critical removal actions performed at SWMU 4 were issued for formal public comment:

- Engineering Evaluation/Cost Analysis for Munitions and Explosives of Concern (MEC) Removal from the Beaches and Roadways of SWMU 4 (2008) – Described the evaluation process for the munitions removal action to be performed along the roads and beach at SWMU 4.

- Engineering Evaluation/Cost Analysis for a Non-Time Critical Removal Action at SWMU 4 (2014) – Described the evaluation process for the munitions removal action to be performed at the OB/OD areas and all remaining planned public use areas at SWMU 4.

Informational flyers and newsletters are regularly distributed to keep the Vieques community informed about Vieques cleanup activities. Information specific to SWMU 4 was included in the following flyers/newsletters:

- July 2005 Newsletter – Described work performed in 2003 and that scrap metal generated during this work was certified to be free of explosives and then shipped off Vieques for recycling.
- August and November 2006 Flyers – Described planned Remedial Investigation activities.
- February 2007 Flyer – Described the stakeholder agency site visit to select sampling locations within Laguna Boca Quebrada and ephemeral (intermittent) streams located at SWMU 4.
- March 2007 Flyer – Described the Remedial Investigation field activities, where soil, groundwater, surface water, and sediments samples were collected during the months of January and February. EPA and PREQB provided some oversight during sample collection.
- July 2007 Newsletter – The areas (roads and beach at SWMU 4) planned for inclusion in an Engineering Evaluation/Cost Analysis for munitions removal were discussed.
- April 2008 Flyer – Described preliminary evaluation of the Remedial Investigation sample data and planned follow-up sampling.
- April 2008 Newsletter – Described the specific roads and beach to be cleared of munitions, including the areas identified in the USFWS Comprehensive Conservation Plan for public access.
- October 2009 Flyer – Described the non-time-critical removal action of munitions from the roads and beach at SWMU 4.
- January 2010 Flyer, April 2010 Newsletter, and December 2011 Flyer – Provided an update on the SWMU 4 roads and beach non-time-critical munitions removal action, including its completion.
- May 2012 Flyer – Provided a summary of the Remedial Investigation/ Feasibility Study Report for SWMU 4.
- October 2012 Flyer – Described the stakeholder agency site visit and roundtable discussion for a Proposed Remedial Action Plan based on the SWMU 4 Remedial Investigation/Feasibility Study Report and the public hearing held by EPA to present and accept comments on the proposed remedy.
- November 2014 Newsletter – Described the plan for an additional non-time-critical removal action for munitions at SWMU 4.
- May 2016 Newsletter – Provided an update on cleanup progress at SWMU 4.
- May 2017 Newsletter – Described the SWMU 4 Feasibility Study Addendum results and Proposed Plan.

Restoration Advisory Board: The Vieques RAB comprises community members and representatives from stakeholder government agencies. The objective of the RAB is to foster communication among the community, regulators, and other stakeholders associated with or interested in the Vieques cleanup. RAB meetings serve as a forum to share information on the environmental restoration process. The community was updated, and input was solicited regarding the investigation and cleanup progress associated with SWMU 4 during the following RAB meetings:

- February, May 2005 – Update and schedule for planned Remedial Investigation activities.
- August 2005 – Status of contract award for munitions removal work.
- September 2006 – EPA representative discussed the oversight role of the agency and review of the Engineering Evaluation/Cost Analysis.

- January 2007 – Discussed the SWMU 4 Remedial Investigation Work Plan that was submitted for RAB review in November 2006; discussed the Vieques Background Soil Inorganics Study and how it relates to the SWMU 4 Remedial Investigation.
- March 2007 – EPA representative showed photographs of the agency oversight of the Remedial Investigation sample collection and well installation.
- November 2007 – Provided a preliminary evaluation summary for the Remedial Investigation sample data.
- February, May 2008 – Discussed the planned Remedial Investigation follow-up sampling and anticipated schedule.
- October 2008 – Discussed the supplemental Remedial Investigation sample collection completed in August 2008 and how the data will be used risk assessments.
- January, August 2009 – Provided an update on Remedial Investigation data evaluation and anticipated report preparation schedule.
- November 2009, May 2010 – Provided update on the roads and beaches munitions non-time critical removal action.
- August 2010 – Provided a summary of National Oceanic and Atmospheric Administration's (NOAA's) land and fiddler crab study at SWMU 4.
- November 2010 – Provided a summary of numbers and types of munitions found at the OB/OD pits.
- November 2011 – Described the Feasibility Study of potential remedial alternatives.
- March 2012 – Discussed the Proposed Plan and Record of Decision process as it pertains to SWMU 4. Provided an estimated schedule for submittal of the Draft Final Remedial Investigation/Feasibility Study for RAB review.
- June 2012 – Discussed the public comment period and public meeting for the SWMU 4 Proposed Plan.
- November 2012 – Provided an overview of the SWMU 4 Responsiveness Summary. The PREQB representative summarized the joint stakeholder agency/community members site visit to SWMU 4.
- February 2013 – EPA stated the agency would host a public forum on March 3 to discuss community concerns regarding the planned SWMU 4 remedial action.
- June 2013 – Discussed the planned path forward for SWMU 4 based on public input on the Proposed Plan, including additional non-time critical removal action and data collection.
- September, November 2013, April 2014 – Discussed prioritizing the underwater area adjacent to SWMU 4 for investigation to expedite opening portions of SWMU 4 to the public in accordance with USFWS' Comprehensive Conservation Plan; summarized the planned underwater munitions investigation activities.
- August 2014 – Summarized the Beach Dynamics Investigation planned for various beaches, including the one at SWMU 4.
- November 2014 – Summarized the biota (fish and blue crab) sampling conducted in Laguna Boca Quebrada.
- February, November 2015 – Discussed the additional non-time critical munitions removal action for all remaining areas intended for public use.
- February 2016 – Provided an update on the Beach Dynamics Investigation.

- May, November 2016 – Provided a summary of the Remedial Investigation performed in the underwater area adjacent to SWMU 4; EPA representative discussed agency oversight and collection of split samples for independent analysis.
- February, May, August 2017 – Summary of Remedial Investigation data evaluation for underwater area adjacent to SWMU 4.
- April, August 2018 – Update on status of Remedial Investigation Report for underwater area adjacent to SWMU 4.

Presentations made and minutes from the RAB meetings listed, which summarize discussions regarding SWMU 4, including any comments/questions posed and the associated responses, can be found on the Vieques Public Website at the following link:

https://navfac.navy.mil/products_and_services/ev/products_and_services/env_restoration/installation_map/navfac_atlantic/vieques/outreach/rab_documents.html

In addition, 20 Restoration Advisory Board Status Reports were issued between December 2004 and November 2010 to provide updates on ongoing investigation and cleanup activities across Vieques, including SWMU 4.

A Proposed Plan was issued for public comment in 2012, based on information contained in the Remedial Investigation/Feasibility Study (RI/FS) Report (2012) and the non-time critical removal action conducted in 2009-2010. However, based on input received at the associated public meeting, the Navy shelved the 2012 Proposed Plan and performed further investigation (2014) and an additional non-time critical removal action (2015), as discussed previously.

3. Summary of Commenters' Major Points Regarding the SWMU 4 Proposed Remedial Action

During the SWMU 4 Proposed Plan public comment period (excluding the public meeting), one comment was received. In addition, several comments/concerns were expressed during the August 8, 2018, public meeting. Responses to substantive comments received are summarized herein. It is noted that several commenters provided non-site-specific comments regarding such topics as cleanup of Vieques as a whole, per- and polyfluoroalkyl substances (PFAS), use of detonation chambers around the world, the health of Viequenses, and other comments not specific to the proposed remedial action at SWMU 4. While these comments are outside of the scope of the SWMU 4 remedial action, they are included in the public meeting transcript because they were made during the SWMU 4 Proposed Plan public meeting. It should be noted that evaluation of potential locations on former Navy lands in Vieques where PFAS may be present is underway, including preparation of a work plan for sample collection. Additionally, the Navy has produced a Fact Sheet regarding use of controlled detonation chambers that has been distributed at community meetings and is available on the Vieques Environmental Restoration website (www.navfac.navy.mil/Vieques).

Site-specific substantive comments/input are grouped by category and discussed here. Section 4 of the Responsiveness Summary provides responses to specific substantive questions.

3.1 Major Point/Comment – Cost as a Remedial Alternative Selection Criterion: One commenter felt the proposed remedy (i.e., Alternatives M-2 [Land Use Controls] and G-2 [Natural Attenuation and Land Use Controls]) is based on economic reasons (i.e., low-cost alternative) and that the Navy would prefer to use fences to restrict access rather than perform cleanup.

Response: Every remedial action selected via the CERCLA process, including that for SWMU 4, undergoes a standard evaluation process dictated by the National Oil and Hazardous Substances Pollution Contingency Plan, commonly referred to as the National Contingency Plan or NCP, which provides the framework for how hazardous waste sites in the United States are addressed. In accordance with the NCP, every remedial alternative under consideration is evaluated using nine criteria that help determine its ability to protect human health and the environment; comply with Federal and Commonwealth

environmental laws and other requirements; be effective in the short- and long-term; and reduce toxicity, mobility, or volume of contamination, as well as the alternative's cost, technical feasibility, and level of support by the community and Commonwealth. While cost is one of the evaluation criteria required by the NCP, selection of a remedial alternative cannot be based on consideration of cost alone; the cost of a remedial alternative is no more important than any of the other evaluation criteria. In fact, the most important criteria used in the evaluation of remedial alternatives are protection of human health and the environment and compliance with Federal and Commonwealth laws and other requirements.

For SWMU 4, the reason alternatives M-2 and G-2 are the preferred remedial alternatives is because they:

- Protect human health and the environment and fully support public access under the USFWS land use plan
- Reflect the significant munitions removal already performed as part of the Remedial Investigation and the removal actions performed at the OB/OD pits and all planned public use areas
- Recognize the significant explosive hazard reduction provided by the previous munitions removal activities
- Preserve vegetation and ecological habitat in areas not planned for public use
- Monitor the past munitions removal effectiveness on groundwater perchlorate concentrations
- Include educational kiosks to encourage recreators to access public-use areas and the importance of unexploded ordnance (UXO) awareness
- Include a long-term monitoring program that includes inspections for the presence of munitions that may have become exposed, as well as an assessment of the integrity and effectiveness of the land use controls

With respect to munitions cleanup, the Navy has directed significant resources to historical munitions removal activities at SWMU 4. Between 2000 and 2015, the Navy removed over 8,500 munitions and over 110,000 munition-related debris from SWMU 4, including all the areas for planned public use, at a cost of nearly $10,000,000.

It is also noted that, as demonstrated in the Proposed Plan, no fencing is recommended as part of the SWMU 4 remedial action.

3.2 Major Point/Comment – Remedy Effectiveness and Long-term Reliability: Several commenters expressed interest in assurances that the investigation and cleanup work to date and the planned remedial action are sound, that the area will be safe for its intended use, and that the planned land use controls are enforceable and effective/protective.

Response: The historical investigations and munitions removal activities at SWMU 4 were all conducted in accordance with CERCLA protocol and the associated standard procedures that are practiced throughout the United States. These procedures were included in work plans and associated documents that were provided to the RAB to solicit community input in addition to being reviewed and approved by the regulatory agencies (EPA, PREQB, PRDNER), refuge manager (USFWS), and explosive safety organizations (Naval Ordnance Safety and Security Activity [NOSSA] and Department of Defense Explosives Safety Board [DDESB]).

As noted in Section 3.1, the remedial action evaluation process dictated by the NCP ensures any selected remedy be protective of human health and the environment. By working closely with USFWS to understand its planned land use at SWMU 4, the Navy implemented investigations and munitions cleanup specifically in areas intended for public access, thus allowing a determination that the area would be safe for this use under the proposed remedial action. This conclusion was based on rigorous evaluation of past munitions removal activities and site-specific data, and this conclusion was reviewed and confirmed by the stakeholder agencies.

The remedial action, including the planned land use controls, will be implemented under CERCLA. As such, the Navy has the legal responsibility to ensure all elements of the land use controls are monitored and maintained to ensure they remain protective. As part of the process, EPA will retain regulatory authority over the remedial action, and the consulting parties, including EPA and the Commonwealth, will provide third party verification of the remedy protectiveness.

3.3 **Major Point/Comment – Cleanup Scope:** A comment was made by an individual advocating selection of Alternative M-4 (surface and subsurface MEC removal from entire terrestrial area not already cleared and Laguna Boca Quebrada) and Alternative G-3 (enhanced in situ bioremediation [EISB] to address perchlorate in groundwater) so that no land use controls or restrictions, including fencing, would be necessary.

Response: As noted in Section 3.1, selection of a remedial action is based on rigorous evaluation of various remedial alternatives, which includes consideration of multiple criteria to ensure the remedy selected is protective of human health and the environment and complies with applicable laws, but also takes into consideration a multitude of other criteria to ensure the remedy selected is an appropriate balance of those criteria. As discussed in the Proposed Plan, munitions removal across the entirety of SWMU 4 was considered by the Navy and consulting agencies as Alternative M-4. However, implementing Alternative M-4 would result in significant ecological damage because all vegetation would be removed, which would also aggravate erosion potential by exposing the soil through vegetation clearance. In addition, this alternative would present the highest safety risk to workers and would not significantly increase the remedy protectiveness because all planned public use areas and areas with the highest quantities of munitions have already been cleared. Further, much of the remaining area is inaccessible, not planned for future use, and would contain relatively low quantities of primarily weathered 20-millimeter (mm) projectiles, which pose a very low explosive hazard. Based on this, Alternative M-4 was not selected as the remedial alternative; Alternative M-3 is protective of human health and the environment while supporting the planned public use and avoiding the deleterious impacts of Alternative M-4 previously described.

Further, regardless of the extent of munitions removal performed, land use controls would always be necessary to account for munition items which may not be detected and remain at the site after the remedial action is conducted, or which may be transported to the site through natural processes. As noted in Section 3.1, no fencing is recommended as part of the SWMU 4 remedial action.

Implementation of Alternative G-3 (EISB) was also considered by the Navy and consulting agencies. However, its implementation would damage/destroy native vegetation (to clear areas for injection well installation) and introduce additional chemicals into the groundwater without reducing risk because groundwater is not used nor is planned to be used as a potable source at SWMU 4. Further, because the perchlorate levels in groundwater are already relatively low, the effectiveness of Alternative G-3 in achieving the perchlorate cleanup goal is uncertain. In fact, the action most likely to reduce perchlorate levels in groundwater is removal of the perchlorate source, which was done via the historical munitions removal activities. Alternative G-2 will therefore provide the long-term groundwater monitoring necessary for verification without the deleterious impacts of Alternative G-3.

3.4 **Major Point/Comment – Establishing Precedence:** One commenter expressed concern that if the remedy selected for SWMU 4 involves land use restrictions, it would set a precedent for this type of remedy selection at other sites.

Response: Every remedial alternative evaluation and remedy selection is unique (i.e., site-specific) and follows the standard evaluation and selection process described in Section 3.1 and required under CERCLA. While various elements of a remedial action may be similar from one site to the next, each site undergoes a remedial alternatives evaluation that is based on the specific set of circumstances, such as planned land use, nature and extent of contamination, human health and ecological risks, and explosive

hazards, associated with that particular site. In this way, selection of a remedial action that is appropriate and specific for each site can be assured.

In addition, as noted in Section 3.3, any former munitions site will require some level of land use controls to account for the possibility of munition items that may remain at the site following implementation of the remedial action.

4. Summary of Specific Questions Regarding the SWMU 4 Proposed Remedial Action

This section provides specific questions regarding the SWMU 4 Proposed Plan that were asked at the public meeting (questions were edited for clarity as necessary to account for translation from Spanish to English). Other than at the public meeting, no questions were received during the public comment period.

Question: In the presentation here this evening, I see no listing of the contaminants, the toxins that have been found, etcetera. Where is that available?

Response: Information regarding the nature and extent of contamination, associated human health and ecological risks, and remedial alternatives evaluated is available in the Administrative Record, which is accessible on the Vieques cleanup public website: https://go.usa.gov/xRHxY. Specifically, the information is contained within the SWMU 4 Remedial Investigation/Feasibility Study (RI/FS) Report (2012) and the SWMU 4 Feasibility Study Addendum (2017). A copy of the RI/FS Report was sent to the individual who asked the question.

4.1 **Question:** Once the Navy completes the remedial action, who responds in the future if an unexploded ordnance item is found or some chemical is found that causes harm to people?

Response: By law the Navy has this responsibility. As such, the Navy retains responsibility for long-term monitoring and management, and if any munitions are found or reported, the Navy is responsible for handling them.

4.2 **Question:** If a 20-millimeter projectile that was not found during the cleanup happened to be stepped on, does it have the capability of exploding, or does it need a trigger, or if it was struck with a rod or a fire was started near it, could it explode?

Response: The 20-millimeter projectiles are not designed to function in that way, so if one was stepped on or struck, it would not explode. They require the fuse to set off the explosive. Additionally, most 20-millimeter projectiles found at SWMU 4 were practice rounds and contained no high explosives. Further, it is also very likely that the 20-millimeter projectiles at SWMU 4 are so degraded that nothing will cause them to function (explode). They have been subject to weathering for several decades and, therefore, munitions professionals have determined the area is safe for the planned use.

4.3 **Question:** How many pounds of ordnance have been removed and does the RI/FS Report contain the details?

Response: The RI/FS Report summarizes the various removal actions that have taken place at SWMU 4, including the types of munitions and munitions-related material removed from the site. While it does not break down the quantities and weight by event, approximately 8,500 ordnance items (referred to as munitions and explosives of concern, or MEC) totaling several thousand pounds have been removed from SWMU 4. In addition, many thousands of items associated with ordnance but lacking any explosive component (referred to munitions debris) were removed from the site.