

# Summary of the *No Further Action Report for Nine Sites*

## Former U.S. Naval Ammunition Support Detachment Vieques Island, Puerto Rico

SEPTEMBER 2003

### 1 Introduction

This Summary of the No Further Action Report for Nine Sites (herein referred to as the Summary NFA Document) provides a concise summary of the information detailed in the No Further Action Report for Nine Sites and other related documents. In addition, it presents the rationale for selecting no further action (NFA) as the preferred remedial alternative for nine sites at the former U.S. Naval Ammunition Support Detachment (NASD), Vieques Island, Puerto Rico. The locations of the sites are presented in Figure 1.

The purpose of this Summary NFA Document is to provide an easy-to-understand document to promote public participation in the remedy selection process. This document informs the public of the preferred alternative of NFA due to the absence of human health or ecological impacts from past Navy activities at these sites.

This Summary NFA Document is divided into the following sections:

1. Introduction
2. Site Descriptions and Background
3. Site Characteristics
4. Scope and Role of Summary NFA Document
5. Summary of Site **Risks**
6. Remedial Action Objectives
7. Summary of Remedial Alternatives Evaluation
8. Overall Summary
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### 2 Site Descriptions and Background

The sugarcane industry was the major economic base of Vieques Island during the latter part of the 19<sup>th</sup> century and early 20<sup>th</sup> century. Several sugarcane factories, including Arcadia, La Playa Grande, Resolución, and Santa Elena,

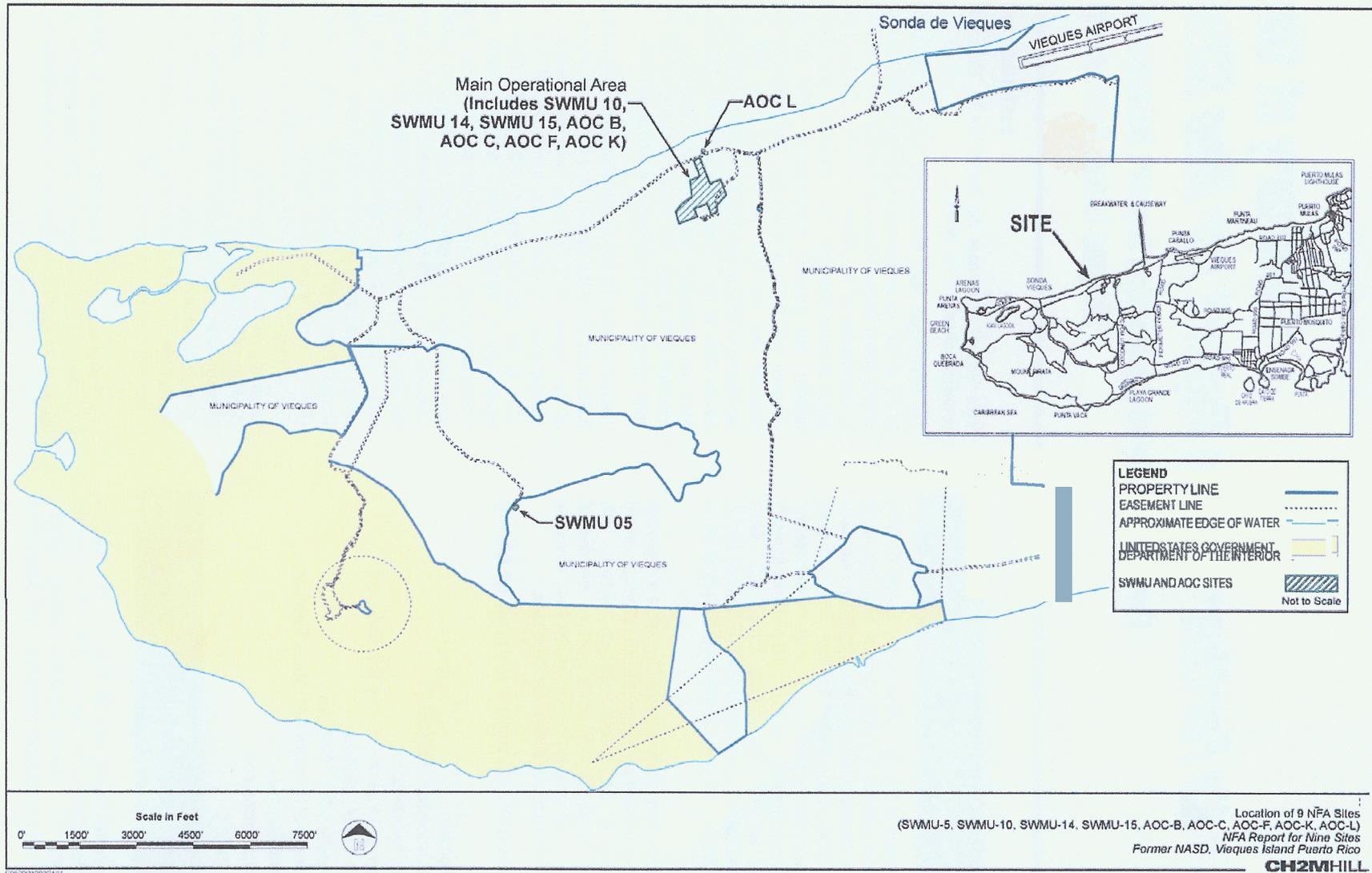
were located at or near the former NASD. Sugarcane operations ceased in the 1940s.

The Navy began using the property located at the former NASD in 1941 as an ammunition storage facility that would service Naval Station Roosevelt Roads during World War II. Construction of the Naval Ammunition Facility (NAF), which included Mosquito Pier, magazines, and support facilities, was generally completed by 1943. The NAF operated until 1948, at which time the ammunition was removed and the NAF was closed. The NAF was reactivated in 1962 as the NASD in response to the Cuban missile crisis. In 1971, construction of the Main Operations Area was completed, and all support operations were relocated to that area. The NASD was used by the U.S. Navy Atlantic Fleet for storage of munitions until 2000.

The entire former NASD property consists of approximately 8,000 acres along the western third of Vieques Island. All of the former NASD property, with the exception of approximately 100 acres, was transferred on April 30, 2001, to the U.S. Department of the Interior (DOI), the Municipality of Vieques (MOV), and the Puerto Rico Conservation Trust. Some of the areas adjacent to the sites discussed in this document are being used by MOV. Currently, the property is **owned** by the DOI (3,100 acres), the Municipality of Vieques (4,000 acres), the Navy (100 acres), and the Puerto Rico Conservation Trust (800 acres). As part of the property transfer, seven Solid Waste Management Units (SWMUs) and ten Areas of Concern (AOCs) were investigated through the Puerto Rico Environmental Quality Board's (PREQB's) oversight and following the U.S. Environmental Protection Agency's (EPA's) Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. Of the 17 sites investigated, nine sites are recommended for NFA and are the subject of this Summary NFA Document. Table 1 lists the sites recommended for NFA status.

As illustrated in Figure 1, with the exception of SWMU 5, the sites that are proposed for NFA are located in close proximity to each other and are at or near the former NASD

Figure 1. Locations of the Nine NFA Sites



<b>Table 1. Sites Recommended for NFA Status</b>	
<b>SWMU/AOC</b>	<b>Historical Operation</b>
<b>SWMU 5</b>	<b>Former Disposal Site for Inhibited Red Fuming Nitric Acid (IRFNA) and Mixed Amine Fuels(MAF-4)</b>
<b>SWMU 10</b>	<b>Former Waste Paint and Solvents Disposal Ground</b>
<b>SWMU 14</b>	<b>Former Wash Rack</b>
<b>SWMU 15</b>	<b>Former Waste Transportation Vehicle Parking Area</b>
<b>AOC B</b>	<b>Former Wastewater Treatment Plant (WWTP)</b>
<b>AOC C</b>	<b>Former Transportation Shop Drainage Ditch</b>
<b>AOC F</b>	<b>Former Underground Injection Control (UIC) Septic Tank</b>
<b>AOC K</b>	<b>Former Water Well</b>
<b>AOC L</b>	<b>Abandoned Septic Vault</b>

Main Operations Area, which is also referred to as the Public Works Area in some of the historical reports.

Descriptions of the individual sites are provided below.

### 2.1 SWMU 5

The IRFNA/MAF-4 Disposal Site (SWMU 5) is in a remote area of the former NASD in the vicinity of Magazine Building 422, as shown in Figure 1. It is the location where, in 1975, approximately 7,000 pounds (lbs) of fuel were reportedly emptied from leaking AQM-37A target drones into a low spot in a road near Building 422. The fuel contained 5,275 lbs of inhibited red fuming nitric acid (IRFNA) and 1,775 lbs of mixed amine fuels (MAF-4), which were emptied into a natural intermittent storm drainage channel that eventually discharges into Vieques Sound.

### 2.2 SWMU 10

SWMU 10 is the Former Waste Paint and Solvents Disposal Ground. It is located on the northern portion of the former NASD within the former Main Operational Area. The site consists of an area surrounding the former Paint Locker (Building 4001), and was used between the mid-1970s until approximately 1990. It is suspected that small quantities of paints, solvents, and thinners were disposed of on the ground outside Building 4001; however, no evidence has been uncovered to support this supposition.

### 2.3 SWMU 14

SWMU 14 is the Former Wash Rack located in the former Main Operational Area, on the northern half of the former NASD and immediately west of the former Transportation Shop (Building 2016). Currently the site is within a chain-

link fenced area. The site consists of a concrete driveway with 4-inch curbs on each side, and ramps on each end measuring approximately 20-feet long by 10-feet wide. Runoff was collected into an oil/water separator (OWS) that was located at the end of the driveway. The OWS was removed and properly disposed of prior to the sampling conducted during the Phase I Preliminary Investigation/Site Assessment (PNSI) in April 2000.

This site was in use from the late 1970s until the end of 2000, and was used primarily for cleaning Navy vehicles. Degreasing solvents are suspected to have been used occasionally at the site. During operations, the concrete bermed area drained into an OWS, which has been removed, prior to discharging into an open ditch. A swale at the end of the OWS facilitated the discharge of runoff water to the ditch, which eventually extends to the north; however, there is no apparent direct connection from the site to any continuously flowing water bodies. The drainage ditches are dry, except during rain events.

### 2.4 SWMU 15

SWMU 15 was a Navy truck parking area located in the former Main Operational Area, on the northern half of the former NASD near the Transportation Shop. The precise location of the truck has not been identified; however, the entire parking area has been investigated as part of the Phase I PNSI. A truck in the parking area was reported to have contained 55-gallon metal drums and overpack drums of caustic waste. The drums allegedly contained napalm from Naval Station Roosevelt Roads. The use of overpack drums suggests that the material inside the drums may have leaked at one time. No physical evidence of leakage was observed at the site, and the vehicle was no longer at the site at the time of investigation. The yard is no longer used for any truck storage, and the suspect vehicle is no longer at the site. The entire area in which trucks were parked was investigated as SWMU 15, as the vehicle may have been moved around the area.

### 2.5 AOC B

AOC B is the former NASD Wastewater Treatment Plant (WWTP), which operated from 1983 to 2000. This site is located at the southwest end of the former Main Operational Area and served as the primary domestic wastewater treatment system for the facility. The WWTP consisted of one aeration tank and one separation tank with two blowers to supply air for biological treatment.

Effluent from the WWTP drained into a series of four self-contained lagoons with no discharge point. The lagoons were lined with compacted clay. The lagoon area is surrounded by an 8-foot-high cyclone fence as an access control measure to limit wildlife access to the site. The site was investigated as part of the 2002 Phase II Expanded PNSI. No evidence has been uncovered to indicate that hazardous wastes were discharged to the WWTP.

## 2.6 AOC C

AOC C includes the drainage ditches located in the former Main Operational Area near the Transportation Shop (Building 2016). This site consists of two grass-lined stormwater drainage ditches located on both sides of the main road leading to the former Main Operational Area and an old buried tank that handled **wastes** from the sink in the former Transportation Shop. The ditches originate on the surface near the Transportation Shop and travel north, parallel to the road, and then merge at the main road that runs through the former NASD. The ditches eventually drain under Highway 200 and end about **50** feet north of the highway in a diffused area that could eventually drain to the Atlantic Ocean.

An oily sheen of unknown origin was observed in one of the ditches during a site inspection in 1988. It is unknown whether the observed sheen **was** from waste discharged to the ditch or from natural plant debris or from motor oil from the adjacent roadway.

## 2.7 AOC F

AOC F is the Underground Injection Control (UIC) septic tank site located near the Enlisted Men's Club near the former Main Operational Area. This buried (subsurface) septic tank had a capacity of 1,500 gallons, and **was** used to service the domestic waste from the Enlisted Men's Club when the facility was in use. The tank was closed in 1997, and a sampling investigation was conducted at AOC F during July 1997 as part of the UIC program to gather data and serve as a preliminary evaluation of potential contamination regarding possible septic tank leakage. To facilitate PREQB review, the site was transferred from the UIC program to the CERCLA program during 2000. The site was subsequently investigated as part of the Phase I Expanded PNSI. No evidence was discovered indicating that hazardous wastes were ever disposed of at this site.

## 2.8 AOC K

AOC K consists of one 8-inch-diameter former water supply well completed to a depth of 69 feet below land surface to the northeast of the former Main Operational Area barracks. The well was utilized for potable water supply between 1941 and 1979 but has since been plugged and abandoned.

The AOC K well was rehabilitated in 1997 as part of a water well investigation conducted by the U.S. Geological Survey (USGS). The USGS investigation included collecting groundwater samples from the well to determine native or background conditions. The analytical results indicated that benzene **was** present above the maximum contaminant level (MCL) level of 5 micrograms per liter. However, subsequent sampling of the well did not detect benzene. Iron and manganese in the well were found to be greater than screening criteria (secondary MCLs) in the sampled groundwater. The USGS report cites that the

potential source for the observed iron and manganese is the volcanic rock prevalent in the western half of Vieques, which is enriched with iron and manganese. It was also confirmed in the Phase I PNSI that the likely source of these metals **was** from background conditions rather than site-related activities.

## 2.9 AOC L

AOC L consists of a partially buried, compartmentalized, 25-foot by 40-foot concrete vault. The vault is located north of the former Main Operational Area, north of the main road crossing the former NASD, and approximately 200 feet from the beach. The area surrounding the vault consists of low-growing vegetation (grasses and shrubs). It is suspected that the vault was in existence when the area **was** used for sugarcane farming. Currently, the vault consists of a dry cement container with an opening on top. There is a spill overflow at the northeast corner of the vault. There are no indications that the vault **was** used for industrial purposes, but because actual historical use of the site is unknown, the site was investigated.

# 3 Site Characteristics

A total of nine sites are included in this Summary NFA Document. One site, SWMU 5, is physically separated from the remaining eight sites in the former Main Operational Area (Figure 1). SWMU 5 is located on the west-central portion of Vieques Island, which is a remote area of the former NASD. The topography at this site is relatively flat, with an elevation of approximately 120 feet above mean sea level. Stormwater drains to an intermittent ditch that flows north to Vieques Sound. No lakes or springs are present in the vicinity of this site.

The remainder of the eight sites that are the subject of this Summary NFA Document are located in the former Main Operational Area, which lies on a north facing slope (approximately 45 feet above mean sea level), and is underlain by silt and clay soils derived from highly weathered volcanic rock. Because of the **tight** binding of these hard clays, the soil has low permeability, and surface runoff is generally the primary migration pathway for any surface releases. Surface runoff from these sites flows north to the Atlantic Ocean. Weathered volcanic bedrock underlies the soils at depths ranging from approximately **50** to 100 feet.

The hydrogeology of the former Main Operational Area is characterized by an underlying, semi-confined groundwater system. Groundwater was encountered at the site at depths of 50 feet below land surface during monitoring well installation procedures; however, the water levels eventually stabilized at depths of approximately 41 to 42 feet below land surface. Monitoring wells in the shallow

zone had low yield and groundwater had high turbidity when sampled. Groundwater flow near the former Main Operational Area is generally in a northern direction toward the Atlantic Ocean.

### 3.1 Summary of Studies and Investigations

The investigation and development of remedial options for the nine sites recommended for NFA has been consistent with EPA's guidance outlining the CERCLA cleanup process. The Initial Assessment Study (IAS) is the first opportunity in the CERCLA process to gather information on the sites. It is used to better focus scoping and sampling efforts and to develop a more thorough understanding of the nature and extent of potential contamination. The IAS was conducted in 1984 at the former NASD.

A Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) is conducted to identify SWMUs at RCRA facilities and to evaluate SWMUs and other AOCs for releases to environmental media. In addition, the RFA is conducted to make preliminary determinations regarding releases and the need for further actions. At NASD, the RFA was conducted in 1988. Through the IAS and the RFA, 10 potentially contaminated properties were identified in the former NASD. Of these sites, only six sites (SWMUs 5, 10, 14, and 15, and AOCs C and F) are included in the NFA sites addressed in this Summary NFA Document. The other four sites identified during the IAS are among the sites needing further investigations.

An Environmental Baseline Study (EBS) was conducted in 2002 to identify sites, other than RCRA sites, that may pose a threat to the environment. The EBS was based on records review, site inspections and investigations, interviews, and other environmental information related to site operations and the treatment, storage, disposal, and release of hazardous substances or petroleum products. The EBS identified seven additional sites for further investigations. Of these, three were among the NFA sites addressed in this report (AOCs B, K and L).

A background study was conducted for the western portion of Vieques for use at former NASD site investigations. A final background investigation report was presented in 2002, after review by the PREQB, EPA and a community interest group, the Technical Review Committee. This study established the background levels for inorganic chemicals in soils. These soil background levels are used for comparison with the nine sites included in the No Further Action Report for Nine Sites after conducting risk assessments. Site-specific upgradient groundwater monitoring wells are also included for comparison during site data evaluations. Background levels are important for the nine NFA sites, as most of the chemicals of potential concern (COPCs) identified in the soils and groundwater at the nine sites are also present in background samples at similar concentrations.

The Preliminary Assessment (PA) and Site Inspection (SI) are performed to distinguish sites posing little risk from those requiring immediate response or further investigations. Samples are collected during the SI to determine which substances are present at the site and if they have been released to the environment. At the former NASD, the PA/SI was conducted in two phases in 2000 and 2002. Seventeen sites were investigated in these two Expanded PA/SIs to assess the soil, groundwater, sediment, and surface water for possible hazardous waste releases. The results of these investigations indicate that eight of the sites require further investigations, and the nine remaining sites discussed herein do not pose a threat to human health and the environment. An ecological survey was conducted as part of the two phases of the Expanded PA/SIs to determine if the site historical operations had any ecological impacts at any of the 17 sites. The survey results indicated that no impacts were identified. Therefore, these sites were recommended for NFA. An NFA document that included a risk assessment was prepared for the nine sites. The results of the Expanded PA/SI and the risk assessment included in the No Further Action Report for Nine Sites are presented in the text that follows.

All detected chemicals in site-specific data were screened against health-protection-based comparison criteria, and any exceedences were identified as COPCs for risk assessment. Table 2 summarizes the human health risk assessment process.

#### SWMU 5

During the Expanded PA/SI, the surface and subsurface soil samples were collected from the entire length of the ditch that was reported to have received the IRFNA/MAF-4 fuel spill runoff in 1975. Soil was monitored at several depth intervals up to the underlying granite rock, and a field measurement for presence of organic vapor monitor (OVM) was also conducted.

The only COPC identified for SWMU 5 was benzo[a]pyrene in surface soil. It is not likely site-related and may be associated with migration of polycyclic aromatic hydrocarbons (PAHs) from the asphalt road or vehicle emissions to the adjacent ditch. The risks at SWMU 5 are within acceptable human health limits for maintenance workers, industrial workers, recreational receptors, and residential receptors. No COPCs were identified in the subsurface soil; thus, there are no subsurface exposure pathways. SWMU 5 does not present a health risk concern to current or future receptors.

#### SWMU 10

A total of 10 surface soil and 10 subsurface soil samples were collected from around this former paint locker that is Building 4001. The soils were identified as low-permeability clays, and groundwater at this and other sites in the area occurs at approximately 40 to 50 feet below land surface.

## Table 2. What Is Risk and How Is It Calculated?

A human health risk assessment estimates the likelihood of health problems occurring as a result of exposure to contaminants at a site. To estimate the risk at a site, the following four-step process has been developed and approved by PREQB and EPA:

Step 1: Analyze Contamination.

Step 2: Estimate Exposure.

Step 3: Assess Chemical Criteria.

Step 4: Characterize Site Risk.

In Step 1, the concentrations of chemicals found at the site during the past investigations are identified. Comparisons between site-specific concentrations and concentrations reported in past studies help determine which contaminants may pose a threat to human health.

In Step 2, the different ways that people might be exposed to the contaminants identified in Step 1 are considered, the concentrations that people might be exposed to, the potential frequency of exposure, and the length of exposure. Using this information, the Navy calculates a "Reasonable Maximum Exposure" (RME) scenario that portrays the highest level of human exposure that could be reasonably expected to occur.

In Step 3, EPA-published criteria for chemicals, which are based on scientific studies on the effects these contaminants have had on people (or animals when human studies are not available) are evaluated. The information in Step 2, combined with the toxicity information for each chemical, is used to assess the potential risks.

In Step 4, the results of the three previous steps are combined, evaluated, and summarized. The potential risks are accumulated from the individual contaminants and exposure pathways to calculate a total site risk.

Two types of risk are considered: (1) cancer risk and (2) noncancer hazard index. The Excess Lifetime Cancer Risk (ELCR) is used to evaluate cancer risks and represents the probability of an individual developing cancer over a lifetime as a result of exposure to a chemical. The likelihood of any kind of cancer resulting from exposure to a contaminated site is generally expressed as an upper bound probability; for example, a "1 in 10,000" chance. In other words, for every 10,000 people that could be exposed, one additional person may develop cancer as a result of exposure to site contaminants. An additional cancer case means that one more person could get cancer than normally would be expected to from all other causes. Remedial action is generally warranted at a site when the calculated cancer risk exceeds 1 in 10,000 ( $1 \times 10^{-4}$ ). To assess cancer health risks, the Navy compared ELCRs with EPA's recommended action range of 1 in 10,000 ( $1 \times 10^{-4}$ ) to 1 in 1,000,000 ( $1 \times 10^{-6}$ ). For non-cancer health effects, a Hazard Index (HI) is calculated. The key concept of the HI is that a "threshold level" exists (usually as an HI of 1 or less) below which noncancer health effects are not predicted.

At the end of risk estimation, site media concentrations are compared to the background levels. If site media concentrations are within the background media concentration levels for naturally occurring chemicals, then no actions are recommended for a site.

Soil samples were analyzed for organic and inorganic chemicals, and field screening of the samples was conducted using OVM measurements. Several inorganic chemicals were detected in site soils above human health screening criteria. These chemicals were included in the risk assessment.

Five metals (arsenic, chromium, manganese, thallium, aluminum, and iron) were selected as COPCs. There were no ecological impacts identified during the ecological survey conducted. The cancer risks and health hazard effects are within acceptable limits for maintenance workers, industrial workers, construction workers, recreational receptors, and residential receptors. Iron concentrations in surface soils are within the range of background concentrations found at the former NASD.

Therefore, any health hazard that may be estimated in SWMU 10 soils from iron is not site-related. Since no hazardous waste release from past Navy operations is identified, and no human health risk concerns are identified during risk assessment, the site is recommended for NFA.

### SWMU 14

A total of 14 surface soil samples, 14 subsurface soil samples, and one groundwater sample were collected from the site. One upgradient monitoring well was also installed at this site to serve as the background well for sites within this area. All the samples were analyzed for organic and inorganic chemicals, and those chemicals identified as COPCs were included for a risk assessment. COPCs selected for SWMU 14 included six metals (aluminum,

arsenic, iron, manganese, thallium, and vanadium) in surface soils, the metals aluminum, iron, and thallium in subsurface soil, and manganese and dieldrin in groundwater.

The ecological survey conducted did not find any impacts from past site operations in this area. The cancer risks and health hazard effects are within acceptable limits for maintenance workers, industrial workers, construction workers, recreational receptors, and residential receptors. There is some slightly elevated hazard index (HI) associated with iron in soil for a hypothetical residential child. However, iron is commonly detected at similar concentrations across the former NASD at most sites, and site iron concentrations well are within background soil levels; thus, the iron represents background conditions from the site soil and suspended particles in groundwater. A well upgradient of this site has higher metals concentrations than the site well, and detected metals in wells in this area are related to suspended particles as filtered samples did not have elevated metals. This site does not present ecological or human health hazard concerns; therefore it is recommended for NFA.

#### **SWMU 15**

During the Expanded PNSI, a total of 16 surface soil samples were collected from grid locations evenly spaced from each other across the site to ensure that the entire area was uniformly investigated. One groundwater sample was also collected from this site. Additionally, organic vapor meter (OVM) measurements were taken from the subsurface soils from the core material during the monitoring well installation all the way to a depth of 53 feet below land surface. The samples were analyzed for metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, and polychlorinated biphenyls (PCBs).

Seven metals (aluminum, arsenic, chromium, iron, manganese, thallium, and Vanadium) and one SVOC (benzo[a]pyrene) were selected as COPCs for surface soil; five metals (aluminum, antimony, iron, manganese, and vanadium) were selected as COPCs for groundwater. The cancer risks and health hazard effects are within acceptable limits for maintenance workers, industrial workers, recreational receptors, and residential adult receptors. For a residential child, the HI exceeds the acceptable limit, primarily from iron in surface soils and groundwater. There is no historical evidence to suggest any activities at this site would have resulted in the release of iron to surface soils or groundwater. The background samples also had the same metals at similar concentrations. The cancer risks and HI estimates were within acceptable limits for maintenance workers, industrial workers, and recreational receptors; the hazard to future residents were above a value of 1.0 from metals in soil and groundwater. Groundwater samples had high turbidity, resulting in elevated metal concentrations within the

suspended sediments detected in the groundwater. However, the dissolved metals levels are similar in background levels and site well concentrations. Therefore, this site is recommended for NFA due to the absence of ecological or human health concerns. The observed metals concentrations are similar to background levels.

#### **AOC B**

During the Expanded PNSI, a total of 16 surface and 16 subsurface soil samples were collected from 16 locations within the treatment lagoons at AOC B. The samples were analyzed for organic and inorganic chemicals. In addition, one sample of water was collected from the aeration tank and analyzed for the full target compound list/target analyte (TCL/TAL) list. The water sample had trace levels of SVOCs and metals, none of which were above their respective screening criteria.

Six metals (aluminum, arsenic, iron, manganese, thallium, and vanadium) were identified as COPCs in surface soil. The cancer risks and health hazard effects are within acceptable limits for maintenance workers, industrial workers, construction workers, recreational receptors, and residential adult receptors. For a residential child, the HI slightly exceeds the target value, primarily from the iron in surface soils. However, iron levels are similar to the background soil iron levels. Due to the absence of site-related ecological or human health risk concerns, AOC B is recommended for NFA.

#### **AOC C**

During the Expanded PNSI, 15 surface and 20 subsurface soil samples were collected at various depths (5 to 25 ft below land surface) around the former septic tank at AOC C. Seven surface soil samples were collected from each of the two ditches, and one was collected in the downstream release point past the road. The ditches also collect water from the adjacent grass fields and stormwater runoff from an asphalt road. One groundwater sample was collected from a monitoring well located immediately downgradient of the septic tank.

The presence of volatiles in subsurface soils was also evaluated using an OVM at three soil borings (AOC-C-SB16, AOC-C-SB17, and AOC-C-SB18) and at the monitoring well during installation. Only analytical data from the laboratory were used for quantitative analysis.

All sampled media were analyzed for the full list of organic and inorganic chemicals. Although inorganic chemicals are present in background soils, they were also included in the risk assessment, and were compared against background levels at the end of the risk assessment process. A baseline ecological survey was conducted during the Expanded PNSI and concluded that there were no impacts due to past operations in this area. Only metals were selected as COPCs in surface soil (aluminum, arsenic, iron, manganese, thallium, and vanadium), subsurface soil

(aluminum, iron, and thallium), and groundwater (aluminum, chromium, iron, manganese, and vanadium). The cancer risks and health hazard effects of these metals are within acceptable limits for maintenance workers, industrial workers, construction workers, recreational receptors, and residential adult receptors. For a residential child, the HI exceeds the acceptable limit, primarily from iron in surface soils and groundwater. Iron levels at the site are well within background levels. Therefore, due to the absence of ecological or human health risk concerns from site-related constituents, AOC C is recommended for NFA.

#### **AOC F**

Because AOC F is a buried septic tank, only subsurface soil and groundwater were monitored. A total of 17 subsurface soil samples were collected from four soil borings, and five groundwater samples were collected as part of the Phase I Expanded PA/SI field investigation. One well was installed upgradient of the septic tank, and four wells were installed downgradient. The soil and groundwater samples were analyzed for a full list of organic and inorganic chemicals.

The presence of volatiles in subsurface soils was also evaluated during sampling using an OVM at the four soil borings and the five groundwater borings during well installation at various depths. Metals selected as COPCs included aluminum, arsenic, and iron in subsurface soils and five metals (aluminum, antimony, chromium, iron, manganese, and vanadium) in groundwater. The health hazards estimated were greater than the target value of 1.0 for an industrial worker, residential adults, and residential children due to iron in groundwater. Metal concentrations (particularly dissolved metals) are similar to background groundwater concentrations. The total metals concentrations in groundwater are due to the suspended soil particles in water. Due to the absence of contamination above the background levels, and the absence of site-related human health cancer or non-cancer hazards from past septic tank use, the site is recommended for NFA.

#### **AOC K**

The Phase II Expanded PA/SI field investigation at AOC K included the installation and sampling of two groundwater monitoring wells upgradient, and three monitoring wells downgradient of the former water supply well, and all the samples were analyzed for a full list of organic and inorganic chemicals.

Six metals (aluminum, barium, iron, manganese, thallium, and vanadium) were selected as COPCs for groundwater. The health hazard effects are within acceptable limits for an industrial worker. There are some slightly elevated HI values associated with residential adult and child receptors' exposure to thallium in groundwater. However, the highest concentrations of thallium at this site were detected in the two upgradient wells, and is associated with the suspended sediments in the groundwater samples. Thus, it represents

site-specific background levels or turbidity in the groundwater samples. Iron concentrations in groundwater are within the range of concentrations found across the former NASD. Therefore, any health hazard that may be present in AOC K groundwater from iron or thallium is not related to the former water supply well site. No benzene was detected in any of the wells installed for the PA/SI. Therefore, the site is recommended for NFA.

#### **AOC L**

AOC L consists of a 25-foot by 40-foot concrete vault with separate compartments near the beach north of the former Main Operational Area. The vault has been out of service since 1942. There are no indications that the vault was used for industrial purposes.

Four metals (aluminum, arsenic, iron, manganese) were selected as COPCs for surface soil and subsurface soil. The cancer risks and health hazard effects are within acceptable limits for maintenance workers, industrial workers, recreational receptors, and residential adult receptors. For a residential child, the health hazard is equal to the target value of 1.0, primarily from iron in surface soils. However, iron concentrations are within the range of background concentrations, and therefore iron is not a site-related COPC. The site-related constituents detected at this site do not present an ecological or human health risk concern; therefore, it was recommended for NFA.

### **3.2 Current Conditions**

The property at each of the nine site areas was transferred to MOV.

Based on the site history, previous investigations, and findings from the Expanded PA/SI, several Chemicals have been detected above conservative (protective) human health screening criteria at these sites. However, the detected inorganic chemicals are also present in background soils samples as reported in the background report and upgradient wells at sites. There is no evidence to suggest that a release of hazardous materials occurred at any of the sites discussed in this Summary NFA Document as a result of historical site-related activities.

Furthermore, potential sources of contamination have been removed, such as the sump at the former Wash Rack, or the vehicle at SWMU 15 within the former Main Operational Area. An ecological baseline survey and assessment conducted for these sites concluded that site operations at each of these nine sites did not have any impact on the ecological receptors. Site-related human health risks are not a concern for any of these nine sites. When compared against background levels for soils and groundwater, site concentrations are similar to the background levels for the COPCs included in the risk assessment.

## 4 Scope and Role of Summary NFA Document

In 1975, the Department of Defense (DoD) began the Installation Restoration Program (IRP) at military facilities to identify, evaluate, and remediate environmental contamination resulting from activities that involved hazardous and toxic materials. In 1980, Congress passed CERCLA, commonly known as Superfund, to investigate and remediate areas affected by past hazardous waste management practices. The CERCLA program is administered by EPA. The DoD's IRP was reissued in 1981 to include additional responsibilities and authorities specified by CERCLA. The present IRP is implemented in accordance with CERCLA and applicable Commonwealth of Puerto Rico laws.

The role of the preferred alternative presented in this Summary NFA Document is to address potential threats posed by the sites and to eliminate exposure pathways that pose unacceptable human health or ecological risks from site-related contamination. The preferred alternative presented in this Summary NFA Document is consistent with the IRP, RCRA, and CERCLA.

## 5 Summary of Site Risks

### 5.1 Human Health Risks

The health risk estimations associated with exposure to environmental media at the nine sites recommended for NFA were evaluated in a Human Health Risk Assessment (HHRA) that was presented in the *No Further Action Report for Nine Sites*. The HHRA evaluated and assessed the potential health risks under current and future land use scenarios. Table 2 summarizes the HHRA process.

The HHRA evaluated the health risks associated with exposure to soil, sediment, and groundwater at the sites. Mostly inorganic chemicals were identified as COPCs at each site, based on screening of the maximum site concentration against human health protection-based screening criteria. A new EPA policy recommends comparison of the site concentrations against background levels after completion of the risk assessment. Therefore, chemicals detected in site soils and groundwater at concentrations similar to background concentrations were included for risk assessment. Also, COPCs were selected using unfiltered groundwater samples. Because of this, several inorganic chemicals that occur naturally as suspended sediments in the groundwater were also selected as COPCs. The detected site-related concentrations were either within the acceptable human health risk levels or were similar to those found in the background soil and groundwater. The HHRA considered

the following categories of receptors for exposure to COPCs at the sites:

- Current adult maintenance worker
- Current adult and child recreational user
- Current adult construction worker
- Future adult industrial worker
- Future adult and child resident at the site

The risk assessment concluded that the cancer risks are well within acceptable risk range for all the sites for maintenance workers, industrial workers, construction workers, recreational receptors, and residential receptors. The HI values from background chemicals were sometimes above a value of 1.0 from the most common metal (iron), and less frequently from thallium, which is elevated in upgradient (background) wells. Thus, all the calculated hazards in the conservatively assessed risks were from background conditions. This indicates that site hazards are similar to background hazards. Therefore, detected levels of inorganic chemicals are likely naturally occurring and not related to NASD activities. EPA guidance does not allow the elimination of these inorganic chemicals from risk assessment, while it allows for the background levels comparisons in site risk management decisions. However, eliminating these background inorganic chemicals from the risk evaluation would result in acceptable risk levels for all evaluated land use scenarios since organic COPCs were identified at only two sites (SWMU 5 and SWMU 14) and the health risks estimated from these organic chemicals are well below the target values. This information supports the conclusion that these sites do not pose excessive risk to human health. The residual risks from the site are identical to the background areas in which no Navy operations occurred.

### 5.2 Ecological Risks

A qualitative ecological survey was performed for each of the nine sites; sites located within the Main Operational Area compound were grouped together. The ecological survey concluded that although past activities at these sites have had some degree of physical impact on the vegetation due to clearing of the area and parking of the vehicles, the impacts appear to be limited to changes in the species composition based on physical disturbances. Clearing activities for the construction of structures and roads has caused a temporary shift in animal species that prefer closed forest systems to those preferring an open habitat. Vegetation that was removed during clearing was mostly thorn scrub, the most abundant and widespread vegetation at NASD. Limited removal of this vegetation is not expected to impact wildlife or overall habitat availability at NASD. None of these impacts are considered significant or long-term, and when compared with the control areas with similar structure, none of the nine site operations showed any difference in the ecological structure and health at the nine sites. No threatened or endangered

species were identified in these areas. Based on these observations, past Navy activities at the sites recommended for NFA did not impact the local ecosystems. Thus, no further actions are recommended to protect ecological receptors at these nine sites.

## 6 Remedial Action Objectives

It is the Navy's current judgment, after consultation with PREQB, as well as EPA, that the preferred alternative presented in this Summary NFA Document will protect public health, welfare, and the environment from actual or threatened releases of hazardous substances. Because risks to human health and the environment were found to be within background levels and thus are within acceptable limits at the nine sites, no remedial actions were recommended for these sites. Consequently, Remedial Action Objectives (RAOs) were not developed.

## 7 Summary of Remedial Alternatives Evaluation

The National Contingency Plan (NCP) outlines the approach for evaluating remedial alternatives. Remedial alternatives are evaluated on the basis of the nine evaluation criteria presented in Title 40 Code of Federal Regulations (40 CFR) 300.430 (9)(iii). These evaluation criteria are categorized into three groups (threshold criteria, primary balancing criteria, and modifying criteria). All alternatives are initially evaluated against threshold and primary balancing criteria, which are technical criteria based on environmental protection, cost, and engineering feasibility. The preferred alternatives are then evaluated against the modifying criteria. The nine evaluation criteria from NCP are presented below.

- Threshold Criteria
  - 1 Overall protection of human health and the environment
  - 2 Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)
- Primary Balancing Criteria
  - 3 Long-term effectiveness and permanence
  - 4 Reduction of toxicity, mobility, or volume
  - 5 Short-term effectiveness
  - 6 Implementability
  - 7 Cost
- Modifying Criteria
  - 8 State acceptance
  - 9 Community acceptance

Most of these criteria are not pertinent for the nine sites as there are no ecological or human health risk concerns for the nine sites. The analytical results and risk assessment results from site investigations indicated that no further investigations or remedial actions are necessary.

Therefore, remedial alternatives were not assessed against the nine evaluation criteria at the nine sites recommended for NFA at the former NASD. However, the no further action alternative for the nine sites is protective of human health and the environment for all the nine evaluation criteria identified in the NCP.

Based upon the analytical results of the environmental samples collected at the sites as part of the Phase II Expanded PA/SI, the Navy, PREQB, and EPA have determined that these sites do not pose unacceptable risks to human health or the environment. Active remedial actions were determined to be unnecessary and were not considered since no contaminated media were identified at the sites. Therefore, no other alternative beyond the NFA alternative was considered or evaluated.

## 8 Overall Summary

This Summary NFA Document was developed to enhance understanding of *the No Further Action Report for Nine Sites*. Based on the risk assessment results detailed in Sections 3 and 4, these sites do not pose unacceptable risk to human health or the environment. Therefore, according to 40 CFR 300.425(e)(1)(iii), the taking of remedial actions at these sites is not required or appropriate. Hence, the no-action alternative is the only remedial alternative considered, and a feasibility study as defined in 40 CFR 300.430 (e) is not required for these sites. Therefore, the preferred remedial alternative for SVMU 5, SVMU 10, SVMU 14, SVMU 15, AOC B, AOC C, AOC F, AOC K, and AOC L is no further action.

The Navy, PREQB, and EPA support the Preferred Alternative. However, their final concurrence with the alternative will be provided after review of all comments received during the public comment period.

## 9 Contact Information

### 9.1 Information Repository

The No Further Action Report for the Nine Sites and other related documents are available to the public at the following location:

Biblioteca Pública  
Calle Baldorioty de Castro  
Vieques Island, Puerto Rico 00765  
Tel: 787-741-3706

## 9.2 Points of Contact

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## 10 Glossary

**ARARs:** Applicable or Relevant and Appropriate Requirements. Federal or state environmental standards and/or limitations based on rules and regulations.

**Background Concentration:** Concentrations of naturally occurring and human-made constituents, such as metals, that are found in soil sediment, surface water, and groundwater in areas that have not been impacted by spills, releases, or other site-related activities. Background concentrations of some metals and other constituents are often at levels that may pose a risk to human health or the environment. These background-related risks should be considered (i.e.; subtracted) when calculating risk posed by site conditions.

**Carcinogenic Risk** Cancer risks are expressed as a number reflecting the increased chance that a person will develop cancer if exposed to chemicals or substances. For example, EPA's acceptable risk range for Superfund sites is  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$ , meaning there is one additional chance in ten thousand ( $1 \times 10^{-4}$ ) to one additional chance in one million ( $1 \times 10^{-6}$ ) that a person will develop cancer as a result of exposure to a contaminated site.

**CERCLA:** Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S. Code 9601-9675). A federal law, commonly referred to as the Superfund Program, passed in 1980, that provides for cleanup and emergency response in connection with numerous existing, inactive hazardous waste disposal sites that endanger public health and safety, and the environment.

**Chemical of Potential Concern (COPC):** A chemical identified in the initial stages of a site investigation that could pose a risk, and so is further investigated to gather data for a risk assessment.

**Contaminant Migration Pathway:** The routes that site contaminants may take to get from the source of contamination to a human being, animal, or plant.

**Environmental Media:** Soil, sediment, surface water, or groundwater at a site.

**Exposure:** People are exposed to a chemical by breathing it (inhalation), eating or drinking something that contains it (ingestion), or by getting it on their skin (dermal contact). The release of a chemical into the environment does not always result in exposure. The health effects of exposure to any hazardous substance depend on the dose (how much); the duration (how long); how the exposure occurred; personal traits and habits of the people who are exposed; and whether other chemicals are also present. The goal of CERCLA is to prevent or minimize exposure.

**Groundwater:** Subsurface water that occurs in soil and geologic formations that are fully saturated.

**HHRA:** Human Health Risk Assessment. An evaluation of the risk posed to human health from a contaminated site.

**HI:** Hazard Index. A number indicative of noncarcinogenic health effects that is the ratio of the existing level of exposure to an acceptable level of exposure. A value equal to or less than 1 indicates that the human population is not likely to experience adverse effects.

**Maximum Contaminant Level (MCL):** The maximum allowable level of a contaminant in water delivered to users by a public drinking water system. MCLs are enforceable standards for drinking water. They are also used as a very conservative (protective) screening criteria for assessing chemicals in groundwater or surface water at a waste site and determining whether there is enough possible risk to justify further investigation.

### Nine Evaluation Criteria

1. **Overall protection of human health and the environment:** The effectiveness of a remedy in providing adequate protection of human health and the environment.

2. **Compliance with ARARs:** Describes whether a remedy will meet ARARs or other federal and state regulations and/or justifies a waiver.
3. **Long-term effectiveness and permanence:** The ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met.
4. **Reduction of toxicity, mobility, or volume through treatment:** The anticipated performance of the treatment technology in reducing toxicity, mobility, and/or volume of contaminants.
5. **Short-term effectiveness:** The period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period.
6. **Implementability:** The technical and administrative feasibility of a remedy, including the availability of required materials and services.
7. **Cost:** The estimated capital and O&M costs of a remedy, generally in present-worth value.
8. **State acceptance:** The state regulatory acquiescence of a remedial action.
9. **Community acceptance:** The public concurrence of a remedial action.

**NCP:** National Oil and Hazardous Substances Contingency Plan. Provides the organizational structure and procedures for preparing for, and responding to, discharges of oil and releases of hazardous substances, pollutants, and contaminants.

**NPL:** National Priorities List. A list, developed by EPA, of uncontrolled hazardous substances release sites that are considered priorities for long-term remedial evaluation and response.

**O&M:** Operations and maintenance. The costs and activities associated with the long-term operation of a remedial technology.

**Public Comment Period** The time allowed for members of an affected community to express views and concerns regarding an action proposed to be taken by EPA, such as a rulemaking, permit, or remedy selection.

**ROD** Record of Decision. A legal document that describes the cleanup action or remedy selected for a site, the basis for the choice of that remedy, and public comments on alternative remedies.

**Remedial Action:** Implementation of plans and specifications, developed as part of the design, to remediate a site.

**RAOs:** Remedial Action Objectives. Objectives of remedial actions that are developed on the basis of contaminated environmental media, contaminants of concern, potential receptors and exposure scenarios, human health and ecological risk assessments, and attainment of regulatory cleanup levels.

**Receptor:** Living organisms (people, animals, or plants) that could be exposed to contamination from a hazardous waste site.

**Screening Criteria:** Conservative EPA standards that define how much of a chemical can be present in surface and subsurface soils, sediment, surface water, or groundwater, before additional investigation and possibly some kind of corrective action is required. **Site:** The facility and any other areas in close proximity to the facility in which a hazardous substance, hazardous waste, hazardous constituent, pollutant, or contaminant from the facility has been deposited, stored, disposed of, or placed, or that has migrated or otherwise come to be located.