

Department of the Navy

## Proposed Remedial Action Plan for Site 5 Soil (OU 4)

**NAS JRB Willow Grove  
Willow Grove, Pennsylvania**



**JUNE 2007**

### **NAVY ANNOUNCES PROPOSED REMEDIAL ACTION PLAN**

The purpose of this **Proposed Plan** is to present the preferred alternative for remedial action at Site 5 Soil – The Former Fire Training Area at the Naval Air Station Joint Reserve Base (NAS JRB) Willow Grove in Horsham Township, Pennsylvania. This Proposed Plan recommends that no further action be taken to address the soil, designated Operable Unit (OU) 4, at the Fire Training Area. This Proposed Plan provides background information and the rationale for choosing the preferred alternative.

This Proposed Plan is issued by the Navy, the lead agency for the **Installation Restoration Program (IRP)** and **Superfund** activities at the NAS JRB Willow Grove facility, and by the U.S. Environmental Protection Agency (EPA). The Navy and EPA, in consultation with the Pennsylvania Department of Environmental Protection (PADEP), a support agency for Superfund activities at NAS JRB Willow Grove, will make a final decision on the remedial approach for Site 5 after reviewing and considering all information submitted during the 45-day **Public Comment Period**. The Navy and EPA may modify the preferred remedy in the Proposed Plan based on new information or public comments. Therefore, the public is

encouraged to review and comment on the remedy presented in this Proposed Plan.

The Navy is issuing this Proposed Plan as part of its public participation responsibilities under Sections 113(k), 117(a), and 121(f) of the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)** and 40 C.F.R. § 300.430(f)(2) of the **National Oil and Hazardous Substances Pollution Contingency Plan (NCP)**.

### **PUBLIC MEETING**

A public meeting to discuss this Proposed Plan will be held on Wednesday, July 11, 2007 at 6:00 PM in the Community Meeting Room at the Horsham Township Public Library, 435 Babylon Road, Willow Grove, Pennsylvania. For directions to the Horsham Township Library, please see the Library's Web site at <http://htl.mclinc.org/index.html> or call them at (215) 443-2609. The meeting date and location will also be published in the *Intelligencer* newspaper.

This Proposed Plan summarizes the findings of the Site 5 – Fire Training Area **Remedial Investigation (RI)** report, outlines the alternatives detailed in the **Engineering Evaluation/Cost Analysis (EE/CA)** in the second phase RI,

summarizes the soil removal action performed in 2006, identifies the cleanup alternative preferred by the Navy and EPA, and explains the reasons for this preference. In addition, this Proposed Plan explains how the public can participate in the decision-making process and provides addresses for the appropriate Navy and EPA contacts.

The Proposed Plan also summarizes information from other documents that are contained in the **Administrative Record** file for this site. The Administrative Record file is available at the Navy's **Information Repository** located at the Horsham Township Public Library, 435 Babylon Road, Horsham, Pennsylvania. The Navy invites the public to review the available materials and to comment on this Proposed Plan during the public comment period.

NOTE: A glossary of relevant technical and regulatory terms is provided at the end of this Proposed Plan. Terms included in the Glossary are initially indicated in **boldface** within the Proposed Plan.

## **SITE BACKGROUND**

NAS JRB Willow Grove is located in Horsham Township, Montgomery County in southeastern Pennsylvania, approximately 20 miles north of the city of Philadelphia (Figure 1). The Base occupies approximately 1,000 acres of flat to slightly rolling terrain and is generally bounded by State Route 611 to the east, State Route 463 to the southwest and Keith Valley Road to the north.

The Former Fire Training Area is located near the southern end of the Navy's property, west of the runways, south of Taxiway Juliet, adjacent to the Marine Corps Reserve Compound, and covers an irregularly shaped area of approximately 1.25 acres (Figure 2). Fire training operations included storage and burning of flammable liquid wastes, including chlorinated

**Volatile Organic Compounds (VOCs)** as well as **Polyaromatic Hydrocarbon (PAH)** wastes generated by the Air Station in the period from 1942 through 1975. Fire training activities resulted in soil contaminated with PAHs and groundwater contaminated by chlorinated VOCs.

Previous work at NAS JRB Willow Grove includes the **Initial Assessment Study (IAS)**, **Site Inspection (SI)**, the first and second phase RI and a soil removal action. The IAS identified 16 sites: seven at the Air Reserve Facility in 1984 and nine at the Naval Air Station in 1986. One additional site was added to the program in 1988. SI work was performed on 12 of the 17 sites, and Remedial Investigation/**Feasibility Study (RI/FS)** activities have subsequently been completed or are underway at eight sites. Phase I RI activities were completed for four sites, including Site 5. The Phase I RI characterized the physical and chemical nature of these four sites and identified data gaps requiring further study. Recommendations for further investigation led to the Phase II activities that were reported in the Phase II RI report and Addenda RI reports. As a result of the RI, the Navy performed a soil removal action to address PAH contaminated soils at Site 5, which was concluded in 2006.

The final Site 5 Phase II RI report for NAS JRB Willow Grove (February 2002) was reviewed by the regulatory community as well as by members of the Willow Grove **Restoration Advisory Board (RAB)**. An Action Memorandum for Site 5 soil removal of PAH-contaminated soil was made available for public review in August 2005. During the NAS JRB Willow Grove RAB meeting held on September 14, 2005, the Navy presented a discussion of the proposed soil removal action for Site 5 soil, and community members present were given a copy of the Action Memorandum, which contained an analysis of removal alternatives and their costs. A copy of the Action

Memorandum for the Site 5 soil removal was also available for public review and comment at the Navy's Information Repository located at the Horsham Township Public Library.

## SITE CHARACTERISTICS

Due to leakage or spillage from solvent waste-containing drums stored and handled in the vicinity of the Former Fire Training Area at Site 5, or from the training exercises themselves, there existed an area of soil contaminated with PAHs and low levels of **dioxins** at the surface (0 to 6 inches) and shallow subsurface (6 inches to approximately 3 feet). The Phase II RI determined that limited migration of PAHs was occurring, as evidenced by low concentrations of PAHs detected in two sediment sample locations receiving drainage from the site. No PAH impact on site groundwater was detected in groundwater samples taken during the Phase II RI.

As a result of these findings and in agreement with PADEP and EPA, the Navy performed a soil removal action. Soil excavation and off-site disposal was selected as the remediation solution to comply with the Department of the Navy's guidance 99-02 regarding land use controls (LUCs). The guidance states that the long-term cost associated with maintaining LUCs should be weighed against the additional cleanup cost required for an unrestricted land use scenario. In this case, since the area of contamination was small and localized, it made economic sense to remediate the soils to the **Preliminary Remediation Goals (PRGs)** level for unrestricted use provided by EPA (Table 2), thereby eliminating the need for long-term LUCs. This approach was also found to be favorable as it insured that the land could be used without restrictions, thereby removing the need for any long-term remedy maintenance or monitoring.

### WHAT IS A HUMAN HEALTH RISK ASSESSMENT AND HOW IS IT CALCULATED?

A human health risk assessment estimates the baseline risk, an estimate of the likelihood of health problems occurring if no cleanup action is taken at a site. To estimate the baseline risk at a site, the Navy performs the following four-step process:

- Step 1: Analyze Contamination
- Step 2: Estimate Exposure
- Step 3: Assess Potential Health Dangers
- Step 4: Characterize Site Risk

In **Step 1**, the Navy looks at the concentrations of contaminants found at a site as well as past scientific studies describing the effects these contaminants have had on people (or animals, when human studies are unavailable). Comparisons between site-specific concentrations and concentrations reported in past studies help the Navy to determine which contaminants are most likely to pose threats to human health.

In **Step 2**, the Navy considers the different ways that people might be exposed to the contaminants identified in Step 1, the concentrations that people might be exposed to, and the potential frequency (how often) and 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 reasonably be expected to occur.

In **Step 3**, the Navy uses the information from Step 2 combined with information on the toxicity of each chemical to assess potential health risks. The Navy considers two types of risk: (1) cancer risk and (2) noncancer risk. The likelihood of any kind of cancer resulting from 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 who could be exposed, one extra cancer may occur as a result of exposure to site contaminants. An extra cancer case means that one more person could get cancer than normally would be expected from all other causes. For noncancer health effects, the Navy calculates a "hazard index." The key concept here is that a "threshold level" (measured usually as a hazard index of 1) exists above which noncancer health effects are predicted.

In **Step 4**, the Navy determines whether site risks are great enough to cause health problems for people at or near the site. The results of the three previous steps are combined, evaluated, and summarized. The Navy adds up the potential risks from the individual contaminants and exposure pathways and calculates a total site risk.

## **Summary of Soil Removal Action**

In January 2006, in accordance with the Action Memorandum, soil was excavated and removed to a depth of approximately 2 feet in the burn ring area (Figure 2). The "burn ring" was a section cut from a cylindrical tank with the intact bottom (tank end cap) buried below the surface of the surrounding soil. The burn ring (tank section) and soil were removed for disposal off site. A total of 286 tons of soil was excavated in the first phase of the soil removal and transported to a permitted facility for disposal. The results of confirmatory soil sampling revealed that several PAH compounds exceeded the  $10^{-5}$  cancer risk level PRG for a lifelong resident, and the total residual risk ( $7.39 \times 10^{-4}$ ) exceeded the acceptable carcinogenic risk range ( $1 \times 10^{-6}$  to  $1 \times 10^{-4}$ )\* for the maximum exposure scenario as required by the NCP at 40 C.F.R. § 300.430(e)(2)(i)(A)(2). Maximum concentrations of PAHs exceeding PRGs after the first phase of soil removal included Benzo(a)anthracene up to 61.0 mg/kg, Benzo(a)pyrene up to 260 mg/kg, Benzo(k)fluoranthene up to 9.0 mg/kg and Dibenzo(a,h)anthracene up to 5.7 mg/kg.

In order to address the unacceptable residual risk, the Navy performed an excavation at the site in August 2006 as the second phase of the removal. A total of 227 tons of soil were excavated and transported to a facility permitted for disposal. The results of the confirmatory soil sampling after the second phase of removal indicated that considerable risk reduction had been achieved.

### **\*NOTE**

The EPA uses an acceptable cancer risk range that corresponds to one additional case per one million ( $1 \times 10^{-6}$ ) to one case per ten thousand ( $1 \times 10^{-4}$ ) persons exposed.

Maximum concentrations of PAHs after the second phase of soil removal included Benzo(a)anthracene at 3.4 mg/kg, Benzo(a)pyrene at 3.4 mg/kg, Benzo(k)fluoranthene at 1.6 mg/kg and Dibenzo(a,h)anthracene at 0.68 mg/kg. Table 3 presents a summary of individual risk components remaining, including total dioxins ( $4.27 \times 10^{-6}$ ) and the primary PAH's of concern (totaled  $8.22 \times 10^{-5}$ ). The total residual risk remaining after the soil removal ( $8.65 \times 10^{-5}$ ) was within the acceptable carcinogenic risk range for the lifetime resident scenario. Subsequently, the excavation site was backfilled with clean soil and restored with seed and mulch.

## **SCOPE AND ROLE**

There are four main IRP sites at NAS JRB Willow Grove; Site 1 - Privet Road Compound Area (OU 1 - Soil and OU 3 - Groundwater), Site 2 - Antenna Field Landfill (OU 5 - Soil and OU 9 -Groundwater), Site 3 - Ninth Street landfill (OU 6 - Soil and OU - 10 Groundwater), and Site 5 - Fire Training Area (OU 2 - Groundwater and OU 4 - Soil). Only one of these site operable units has attained a remedial action decision. The Record of Decision (ROD) for OU 1 (Site 1 soil) was signed in September 2006. This PRAP applies to Site 5 soil only. Site 5 groundwater will be addressed in a separate document.

## **SUMMARY OF SITE RISKS**

As part of the Phase II RI, a human health risk assessment and an ecological risk assessment were performed for Site 5. After the soil removal action, the human health risk was recalculated in a post-removal-action residual risk evaluation based on analytical data obtained from post-excavation soil sampling.

## Summary of Human Health Risk Assessment

A screening-level human health risk assessment was performed as part of the Phase II Remedial Investigation. Surface soil concentrations were compared to residential Region 3 EPA **Risk-Based Concentrations (RBCs)** to be protective of all receptors exposed to surface soil. Subsurface soil concentrations were also compared to surface soil RBCs since, generally, surface soil is expected to be interchangeable with subsurface soils during excavation or future construction activities. Using the RBC screening approach, a chemical was eliminated from consideration as a chemical of potential concern (COPC) at the site if the maximum detected concentration was less than the RBC screening value determined at a cancer risk level of  $1 \times 10^{-6}$  or a non-cancer **Hazard Quotient (HQ)** of 0.1, or if site concentrations were not greater than background (inorganics only). The screening-level human health risk assessment indicated potential risks in surface and subsurface soils above acceptable levels. A summary of COPCs is presented in Tables 1a and 1b.

The potential receptors evaluated in the risk assessment included current occupational workers, current adolescent and adult trespassers, future excavation workers, future recreational children, and future residents. The risk evaluation assumed that potential human receptors would be exposed to COPCs at Site 5 via incidental ingestion, dermal contact, and inhalation of fugitive dusts from soil.

The quantitative risk assessment evaluated each potential receptor under a **reasonable maximum exposure (RME)** scenario and a less conservative **central tendency exposure (CTE)** scenario. RME incorporates input parameters into the exposure scenarios that are protective of 90 percent of the population, and CTE

incorporates input parameters that are representative of an average or median exposure scenario.

Excess lifetime cancer risks were determined for each receptor by multiplying a daily dose by the chemical-specific cancer slope factor. Cancer slope factors have been developed by EPA from epidemiological or animal studies to reflect a conservative "upper bound" of the risk posed by potentially carcinogenic compounds. According to the NCP, the maximum acceptable carcinogen risk range for site-related exposure is  $1 \times 10^{-6}$  to  $1 \times 10^{-4}$ .

Non-carcinogenic risks are presented in the form of HQs, which are determined by dividing the daily dose of a chemical by the published reference doses (RfDs). RfDs have been developed by EPA and represent a level to which an individual may be exposed that is not expected to result in any deleterious effect. An HQ of less than or equal to 1.0 indicates that a receptor's dose of a single contaminant is less than the RfD and that adverse non-carcinogenic effects from that chemical are unlikely. The HQs for each COPC that the receptor is assumed to be exposed to via a specific pathway are summed to yield the **Hazard Index (HI)** for that pathway. A total HI is then calculated for each receptor by summing the pathway-specific HIs.

The results of the risk assessment prior to the removal action showed that the estimated RME incremental lifetime carcinogenic risks (ILCRs) for the occupational worker ( $1 \times 10^{-4}$ ) and adult resident ( $1 \times 10^{-4}$ ) were equal to the upper bound of the acceptable risk range, ILCRs for the child resident ( $3 \times 10^{-4}$ ) and lifelong resident ( $4 \times 10^{-4}$ ) exceeded the acceptable risk range under the RME scenario. Carcinogenic PAHs [primarily benzo(a)pyrene] were the major contributors to the ILCR for all receptors under the RME scenario.

ILCRs for the occupational worker ( $1 \times 10^{-5}$ ), child resident ( $3 \times 10^{-5}$ ), adult resident ( $1 \times 10^{-5}$ ), and lifelong resident ( $4 \times 10^{-5}$ ) under the CTE scenario were within the acceptable risk range of  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$ .

HIs for the occupational worker (0.2) and adult resident (0.3) under the RME scenario were less than 1.0, indicating that adverse non-carcinogenic effects were not anticipated for these receptors under the defined exposure conditions. The HI for the child resident (2) exceeded 1.0, although the HQs for the individual target organs were all less than or equal to 1.0.

HIs for the occupational worker (0.1), child resident (1.0), and adult residents (0.1) under the CTE scenario were less than or equal to 1.0, indicating that adverse non-carcinogenic effects were not anticipated for these receptors under the defined exposure conditions.

PRGs for protection of human health were developed by EPA Region III and the Navy using EPA Region III RBCs and based on site-specific risk for lifetime resident exposure scenarios (Table 2).

As summarized earlier in this proposed plan, in 2006 the Navy performed a two-phased soil removal action for PAH-contaminated soil followed by subsequent confirmatory sampling to ensure all soils containing PAHs in excess of PRGs were removed. The human health risk assessment was recalculated using the confirmatory sampling results from the removal action to demonstrate that human health (cancer) risk had been reduced to acceptable levels.

After accounting for the PAH-contaminated soil removal and residual dioxin risk after resampling, the revised calculated RME cancer

risk for the future adult lifetime resident ( $8.65 \times 10^{-5}$ ) was within the acceptable risk range. Table 3 lists the estimated RME carcinogenic risks for the lifelong resident after PAH-contaminated soils were removed. The revised human health risk assessment found that the site soils no longer pose a threat to current or the most sensitive anticipated future human receptors.

### **Summary of Ecological Risk Assessment**

A screening-level ecological risk assessment (ERA) was performed before the 2006 soil removal to characterize the potential risks from site-related contaminants to ecological receptors that inhabit the installation. All analytes detected in surface soil samples collected during the 1991 Phase I and 1997 Phase II sampling activities were assessed in this investigation. Calcium, magnesium, potassium, and sodium were excluded in the screening process since they are essential nutrients that are toxic only at extremely high concentrations.

Initial screening levels for contaminants that may adversely affect soil organisms primarily consisted of EPA Region 3 Biological Technical Assistance Group (BTAG) screening levels, Oak Ridge National Laboratory surface soil screening levels, and Dutch "B" levels that were used at the time if other preferred ecological risk evaluation values were not available.

Aluminum, antimony, arsenic, cadmium, chromium, iron, lead, manganese, thallium, vanadium, and zinc were retained as inorganic COPCs in soil since their maximum concentrations exceeded screening levels. Several PAHs and acetone were retained as organic COPCs in soils since their maximum concentrations also exceeded screening levels.

## WHAT IS AN ECOLOGICAL RISK ASSESSMENT AND HOW IS IT CALCULATED?

An ecological risk assessment evaluates the potential adverse effects human activities have on the plants and animals that make up ecosystems. The ecological risk assessment process follows a phased approach similar to the human health risk assessment. The risk assessment results are used to help determine what measures, if any, are necessary to protect plants and animals.

Ecological risk assessment includes three steps:

- Step 1: Problem Formulation
- Step 2: Analysis
- Step 3: Risk Characterization

The problem formulation includes:

- Compiling and reviewing existing information on the site habitat, plants, and animals that are present
- Evaluating how plants and animals may be exposed
- Identifying and evaluating area(s) where site-related chemicals may be found
- Evaluating potential movement of chemicals in the environment
- Evaluating routes of exposure (for example, ingestion)
- Identifying receptors (plants and animals that could be exposed)
- Identifying exposure media (soil, air, water)
- Developing how the risk will be measured for all complete pathways (determining the risk where plants and/or animals can be exposed to chemicals)

In **Step 2**, the potential exposures to plants and animals are estimated and the concentrations of chemicals at which an effect may occur are evaluated.

In **Step 3**, all of the information identified in the first two steps is used to estimate the risk to plants and animals. Also included is an evaluation of the uncertainties (potential degree of error) that are associated with the predicted risk evaluation and their effects on the conclusions that have been made.

Step 3 involved the consideration of factors such as background data (mainly for inorganics), toxicological evaluation of COPCs, frequency of detection, and comparisons of COPCs to alternate guidelines.

Almost all of the COPCs were eliminated as COCs in the risk evaluation phase of the assessment for one or more reasons, including

low frequency of detection, maximum concentrations comparable to or below background (primarily inorganics), or alternative guidelines and spatial analysis of detection. Only COPCs that were determined to be present in soils at high enough concentrations and with sufficiently high frequencies of detection to pose potential risks to terrestrial receptors were selected as COCs. Table 4 shows the results of the selection of ecological COCs in surface soil.

Based on the following set of criteria, no further action to protect the environment or potential ecological receptors is deemed necessary:

- Terrestrial habitat is very limited. The site is surrounded by several acres of hard-packed gravel parking area, asphalt roadways, and the taxiway associated with the adjacent 8,000 foot military runway.
- Only limited receptors are potentially present. Wildlife species potentially present at the site consist of those that have become accustomed to human disturbance. These could include rabbits, raccoons and smaller mammals such as mice, reptiles, amphibians and various birds. Although a woodchuck hole was noted in 1999 near the burn ring, few receptors of any kind have been recorded living in the area. The presence of high fences and wide expanses of pavement and hard-pack discourage most species from settling in the area.
- The limited contamination found in Site 5 soil (mainly PAHs and dioxins) was largely removed in the 2006 soil removal action, resulting in clean-up to human health unrestricted future use standards.

Consequently, the potential for ecological impacts from site-related contaminants is negligible.

## **COMMUNITY PARTICIPATION**

Community acceptance of the preferred alternative will be evaluated at the conclusion of the public comment period and will be described in the Record of Decision.

**The Navy solicits written comments from the community on the Proposed Plan for Site 5 – Fire Training Area Soil (OU 4).** The Navy has set a public comment period from June 15, 2007 through July 30, 2007 to encourage public participation in the decision process for Site 5 – Fire Training Area soil.

The Navy will hold a public meeting during the comment period. At the public meeting, the Navy, with input from EPA, will present the Proposed Plan, and solicit both oral and written questions. **The public meeting is scheduled for 6:00 p.m. on Wednesday, July 11, 2007 and will be held in the Community Meeting Room of the Horsham Township Public Library.** The Horsham Township Public Library is located at 435 Babylon Road, Willow Grove, Pennsylvania.

Comments received during the public comment period will be summarized and responses will be provided in the Responsiveness Summary section of the **Record of Decision (ROD)**. The ROD is the document that will present the Navy's decision for Site 5 soils.

To send written comments, or to obtain further information, contact:

Ms. Marge Johnston,  
CNRMA Pennsylvania Site Compliance Director  
NAS JRB Willow Grove  
Bldg. #78, Environmental Department  
Willow Grove, PA 19090  
Phone (215) 443-6937

For further information, contact:

Curtis Frye, Remedial Project Manager  
Base Realignment and Closure  
Program Management Office Northeast  
4911 South Broad Street  
Philadelphia, PA 19112-1303  
Phone: (215) 897-4914

Lisa Cunningham, Remedial Project Manager  
Environmental Protection Agency, Region III  
1650 Arch Street (Mail Code: 3HS11)  
Philadelphia, PA 19103  
Phone: (215) 814- 3363  
Fax: (215) 814- 3051  
Email: Cunningham.Lisa@epa.gov

**Please note that all comments must be submitted and postmarked on or before July 30, 2007.**

## TERMS USED IN THE PROPOSED PLAN

**Administrative Record:** An official compilation of site-related documents, data, reports, and other information that are considered important to the status of and decisions made relative to a Superfund site. The public has access to this material.

**Carcinogenic:** A type of risk resulting from exposure to chemicals that may cause cancer in one or more organs.

**Comment Period:** A time for the public to review and comment on various documents and actions taken, either by the Navy, EPA, or PADEP. A minimum 30-day comment period is held to allow community members to review the Administrative Record and review and comment on the Proposed Plan.

**Comprehensive Environmental Response, Compensation and Liability Act (CERCLA):** A federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act (SARA). The Act created a trust fund, known as the Superfund, to investigate and clean up abandoned or uncontrolled hazardous substance facilities.

**Central Tendency Exposure (CTE):** Human health risk assessment calculation approach using average, 50<sup>th</sup> percentile, receptor risk behavior patterns to estimate a realistic expectation of receptor risk.

**Dioxins:** A class of toxic chemical compounds including dioxins and furans that are characterized by multiple ring structures and chlorinated components. Formation of dioxins and furans result from the burning of chlorinated compounds with hydrocarbons.

**Engineering Evaluation/Cost Analysis (EE/CA):** This is an analysis prepared to identify and evaluate a limited range of remedial alternatives considered for immediate action.

**Feasibility Study (FS):** Report identifying and evaluating alternatives for addressing the contamination present at a site or group of sites.

**Hazard Index (HI):** The sum of chemical-specific Hazard Quotients. An HI greater than 1 is considered to indicate the likelihood that adverse non-cancer health effects may occur.

**Hazard Quotient (HQ):** A comparison of the level of exposure to a substance in contact with the body per unit time to a chemical-specific Reference Dose to evaluate potential non-cancer health effects. Exceedence of an HQ of 1 is associated with an increased level of concern about adverse non-cancer health effects.

**Information Repository:** A file containing information, technical reports, and reference documents regarding an NPL site. This file is usually maintained in a place with easy public access, such as a library.

**Initial Assessment Study (IAS):** Preliminary investigation usually consisting of review of available data and information on a site, interviews, and a non-sampling site visit to observe areas of potential waste disposal and migration pathways.

**Installation Restoration Program (IRP):** Navy program to restore old waste sites for reuse and to protect human health and the environment.

**Noncarcinogenic:** A type of risk resulting from the exposure to chemicals that may cause systemic human health effects.

**National Oil and Hazardous Substances Pollution Contingency Plan (NCP):** The purpose of the NCP is to provide the organizational structure and procedures for preparing and responding to discharges of oil and releases of hazardous substances, pollutants, or contaminants.

**Polyaromatic Hydrocarbons (PAHs):** Class of polycyclic aromatic organic compounds derived from petroleum. These compounds are typically found in lubricants and diesel or jet fuels.

**Preliminary Remediation Goals (PRGs):** Set of remediation cleanup goals for individual contaminants agreed upon by the Navy, EPA and PADEP, usually based on various risk-based concentrations and/or site-specific risk assessment.

**Proposed Plan:** A public participation requirement of CERCLA and the NCP in which the lead agency summarizes the preferred cleanup strategy and rationale. This agency also reviews the alternatives presented in the detailed analysis of the feasibility study, if prepared. The Proposed Plan may be prepared either as a fact sheet or as a separate document. In either case, it must actively solicit public comment on all alternatives under consideration.

**Reasonable Maximum Exposure (RME):** Human health risk assessment calculation approach using 90<sup>th</sup> percentile receptor risk behavior patterns to estimate a conservative expectation of receptor risk.

**Record of Decision (ROD):** An official public document that explains which cleanup alternative(s) will be used at NPL sites. The ROD is based on information and technical analysis generated during the RI/FS and consideration of public comments and

community concerns. The ROD is a legal document and explains the remedy selection process and is issued by the Navy following the public comment period.

**Remedial Investigation (RI):** Study that determines the nature and extent of contamination at a site.

**Restoration Advisory Board (RAB):** An advisory group for the restoration process with members from the public, the Navy, and the regulatory agencies. The purpose of the RAB is to gain effective input from stakeholders on cleanup activities and increase installation responsiveness to the community's environmental restoration concerns.

**Risk Based Concentrations (RBC):** Risk-based concentrations established by EPA Region III and associated with specific levels of risk. These concentrations have been developed for both industrial and residential scenarios and incorporate both the ingestion and inhalation pathways.

**Site Inspection (SI):** Sampling investigation with the goal of identifying potential sources of contamination, types of contaminants, and potential migration of contaminants. The SI is conducted prior to the RI.

**Superfund:** The program operated under the legislative authority of CERCLA and the Superfund Amendment and Reauthorization Act (SARA) that funds and carries out EPA solid waste, emergency, and long-term removal and remedial activities. These activities include investigating sites for inclusion on the NPL, determining their priority, and conducting and/or supervising the cleanup and other remedial actions.

**Volatile Organic Compounds (VOCs):** A class of carbon-based chemicals commonly referred to as solvents that are characterized by their ability to evaporate readily at common ambient conditions of temperature and atmospheric pressure.

**FOR FURTHER INFORMATION**

**MAILING LIST**

If you did not receive this Proposed Plan in the mail and wish to be placed on the mailing list for future information pertaining to this site, please fill out, detach, and mail this form to:

Commanding Officer  
NAS JRB Willow Grove  
Bldg 78, Environmental Division  
Attn: Marge Johnston  
Willow Grove, PA 19090

Name: \_\_\_\_\_

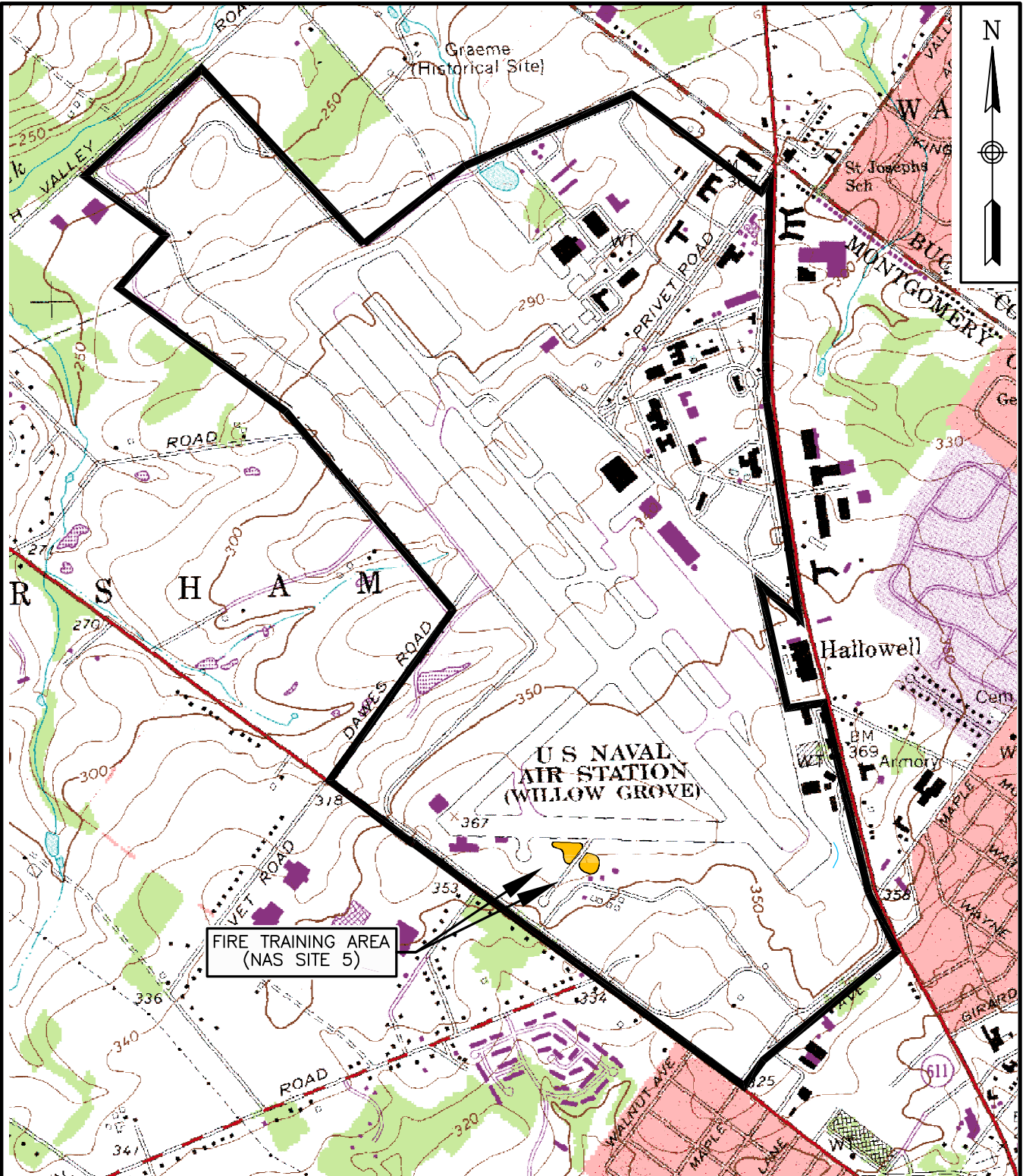
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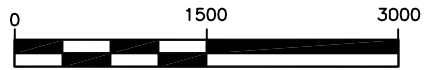
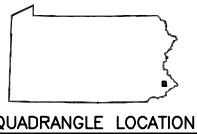
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## FIGURES



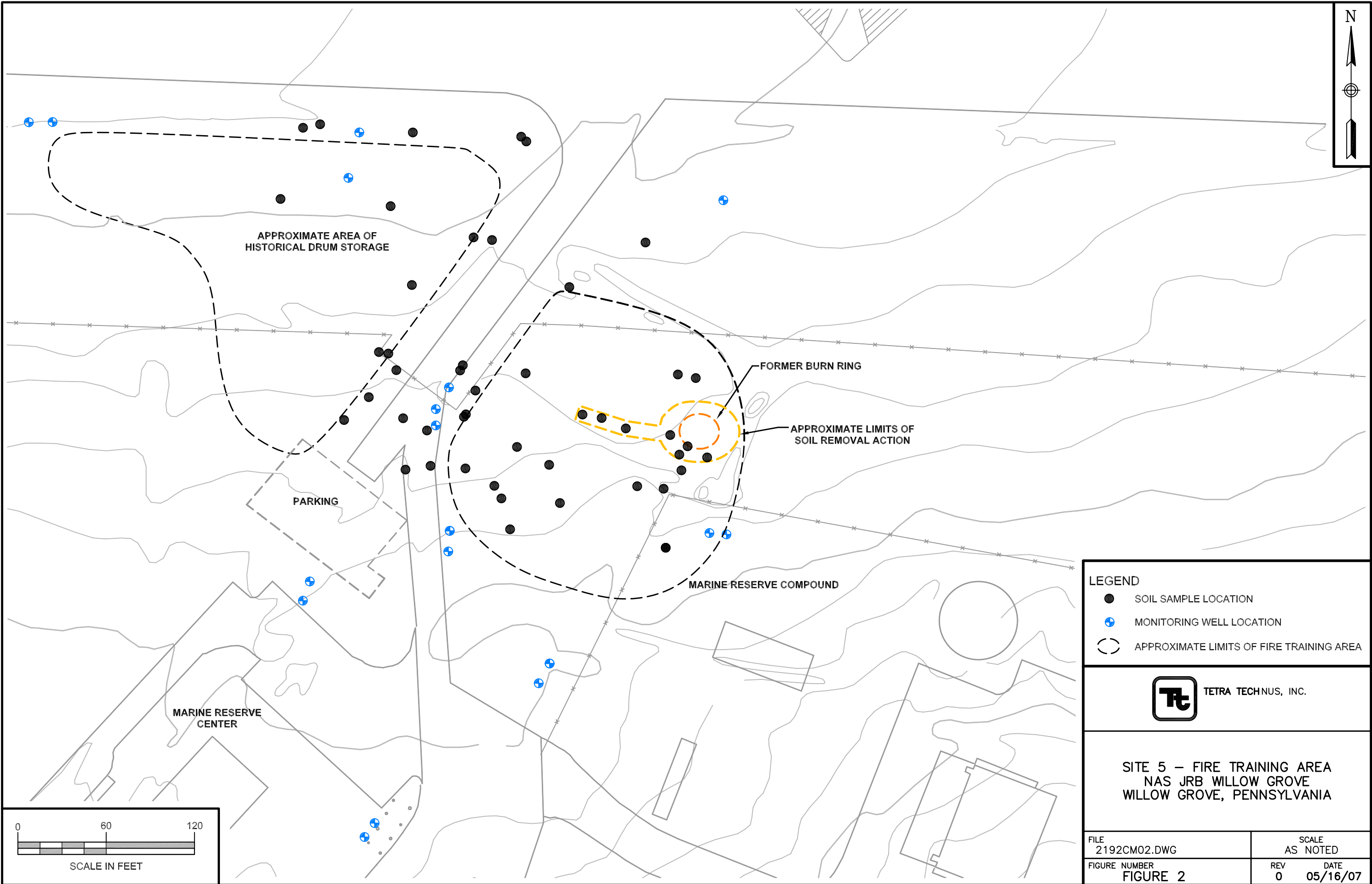
BASE MAP IS A PORTION OF THE AMBLER, PA U.S.G.S. 7.5 MINUTE QUADRANGLE MAP, DATED 1963, PHOTOREVISED IN 1983.



TETRA TECHNUS, INC.

LOCATION MAP  
 NAS JRB WILLOW GROVE  
 WILLOW GROVE, PENNSYLVANIA

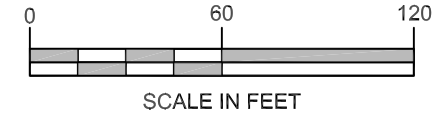
SCALE AS NOTED	
FILE 2192CM01.DWG	
REV 0	DATE 05/16/07
FIGURE NUMBER FIGURE 1	



LEGEND	
	SOIL SAMPLE LOCATION
	MONITORING WELL LOCATION
	APPROXIMATE LIMITS OF FIRE TRAINING AREA



**SITE 5 – FIRE TRAINING AREA  
NAS JRB WILLOW GROVE  
WILLOW GROVE, PENNSYLVANIA**



FILE 2192CM02.DWG	SCALE AS NOTED
FIGURE NUMBER FIGURE 2	REV      DATE 0      05/16/07

## TABLES

**Table 1a**  
**Summary of Chemicals of Potential Concern for Surface Soil**  
**Site 5 - NAS JRB Willow Grove**  
**Page 1 of 2**

Substance	Freq. of Detection	Range of Positive Detection		EPC	Units
		Min.	Max.		
2,3,7,8-TCDD Equivalents	2/2	27.9	- 143	1.4E-04	mg/kg
Benzo(a)anthracene	28/29	22	- 82000	51.3	mg/kg
Benzo(a)pyrene	28/29	37 J	- 68000 J	14.1	mg/kg
Benzo(b)fluoranthene	28/29	60	- 77000 J	17.4	mg/kg
Benzo(k)fluoranthene	27/29	20	- 36000	8.74	mg/kg
Dibenzo(a,h)anthracene	27/29	5.4 J	- 15000 J	2.53	mg/kg
Dibenzofuran	13/14	71 J	- 34000 J	26.7	mg/kg
Indeno(1,2,3-cd)pyrene	28/29	22	- 48000	8.46	mg/kg
Naphthalene	17/29	5.5	- 22000 J	9.56	mg/kg
Chromium	14/14	9.8	- 56.5	24.6	mg/kg
Iron	14/14	6230	- 21600	15983	mg/kg
Lead	14/14	10.1	- 412	95.9	mg/kg
Vanadium	14/14	12.9	- 36.3	26.5	mg/kg

J = Estimated value

**Table 1b**  
**Summary of Chemicals of Potential Concern for Subsurface Soil**  
**Site 5 - NAS JRB Willow Grove**  
**Page 2 of 2**

Substance	Freq. of Detection	Range of Positive Detection		EPC	Units
		Min.	Max.		
Benzo(a)anthracene	5/16	55 J	- 13000	9.45	mg/kg
Benzo(a)pyrene	5/16	45 J	- 11000	8.05	mg/kg
Benzo(b)fluoranthene	5/16	64 J	- 12000	8.92	mg/kg
Dibenzo(a,h)anthracene	3/16	250 J	- 1400 J	0.639	mg/kg
Indeno(1,2,3-cd)pyrene	4/16	170 J	- 5700 J	4.27	mg/kg
Chromium	10/10	6.1	- 23.7	18	mg/kg
Iron	10/10	9320	- 27900	21508	mg/kg
Manganese	10/10	134	- 1550	786	mg/kg
Vanadium	10/10	12.4	- 36.8	28	mg/kg

J = Estimated value

**TABLE 2  
PRELIMINARY REMEDIATION GOALS  
SITE 5 - FIRE TRAINING AREA  
NASJRB WILLOW GROVE, PENNSYLVANIA**

Chemical	REMEDIATION GOALS		
	LIFELONG RESIDENT		
	$10^{-6}$	$10^{-5}$	$10^{-4}$
2,3,7,8-TCDD Equivalents	0.000004	0.00004	0.0004
Benzo(a)anthracene	0.62	6.2	62
Benzo(a)pyrene	0.062	0.62	6.2
Benzo(b)fluoranthene	0.62	6.2	62
Benzo(k)fluoranthene	6.2	62	620
Dibenzo(a,h)anthracene	0.062	0.62	6.2
Indeno(1,2,3-cd)pyrene	0.62	6.2	62

Notes:

1. All concentrations are in mg/kg.
2. The  $1 \times 10^{-5}$  human health risk level represents the mid point in the preliminary remediation goals range. Actual remedial action soil removal endpoints were determined to ensure that the sum of individual risks in soil remaining after removal would be within the acceptable cancer risk range.

**Table 3**  
**Residual Risk Analysis Including Dioxin Data**  
**NAS JRB Willow Grove - Site 5 - After Soil Removal**

	10-5 Cancer Risk Level	PRG for resident mg/kg	Maximum Confirmatory mg/kg	Residual Carcinogenic Risk
2,3,7,8-TCDD Equivalentents	1.E-05	4.00E-05	1.71E-05	4.27E-06
Benzo(a)anthracene	1.E-05	6.2	3.4	5.48E-06
Benzo(a)pyrene	1.E-05	0.62	3.4	5.48E-05
Benzo(b)fluoranthene	1.E-05	6.2	4.5	7.26E-06
Benzo(k)fluoranthene	1.E-05	62	1.6	2.58E-07
Dibenzo(a,h)anthracene	1.E-05	0.62	0.68	1.10E-05
Indeno(1,2,3-cd)pyrene	1.E-05	6.2	2.1	3.39E-06
			<b>Total</b>	<b>8.65E-05</b>

**TABLE 4**  
**SELECTION OF ECOLOGICAL RISK ASSESSMENT**  
**CHEMICALS OF POTENTIAL CONCERN**  
**SITE 5 – FIRE TRAINING AREA SOIL (OU 4)**  
**NAS JRB WILLOW GROVE**

Contaminant	Maximum Concentration	95% UCL	Mean Concentration	Initial Screening Level	BTAG Screening Level	ORNL <sup>a,b</sup>	Dutch B <sup>c</sup>	CCME <sup>d</sup>	Mean/Max. Background	Retained as Final COC?
<b>Metals (mg/kg)</b>										
Aluminum	12400.00	10600	9840	1.0	1.0	600 <sup>a</sup>	NA	NA	11300/15000	No
Antimony	9.20	9.89	4.82	5	0.48	5 <sup>b</sup>	NA	NA	ND	No
Arsenic	10.5	6.04	4.87	10	328	60 <sup>a</sup> /10 <sup>b</sup>	30	19	6.6/10.6	No
Cadmium	4.70	1.73	1.17	3	2.5	20 <sup>a</sup> /4 <sup>b</sup>	5.0	3.8	ND	No
Chromium	56.50	23.8	18.6	10	0.0075	0.4 <sup>a</sup> /1.0 <sup>b</sup>	250	64	15.3/20.8	No
Iron	21600.00	16700	14400	12	12	200 <sup>a</sup>	NA	NA	14800/17600	No
Lead	412.00	217	90	50	0.01	500 <sup>a</sup>	150	70	30.6/64.7	Yes
Manganese	873.00	582	494	330	330	100 <sup>a</sup> /500 <sup>b</sup>	NA	NA	642/1190	No
Thallium	0.39	0.26	0.202	0.001	0.001	1.0 <sup>b</sup>	NA	NA	0.226/0.34	No
Vanadium	36.3	27.7	24.3	20	0.5	20 <sup>a</sup> /2 <sup>b</sup>	NA	130	24.9/28.2	No
Zinc	137.00	87.6	59.6	50	10	100 <sup>a</sup> /50 <sup>b</sup>	200	NA	90.1/597	No
<b>SVOCs (ug/kg)</b>										
2-methylnaphthalene	16000.0	1270	1170	NA	NA	NA	NA	NA	ND	Yes
Acenaphthene	36000.0	4370	2560	100	100	20,000 <sup>b</sup>	NA	NA	178/64	Yes
Acenaphthylene	2300.0	643	356	NA	NA	NA	NA	NA	177/62	No
Anthracene	54000.0	11800	4290	2050	100	NA	10,000	NA	154/160	Yes
Benzo(a)anthracene	48000.0	45400	711	2050	100	NA	NA	NA	306/940	Yes
Benzo(a)pyrene	36000.0	26700	5760	2050	100	NA	1,000	750	394/1100	Yes
Benzo(b)fluoranthene	35000.0	39100	7260	2050	100	NA	NA	NA	507/1500	Yes
Benzo(g,h,i)perylene	13000.0	5910	2290	2050	100	NA	NA	NA	225/490	Yes
Benzo(k)fluoranthene	29000.0	22800	4630	2050	100	NA	NA	NA	370/920	Yes
Carbazole	19000.0	3200	1780	NA	NA	NA	NA	NA	213/310	No
Chrysene	45000.0	37500	7290	2050	100	NA	NA	NA	420/1200	Yes
Dibenz(a,h)anthracene	4800.0	1710	843	2050	100	NA	NA	NA	161/160	Yes
Dibenzofuran	34000.0	3120	2380	NA	NA	NA	NA	NA	172/120	No
Fluoranthene	140000.0	151000	17600	2050	100	NA	10,000	NA	902/2600	Yes
Fluorene	56000.0	5560	3890	2050	100	30,000 <sup>a</sup>	400,000	NA	184/160	Yes

**TABLE 4**  
**SELECTION OF ECOLOGICAL RISK ASSESSMENT**  
**CHEMICALS OF POTENTIAL CONCERN**  
**SITE 5 – FIRE TRAINING AREA SOIL (OU 4)**  
**NAS JRB WILLOW GROVE**

Contaminant	Maximum Concentration	95% UCL	Mean Concentration	Initial Screening Level	BTAG Screening Level	ORNL <sup>a,b</sup>	Dutch B <sup>c</sup>	CCME <sup>d</sup>	Mean/Max. Background	Retained as Final COC?
Indeno(1,2,3-cd)pyrene	18000.0	9700	3180	2050	100	NA	NA	NA	251/640	Yes
Naphthalene	22000.0	1610	1540	2050	100	NA	5,000	600	ND	Yes
Phenanthrene	200000.0	106000	18100	2050	100	NA	5,000	NA	667/1700	Yes
Pyrene	120000.0	135000	15800	2050	100	NA	10,000	NA	723/2100	Yes
Total PAHs	928,000	5,410,000	107,000	4,000	NA	NA	20,000	NA	4,450/14,100	Yes
<b>VOCs (ug/kg)</b>										
Acetone	17.0	16.8	7.7	NA	NA	NA	NA	NA	ND	No

a. Oak Ridge National Laboratory (ORNL) screening levels; a = lowest value for earthworms and soil micro-organisms (Efroymson et al, 1997a).

b. ORNL screening levels; b = soil phytotoxicity (Efroymson et al, 1997b).

c. Dutch "B" soil value: moderate soil contamination that requires further study (Beyer, 1990).

d. Canadian Council of Ministers of the Environment Soil Quality Guidelines (CCME, 1997).

NA = not available or not applicable.

ND = not detected.