**DEPARTMENT OF THE ARMY**
**UNITED STATES ARMY INSTALLATION MANAGEMENT AGENCY**
**NORTHEAST REGIONAL OFFICE GARRISON**
**PICATINNY ARSENAL, NEW JERSEY 07806-5000**

August 8, 2006

Environmental Affairs Directorate

SUBJECT: Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)/Interagency Agreement (IAG) Administrative Docket No. II-CERCLA-FFA-001-04: Submittal of ***Draft Third Five-year Review***: Review is ER,A-eligible

Mr. Gregory Zalaskus
New Jersey Department of Environmental Protection
Division of Responsible Party Site Remediation
Bureau of Case Management,
401 East State Street, Floor 5
P.O. Box 028
Trenton, New Jersey 08625-0028

Mr. William Roach
U.S. Environmental Protection Agency
Region 2
290 Broadway, 18th Floor
New York, NY 10007-1866

Dear Sirs:

Enclosed for your review are copies[1] of the **Third Five Year Review** related to the Installation Restoration Program at Picatinny. This document developed by Shaw Environmental was based on a draft format provided by the EPA. The original draft was modified by comments and information from the Army including this office, Army Environmental Center and Corps of Engineers as well as subsequent comments from the EPA.

Please notify me immediately if your review or your management determines that it will not concur on the protectiveness statements. Otherwise we plan to public notice this draft this month as guidance suggests public noticing as soon as possible.

This document will be on the agenda at the September-planned Restoration Advisory Board; we ask for your participation during that discussion.

[1] PDF and WORD files are provided to addresses and cc's; hard copies are provided only to EPA.

As you recall, the first two five-year reviews were completed and public noticed by the EPA. This five-year review is statutory based on the time the last review that was completed; 5 years have not passes since the first final Record of Decision was implemented.

If you have any questions, please do not hesitate to call me at 973-724-6748.

Sincerely,

TED GABEL
Project Manager for Environmental Restoration

Enclosures

Copies Furnished:

NJ Department of Environmental Protection, Jim Kealy
NJ Department of Environmental Protection, Joe Marchesani
U.S. Army Environmental Center, Paul Schaeffer
Subsurface Solutions, Barbara Dolce
Shaw Environmental Inc., Mr. Doug Schicho
U.S. Army Corps of Engineers, Ms. Nancy Flaherty
ARCADIS, Mr. Tim Llewellyn
USFWS, Clifford Day

# Third Five-Year Review Report
## Picatinny Arsenal
## Morris County, New Jersey

**Prepared by:**
**Shaw Environmental Inc. for**
**Picatinny Arsenal**
**Morris County, New Jersey**
**June 8, 2006**

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## List of Acronyms and Abbreviations

1,1-DCE..... 1,1-Dichloroethene
4,4'-DDE..... 4,4'- Dichlorodiphenyldichloroethylene
4,4'-DDT..... 4,4'-Dichlorodiphenyltrichloroethane
AOC..... Area of Concern
ARAR..... Applicable or Relevant and Appropriate Requirement
BERA..... Baseline Ecological Risk Assessment
BSB..... Bear Swamp Brook
CEA..... Classification Exception Area
CERCLA..... Comprehensive Environmental Response, Compensation, and Liability Act
cis-1,2-DCE..... cis-1,2- Dichloroethene
COC..... Contaminant of Concern
CY..... cubic yards
DBA..... Drum Burial Area
DOD..... Department of Defense
DSERTS..... Defense Site Environmental Restoration Tracking System
EPA..... (United States) Environmental Protection Agency
GPB..... Green Pond Brook
IAP..... Installation Action Plan
LOC..... Level of Concern
LTMP..... Long-Term Monitoring Plan
LUC..... Land Use Control
LUCIP..... Land Use Control Implementation Plan
MCL..... Maximum Cleanup Level
mg/kg..... milligrams per kilogram
NJDEP..... New Jersey Department of Environmental Protection
NJPDES..... New Jersey Pollutant Discharge Elimination System
NPL..... National Priorities List
PAH..... Poly Aromatic Hydrocarbon
PBC..... Performance-Based Contract
PCB..... Polychlorinated Biphenyl
PCE..... Tetrachloroethene (also referred to as perchloroethene)
ppb..... parts per billion
PRB..... Permeable Reactive Barrier
RAO..... Remedial Action Objective
RC..... Response Complete
RCRA..... Resource Conservation and Recovery Act
RFA..... RCRA Facility Assessment
RG..... Remedial Goal
RI/FS..... Remedial Investigation/Feasibility Study
ROD..... Record of Decision
SARA..... Superfund Amendments and Reauthorization Act
Shaw..... Shaw Environmental, Inc.
TCE..... Trichloroethene
TPH..... Total Petroleum Hydrocarbons

## List of Acronyms and Abbreviations (continued)

USATHAMA ..... United States Army Toxic and Hazardous Materials Agency
UST ..... Underground Storage Tank
UXO ..... Unexploded Ordnance
VOC ..... Volatile Organic Compound

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## Executive Summary

The U.S. Army, in conjunction with the U.S. Environmental Protection Agency, has prepared the third five-year review for Picatinny Arsenal, located in Rockaway Township, Morris County, in north central New Jersey. In September 2001, the United States Environmental Protection Agency conducted the second five-year review for Picatinny Arsenal.

As of the date of this Report, five Records of Decision (RODs) have been signed at Picatinny Arsenal covering eight of the approximate 160 sites at Picatinny Arsenal. They include:

- Area D Groundwater
- Site 20/24 – Pyrotechnic Testing Range/Sanitary Landfill
- Site 23 – Post Farm Landfill
- Green Pond Brook and Bear Swamp Brook
- Site 34 – Burning Grounds

Of these five sites, the final remedy has only been instituted at Site 20/24. The selected remedy for Site 20/24 included the following components:

- Containment of contaminated soil using a vegetated soil cover;
- Excavation of soils that lie outside of the capped area and that contain contaminants above remedial goals and placement of those soils within the capped area; and,
- Enforcement of access restrictions designed to prevent disturbance of the soil cover and to prevent any non-industrial use of the site.

Area D Groundwater is operating under an interim pump and treat remedy. The final remedy, which is currently being reviewed by Picatinny's PBC contractor, is planned to be initiated by next year. The remedies for the other three sites have not been implemented yet. RODs for the approximate 139 remaining sites are pending. Of the remaining sites, Proposed Plans have been completed for five sites; RODs for four of these five sites are pending and the results of those four studies are presented in this five-year review.

There are no recommendations or follow-up actions directly associated with this review. Picatinny Arsenal has various ongoing remedial investigations, studies, designs and actions. Within this report, there are a number of "recommendations" made in relationship to specific sites and areas. The purpose of these recommendations is to identify and encourage progress for the various ongoing activities needed at the facility.

Existing site use restricts human exposure - so that human exposure is currently under control. While some of the individual groundwater plumes may not be fully under control, these plumes are sufficiently characterized to not directly threaten drinking-water supplies and are not expected to do so over the next five years. In addition, unacceptable exposure to contaminated soil and sediment is not expected to occur due to restricted site use and site access. Consequently, for this facility, human health is considered adequately protected. The selected remedies also protect the environment. There does not appear to be any unacceptable environmental exposures at the 139 non-ROD sites under current site use.

# Five-Year Review Summary Form

| SITE IDENTIFICATION | | |
|---|---|---|
| **Site name *(from WasteLAN)*:** Picatinny Arsenal | | |
| **EPA ID *(from WasteLAN)*:** NJ3210020704 | | |
| **Region:** 2 | **State:** NJ | **City/County:** Dover/Morris |

| SITE STATUS | |
|---|---|
| **NPL status:** X Final ☐ Deleted ☐ Other (specify) _____ | |
| **Remediation status** (choose all that apply): X Under Construction X Constructed X Operating | |
| **Multiple OUs?*** X YES ☐ NO | **Construction completion date:** N/A |
| **Are portions of this site in use?** X YES ☐ NO ☐ N/A | |

| REVIEW STATUS | |
|---|---|
| **Lead agency:** ☐ EPA ☐ State ☐ Tribe X Other Federal Agency: Department of Army | |
| **Author name:** Ted Gabel | |
| **Author title:** Project Manager | **Author affiliation:** Department of Defense |
| **Review period:**** 09/26/2001 to 08/30/2006 | |
| **Date(s) of site inspection:** | |
| **Type of review:** X Post-SARA ☐ Pre-SARA ☐ NPL-Removal only<br>☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead<br>☐ Policy ☐ Regional Discretion | |
| **Review number:** ☐ 1 (first) ☐ 2 (second) X 3 (third) ☐ Other (specify) _____ | |
| **Triggering action:**<br>☐ Actual RA Onsite Construction at OU #____ ☐ Actual RA Start at OU#____<br>☐ Construction Completion X Previous Five-Year Review Report<br>☐ Other (specify) | |
| **Triggering action date *(from WasteLAN)*:** 9/26/2001 (Previous Five-Year Review) | |
| **Does the report include recommendation(s) and follow-up action(s)?** X yes ☐ no<br>**Is human exposure under control?** X yes ☐ no<br>**Is contaminated groundwater under control?** X yes ☐ no<br>**Is the remedy protective of the environment?** yes<br>**Acres of land in use or suitable for reuse:** 4,600 acres in use or suitable for reuse. | |

***OU refers to operable unit.**

## 1.0 INTRODUCTION

The review was prepared by Shaw Environmental, Inc. (Shaw) using information provided by the Army through the Picatinny Arsenal Project Manager - Ted Gabel. This review was conducted consistent with Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, 42 U.S.C. Section 9601, et seq., and 40 C.F.R. 300.430(f)(4)(ii) and in accordance with the Comprehensive Five-Year Review Guidance, Office of Solid Waste and Emergency Response Directive 9355.7-03B-P (June 2001). The purpose of a five-year review is to assure that implemented remedial actions protect public health and the environment and that they function as intended by the decision documents. This review will become a part of the Administrative Record for Picatinny Arsenal.

This is the third five-year review for the Picatinny Arsenal site. In September 2001, the United States Environmental Protection Agency (EPA) conducted the second five-year review, which included a review of documents, data, and information. The 2001 five-year review, as amended in December 2002, determined that the selected remedies should protect public health and the environment.

Picatinny Arsenal is currently being addressed under three Phases covering approximately 160 areas of concern (AOCs).

## 2.0 SITE CHRONOLOGY

**Chronology of Events**

| Event | Date |
|---|---|
| Installation Assessment completed by the United States Army Toxic and Hazardous Materials Agency (USATHAMA) | 1976, 1981 |
| Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) completed by the New Jersey Department of Environmental Protection (NJDEP) | 1987 |
| Site Investigation completed by Army | 1989 |
| Area D Groundwater Interim Action Record of Decision (ROD) signed | 1989 |
| Picatinny Arsenal placed on National Priorities List (NPL) | 1990 |
| Federal Facility Agreement signed between the Department of Army-Picatinny Arsenal and EPA | 1991 |
| Remedial Investigation (RI) Concept Plan completed | 1991 |
| Lagoons and dry well associated with Building 24 removed under RCRA | 1991 |
| Area D Groundwater Interim Action Remedy commenced | 1992 |

| Event | Date |
|---|---|
| Building 95 Impoundments removed | 1992 |
| Post Farm Landfill Removal Action | 1993 |
| Lead Removal Action – Site 35/Building 1363A and Site 167/Building 1373 | 1995 |
| Wharton Waterline Extension | 1996 |
| First Five-Year Review signed | 1996 |
| Guncotton Line Removal Action – Site 16 | 2000 |
| Second Five-Year Review signed | 2001 |
| Tetryl Removal Action – Site 17 | 2002 |
| Site 20/24 (Pyrotechnic Testing Range/Sanitary Landfill) ROD signed | 2002 |
| Site 20/24 Remedial Action Construction commenced | 2002 |
| Clarification of the Statement of Protectiveness Amending the Second Five-Year Review Report signed | 2002 |
| Polychlorinated Biphenyl (PCB) Removal Action at Site 122/ Building 60 | 2003 |
| Bear Swamp Brook (BSB) Sedimentation Basin Removal Action | 2004 |
| Area D Groundwater Final ROD signed | 2004 |
| Site 23 (Post Farm Landfill) ROD signed | 2004 |
| Site 20/24 Remedial Action Construction completed | 2004 |
| Lead Sites Removal Action | 2004 |
| Green Pond Brook (GPB) and BSB ROD signed | 2005 |
| Site 34 (Burning Ground) ROD signed | 2005 |
| Facility-Wide Removal of Sumps and Dry Wells | 2005 |

# 3.0 FACILITY-WIDE BACKGROUND

## 3.1 Physical Characteristics

Picatinny Arsenal is located approximately four miles north of the City of Dover in Rockaway Township, Morris County, in north central New Jersey. Major roadways adjacent to the Installation include State Route 15 which skirts the southern boundary and Interstate 80 which is located a mile to the southeast of the main gate.

Picatinny Arsenal consists of 6,491 acres of improved and unimproved land area. In general, the areas that surround the base are suburban and summer-vacation areas because of the numerous small lakes and many mountains. Some of the nearby populous areas are Morristown, Morris Plains, Parsippany, Troy Hills, Randolph Township, and Sparta Township.

## 3.2 Geology/Hydrology

Picatinny Arsenal is located in the New Jersey Highlands physiographic province and locally the area is characterized by broad, rounded, or flat-topped northeast-southwest trending ridges, and deep generally narrow valleys that are controlled by northeast-trending folds and faults of the underlying bedrock.

The valley in which Picatinny Arsenal resides has a broad and relatively flat floor, which slopes gently to the southwest. The valley varies from 1,000 to 4,000 feet in width and is bounded to the northwest by Green Pond and Copperas Mountains and to the southeast by an unnamed ridge. Unconsolidated sediments that overlie bedrock formations were deposited during the Wisconsin glacial event. Stratified drift, deposited by retreating glaciers fills the valley underlying Picatinny Arsenal. The drift is thickest along the axis of the valley and thins rapidly off the axis; pinching out against the valley slopes. Maximum drift thickness, located along the valley axis, varies from about 300 feet at the southern boundary to 50 feet at Picatinny Lake, located about 2½ miles to the northeast.

Water in the region enters the ground from precipitation, flows through various combinations of bedrock, till, and stratified drift, and then discharges into streams and ponds. In general, four aquifers have been identified in the valley: (1) an unconfined glacial (water table) aquifer, (2) an upper semi-confined glacial aquifers, (3) a lower semi-confined aquifer, and (4) a confined bedrock aquifer. The unconfined aquifer is separated from the upper semi-confined aquifer by lake-bottom fine sand and silt. The lake-bottom find sand and silt layer is a leaky confining unit, and probably discontinuous near the valley wall.

## 3.3 Land and Resource Use

Picatinny Arsenal currently has 73 military, 2,950 Department of Defense (DOD) civilian, 916 contractor employees working at the facility. Picatinny Arsenal has the responsibility for research and development of armament items for the U.S. Army. Research and development operations are generally located on the valley floor and to a lesser extent on the valley walls and ridges.

Picatinny Arsenal is located within the Appalachian Oak Forest Region which at upper elevations is characterized by birch-hemlock-maple-oak forest type. This cover type persists mainly in the relatively undisturbed ridge crests, slopes, and moist ravines of Picatinny Arsenal. Bottomland areas prevalent in the valley floor consist of poorly-drained silty clays and peats

which primarily support red-maple swamp forest. Much of the poorly-drained swamp area has been drained and filled to support base operations. Nevertheless, sufficient ecological habitat remains at Picatinny Arsenal to support a robust wildlife community.

### 3.4 History of Contamination

Picatinny Arsenal is owned and operated by the U.S. Army and was a major source of munitions for World War I, World War II, the Korean War, and the Vietnam Conflict. During those periods, Picatinny Arsenal was involved in the production of explosives, rocket and munition propellants, pyrotechnic signals and flares, and metal components. It was during this period that the production processes in effect at the time lead to contaminant releases to the environment. Currently, the primary mission at Picatinny Arsenal is research, development, and engineering of munitions and weapons.

### 3.5 Initial Response

Over the years, environmental investigations into the operations and waste management for production activities at Picatinny Arsenal have indicated the potential for contamination at a number of sites. Between 1976 and 1981, the United States Army Toxic and Hazardous Materials Agency (USATHAMA) conducted studies into possible contamination by chemical, biological, and radiological material at the facility. Based on this study, USATHAMA concluded that large sections of Picatinny Arsenal were contaminated or potentially contaminated by manufacturing wastes and unexploded ordnance (UXO). In 1987, the New Jersey Department of Environmental Protection (NJDEP) completed a Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) for Picatinny Arsenal. The RFA identified 55 solid waste management units, many of which had been previously identified in the USATHAMA study. Subsequently, the Army conducted a Site Investigation in 1989 in order to assess the presence and potential for contaminant migration in groundwater.

Picatinny Arsenal was added to the National Priorities List (NPL) in March 1990 with a Hazard Ranking Score of 42.92. A Remedial Investigation/Feasibility Study (RI/FS) Concept Plan was prepared by Argonne National Laboratory in 1991 which identified 156 potentially-contaminated sites at Picatinny Arsenal. This concept plan was developed based on data gathered during previous investigations and a review of production records at Picatinny Arsenal.

The investigative approach suggested by the RI Concept Plan, initiated by the Army and approved by the regulatory agencies in 1990, was to break the defined RI Concept Plan sites into Areas (Areas A – P). These sixteen (16) RI Concept-defined areas were prioritized and divided into three phases of investigation called Phase I, II, and III. The investigation of the Burning Ground (PICA 002/RI-Concept Site 34 or Area A), however, was initiated before the approval and normalization of this approach.

This original approach was modified by the implementation of the DOD's Relative Risk Funding Policy. The goal of the relative risk policy is to attempt to address the worst sites first from a national or DOD perspective. According to the guidance, the investigative and remedial actions for sites with the highest relative-risk will be funded first with few exceptions.

At the August 2000, April 2001 and 2002 Installation Action Plan (IAP) meetings, it was agreed that sites be considered response complete (RC) based on the following:

1. Active Range, not ER-A eligible previously identified in the Defense Site Environmental Restoration Tracking System (DSERTS) database.
2. Active Range, not ER-A eligible, not previously identified in the DSERTS database.
3. Previously identified as RC based on fact assumed to be "No Further Action" now identified in Institutional Control Proposed Plan.
4. Combined with other sites such as PICA-120 now tied to PICA-076 and agreed to at meeting.
5. PICA 78 will be considered RC and any action will be incorporated into the other two (2) sites in the Building 31/Building 33 grouping. The RC is being done for administrative purposes.
6. Site investigation identified no AOCs as discussed in the 1998 IAP and beyond.
7. PICA 63 (Site 20) was combined with PICA 66 (Site 24) for administrative purposes.

As a consequence of the agreements made at a series of meetings that occurred in calendar year 2003, Picatinny Arsenal RI Concept Sites were consolidated into PICA sites. The consolidation was agreed to by the regulators and United States Army Environmental Center program managers. The consolidation was based on geographic attributes, similar schedules, and similar remedies.

## 4.0 REMEDIAL ACTIONS, TECHNICAL ASSESSMENT, ISSUES, RECOMMENDATIONS AND FOLLOW-UP ACTIONS, AND PROTECTIVE STATEMENTS ON A ROD BASIS

As of the date of this Report, five Records of Decision (RODs) have been signed at Picatinny Arsenal covering eight of the approximate 160 sites at Picatinny Arsenal. They include:

- Area D Groundwater
- Site 20/24 – Pyrotechnic Testing Range/Sanitary Landfill
- Site 23 – Post Farm Landfill
- Green Pond Brook (GPB) and Bear Swamp Brook (BSB)
- Site 34 – Burning Grounds

Individual site locations are indicated in **Figure 1**. RODs for the approximate 139 remaining sites are pending. Consolidation of the sites in RODs is most likely to occur. Of the remaining sites, Proposed Plans have been completed for five sites; RODs for four of these five sites are pending and the results of those four studies will be presented in this five-year review as appropriate.

### Area D Groundwater:

**History of Contamination and Initial Response**

Area D groundwater contamination is located in the southern portion of Picatinny Arsenal. Building 24, the source of Area D groundwater contamination, was a plating facility in operation from 1960 to 1981. Washing and degreasing of metal parts prior to plating generated waste

trichloroethene (TCE) which reportedly flowed to a dry well located adjacent to Building 24 via an overflow line. It is felt that this dry well was the primary release mechanism of TCE to groundwater. In addition, two infiltration lagoons were associated with Building 24 operations. Treated waste water from Building 24 was diverted to these lagoons. The lagoons and dry well were removed and closed under RCRA in 1991.

Between 1981 and 1985, 21 wells were installed in the vicinity of Building 24. These wells were sampled periodically between 1981 and 1985 by various agencies and analyzed for volatile organic compounds (VOCs), phenol, metals, anions, and cyanide. Results of this sampling indicated that TCE migrated to groundwater forming a plume which discharges to GPB 1,600 feet away. Approximately 1,100 feet at its widest point, the plume is primarily located in the unconfined aquifer.

**Basis for Taking Action for Interim Action Remedy**

Contaminants

Contaminants of concern (COCs), as identified in the Interim Action ROD Area D include:

Groundwater

Benzene
Chloroform
1,1-Dichloroethene (1,1-DCE)
cis-1,2-Dichloroethene (cis-1,2-DCE)
Methylene Chloride
Tetrachloroethene (PCE)
Toluene
TCE
1,1-Dichloroethane
Freon 113
Phenols, total
Cadmium
Chromium
Lead
Selenium
Arsenic
Copper
Zinc
Iron

The Interim Action ROD for Area D Groundwater was signed on September 28, 1990. The selected interim remedy for Area D consisted of pump and treat remedy to prevent the discharge of TCE contaminated groundwater to GPB. The remedy includes the following components:

- Extraction of contaminated groundwater;
- Pretreatment system for the removal of metals and solids;
- Air stripping for removal of VOCs; and,
- Discharge of treated water to GPB.

### Remedy Implementation and Remedial Systems

Operation of the interim action pump and treat remedy began operation in 1992 and has continued to the present. The cost to construct the remedy was $5.9 million. **Figure 2** shows the location of the extraction wells and the plume. The system has extracted and treated approximately 900,000,000 gallons of groundwater and has removed 50 gallons of TCE. Since the last review period, a sixth withdrawal well, WW-4A was added in 2002 at the request of EPA as an outcome of the second five-year review. This well was meant to increase pumping rates and improve the effectiveness of the capture system. During this period, Shaw has been the remedial contractor responsible for operation of the remedy. The interim action is considered ended because the Area D Groundwater ROD was signed by EPA on September 22, 2004. The pump and treat hydraulic barrier will be replaced with a permeable reactive barrier (PRB) under the final ROD. Upon installation of the PRB, the pump and treat system will be mothballed for several months. Once the final remedy is deemed to be operating in accordance with the remedial action objectives (RAOs), the interim remedy will be abandoned and dismantled.

The annual cost for operation of the remedial system for each of the past five years is as follows:

| OPERATING PERIOD | COST |
|---|---|
| September 2001 to August 2002 | $ 280K |
| September 2002 to August 2003 | $ 342K |
| September 2003 to August 2004 | $ 310K |
| September 2004 to August 2005 | $ 113K |
| September 2005 to August 2006 | $ 72K |

### Systems Operations/Operation and Maintenance

The existing remedial facility requires ongoing operation and maintenance. The facility is made up of three interconnected operating systems. The groundwater extraction system, which includes six withdrawal wells capable of producing a permitted maximum of 50 gallons per minute, transports contaminated groundwater to the treatment facility. The **Andco Heavy Metals Oxidation/Removal System** oxidizes the heavy metals via hydrogen peroxide injection. Solids removal is accomplished through clarification and filtration. pH is controlled through the addition of sodium hydroxide. Due to the low influent metal concentrations and consistent pH values over the years, the use of chemical addition has been reduced to a minimum. The **Calgon Air Stripping/Carbon Adsorption System** strips filtered water of volatiles, whereby off-gases and stripped water feed into carbon adsorption units to complete the treatment. Effluent waters are discharged to GPB under a New Jersey Pollutant Discharge Elimination System (NJPDES) permit-equivalent.

Under the terms of the NJPDES permit-equivalent, the treatment system influent and effluent are sampled on a monthly basis for VOCs, phenols, hexane extractable material, chemical oxygen demand, total metals and total suspended solids/total dissolved solids. During this five-year period, the hexane extractable material parameter replaced total petroleum hydrocarbons (TPH) as a target analyte. This change was made as a result of the banned use of Freon 113, which is needed to perform the TPH analysis. All compounds sampled during this review period, with the exception of phenols, were within permitted limits. Phenols exceeded permit limits once in 2003 and twice in 2005. Investigations into these exceedances determined that the analytical

laboratory was not properly decontaminating their equipment. The laboratory was required to tighten its quality control on equipment decontamination procedures and modify its glassware cleaning procedures to remedy the situation.

Chronic Toxicity is tested quarterly. All test results during this review period were within permitted limits.

The facility's air permit requires sampling of the vapor phase carbon effluent exhaust on a quarterly basis. All test results during this review period were within permitted limits.

**Data Review**

Groundwater Monitoring

As part of the operation of the pump and treat system, a groundwater monitoring program has been in place since 1992. Groundwater samples are collected on a semiannual basis. Groundwater samples are collected from 18 monitoring wells and six withdrawal wells and analyzed for VOCs in the first half of the calendar year and VOCs and metals in the second half of the calendar year.

The plume continues to be the highest in the clay lenses associated with the subsurface geology at monitoring wells 92-3 and 92-12 (**Figure 2**). These wells displayed an average TCE concentration during this period of 4,667 parts per billion (ppb) and 1,040 ppb, respectively. The TCE concentrations in these wells have decreased significantly since they were sampled in the past (**Figures 3 and 4**). The initial TCE concentration detected at 92-3 in 1994 was 14,000 ppb, and the initial TCE concentration reported at 92-12 in 1996 was 5,490 ppb.

Monitoring well 41-9 is the only well located along GPB containing levels of TCE in excess of Applicable or Relevant and Appropriate Requirements (ARARs). The average TCE concentration in this well during the review period was 600 ppb (**Figure 5**). The elevated levels of TCE in 41-9 confirm the results of the groundwater model that groundwater discharges upward into GPB.

**Technical Assessment**

*Question A: Is the remedy functioning as intended by the decision documents?*

Yes.

The Interim RAO established in the ROD was to "present deterioration of GPB water quality by minimizing movement of contaminated groundwater into the brook." Based on the results of the most recent semiannual surface water samples collected from GPB downgradient of the VOC plume, there are VOCs discharging from the groundwater plume into the brook; however, the TCE levels in the brook are not above surface water ARARs.

Most of Picatinny Arsenal is restricted to industrial use, which means no other uses such as residential or agricultural are permitted. Picatinny Arsenal has many safeguards in place to ensure protection of the environment and the health and safety of Arsenal personnel and the public. These safeguards include institutional controls such as a soil clearance policy, UXO policies, master plan regulations, and an integrated Picatinny Arsenal Geographic Information System database to incorporate these policies and regulations into a comprehensive site activity clearing mechanism. As at all military facilities, base access regulations and an Army Safety Program are in place and enforced. These institutional controls are used in layers and/or in series

to enhance their overall protectiveness. In addition, a Classification Exception Area (CEA) has been established for the protection of the groundwater. A CEA establishes a Well Restriction Area (WRA) at the Installation. A WRA is an institutional restriction by which potable use of groundwater can be affected. It does not prohibit installation of wells in the area but will identify any specific requirements for the installation and construction of these wells through the well permit program administered by the Bureau of Water Allocation. The authority for regulating and enforcing the institutional controls at Picatinny Arsenal lies with the Installation Commander.

*Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?*

Yes, all the above factors are still valid.

There have been no changes in the physical conditions of the site or the land-use at Picatinny Arsenal since the last five-year review that would affect the routes of exposure and the protectiveness of the interim-action remedy.

The groundwater standards identified in the ROD are based on Federal Drinking Water Standards Maximum Cleanup Levels (MCLs) and New Jersey Ground Water Quality Standards MCLs. **Table 1** lists the changes to the MCLs for the Area D groundwater COCs since the ROD. Due to the lack of site-specific risk-based cleanup levels, changes in toxicity information are not expected to impact the protectiveness of the remedy. Therefore, the ARARs presented in the ROD continue to be protective of human health. No new location-specific or action-specific ARARs have been identified that are not being met by the interim remedial action.

*Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

No.

Reduced extraction rates have caused the effectiveness of the hydraulic barrier to decrease. Despite this decrease, elevated TCE levels have not been detected in GPB.

**Technical Assessment Summary**

According to the semiannual data reviewed and discussions with the systems operator, the interim remedy is functioning as intended by the interim action ROD. Ongoing remedial operation, maintenance and monitoring activities include monthly analysis of influent and effluent concentrations, semiannual monitoring of groundwater concentrations, and system adjustments to maintain system operations. There have been no changes in the physical conditions or land use of the site that would affect the protectiveness of the remedy. ARARs cited in the ROD remain protective of human health and, due to the lack of use of site-specific risk-based cleanup levels, changes in toxicity information are not expected to impact the protectiveness of the selected remedy.

Optimization of the interim remedy is being reviewed by Picatinny Arsenal's Performance-Based Contract (PBC) contractor. Any optimization of the final remedy as a result of the interim remedy data will be incorporated into the design plan for the final remedy.

**Recommendations**

Perform remedial design of the final remedy and initiate the final remedial action.

**Protectiveness Statement**

The remedy for Area D Groundwater is protective of the environment and human health. Currently, there is no unacceptable exposure to human health or environmental receptors from source area contaminants and none expected over the next five years.

**Basis for Taking Action – Final Remedy**

Contaminants

COCs identified in the final ROD for Area D include the following:

Groundwater

TCE
PCE
cis-1,2-DCE
1,1-DCE
Vinyl Chloride

During the COC selection process performed as part of the Area D Groundwater FS, metals were eliminated as COCs for the final remedy because the inorganic contaminants did not exhibit a distribution pattern indicative of a contaminant plume.

Human Health Risk Assessment

Risk to human health was based on exposure to contaminated groundwater if a potable well were installed, exposure to surface water and sediment in GPB if swimming took place, and exposure to soil vapor in buildings located above contaminated groundwater. Exposure to groundwater at Area D is associated with significant human health risks due to exceedance of EPA's risk-management criteria (probability in the range of one in one million to one in ten thousand of an individual contracting cancer or a Hazard Index exceeding one for non-cancer endpoints due exclusively to exposure to site contaminants). VOC levels in groundwater resulted in carcinogenic risk exceedances while metal levels corresponded to noncarcinogenic risk exceedances. Exposure to surface water and sediment in GPB and soil vapor in buildings located above contaminated groundwater resulted in risk levels within EPA's risk management criteria. Hazard indices for all the indoor air survey buildings were less than 1.

Ecological Risk Assessment

Risk to ecological receptors due to Area D groundwater potentially occurs where the groundwater plume discharges GPB. An investigation of GPB included the collection of surface water and sediment samples. The low level of VOCs found in the reach of stream where the plume discharges were not found to be of concern for ecological receptors because they are not persistent in surface water and unlikely to bioaccumulate.

**Remedy Selection**

The final ROD for Area D Groundwater was signed on September 22, 2004. The selected remedy for Area D Groundwater includes the following components:

- Installation of a passive-treatment wall consisting of zero-valent iron near the discharge point of the plume;
- Monitored natural attenuation of the TCE plume expected to take 170 years;

- Implementation of land use controls (LUCs) to prevent unacceptable exposure to impacted water; and,
- Testing vapor in buildings.

**Remedy Implementation and Remedial Systems**

Not applicable; the system has not been designed or implemented.

**Systems Operations/Operation and Maintenance**

Not applicable; the system has not been designed or implemented.

**Data Review**

Groundwater Monitoring

See the Data Review under the interim remedy for a summary of the groundwater data since the last review period.

**Technical Assessment**

*Question A: Is the remedy functioning as intended by the decision documents?*

Not applicable; the system has not been designed or implemented.

*Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?*

Yes.

There have been no changes in the physical conditions of the site or the land use at Picatinny Arsenal since EPA's last five-year review that would affect the routes of exposure and the protectiveness of the remedy.

The groundwater standards identified in the ROD are based on Federal Drinking Water Standards MCLs and New Jersey Ground Water Quality Standards MCLs. Due to the lack of site-specific risk-based cleanup levels, changes in toxicity information are not expected to impact the protectiveness of the remedy. Therefore, the ARARs presented in the ROD continue to be protective of human health. No new location-specific or action-specific ARARs have been identified that are not being met by the interim remedial action.

*Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

No.

**Technical Assessment Summary**

According to the semiannual data reviewed, the remedy will function as intended by the ROD. Some delays in the implementation of the remedial measures have resulted from the Army's shift to a PBC for remedial actions at the Installation. There have been no changes in the physical conditions or land use of the site that would affect the protectiveness of the remedy. ARARs cited in the ROD remain protective of human health and, due to the lack of use of site-specific risk-based cleanup levels, changes in toxicity information are not expected to impact the protectiveness of the selected remedy.

Several soil-gas investigations have been completed for Area D. Most of the soil-gas samples have been located along the centerline of the groundwater plume. An indoor investigation was conducted in January 1997 to determine if the air quality in buildings over the groundwater plume was being impacted by the underlying plume. A total of 13 buildings including residences, offices, various shops, and the facility-wide cafeteria were part of the survey. The results of the indoor air investigation were used to calculate chemical-specific and cumulative risks to the individuals who occupy and utilize the surveyed buildings. The risk assessment results are summarized in the Human Health Risk Assessment section above. A round of vapor testing is included as part of the final remedy to ensure that this exposure pathway does not present an unacceptable risk to human health in the future.

**Recommendations**

Perform remedial design of the final remedy and initiate the final remedial action.

**Protectiveness Statement**

When implemented, the final remedy for Area D groundwater will be protective of human health and the environment. Currently, there is no unacceptable exposure to human or environmental receptors from source area contaminants and none are expected over the next five years.

## Site 20/24 – Pyrotechnic Testing Range/Sanitary Landfill:

**History of Contamination and Initial Response**

Site 20/24, Pyrotechnic Testing Range/Sanitary Landfill, is located in Area B near the southern boundary of Picatinny Arsenal. In 1940, Site 20/24 was an undeveloped wetland area. Historical aerial photographs indicate the slow expansion of the site from two small clearings to the current site of approximately 28 acres. It should be noted that Site 20 is a sub-area of Site 24. Approximately 7 acres of Site 20/24 have been used for miscellaneous waste and debris disposal that began in the 1960s and continued until 1972. Site 20/24 has also been used for pyrotechnic testing. These activities led to contaminated soil and groundwater at the site. The Site 20/24 ROD addresses only contaminated soil. Contaminated groundwater at this site is addressed in the Area B Groundwater ROD.

**Basis for Taking Action**

Surface soil, subsurface soil, surface water, sediment, and groundwater samples have been collected at Site 20/24 as part of previous investigations. The field investigations identified contaminants, including metals, polychlorinated biphenyls (PCBs), VOCs, poly aromatic hydrocarbons (PAHs), and pesticides in the soil, surface water, and sediment. However, only PCBs, lead, and 4,4'-Dichlorodiphenyltrichloroethane (4,4'-DDT) contributed significantly to site risk and were identified as COCs. VOCs detected in surface water and sediment are related to contaminated groundwater which is being addressed in the Area B Groundwater operable unit.

Contaminants

COCs identified in the ROD for Site 20/24 include:

Soil

PCBs
Lead
4,4'-DDT

Human Health Risk Assessment

Risk to human health at Site 20/24 was based on a commercial/industrial maximum exposure frequency of 250 days per year. Exposure to surface soil resulted in significant human health risks, due to exceedances of EPA's risk management criteria. Carcinogenic risks due to exposure to PCBs resulted in a risk level within EPA's risk management criteria while noncarcinogenic risks due to exposure to PCBs resulted in an exceedance of EPA's risk management criteria.

Ecological Risk Assessment

The ecological assessments for Site 20/24 indicated no impacts to the plant community, toxicity to earthworms, or impact to small mammal populations. Risk modeling indicated a potential risk to the veery (a small bird) and woodcock from 4,4'-DDT and lead in soil (primarily from incidental soil ingestion and from the ingestion of invertebrates which have bioaccumulated these constituents) and to a minor extent from exposure to aluminum and PCBs.

In general, Site 20/24 appears to be a greater potential risk to terrestrial species than aquatic species. There are more potential risks to the veery and woodcock, resulting from chemicals than there are to the great blue heron, mink, and fish from chemicals in surface water and sediment.

**Remedy Selection**

The ROD for Site 20/24 was signed on June 4, 2002. The selected remedy for Site 20/24 included the following components:

- Containment of soil with PCBs, lead and 4,4'-DDT using a vegetated soil cover;
- Excavation of soils that lie outside of the area to be capped and the contain contaminants above remedial goals (RGs) and placement of those soils within the area proposed for capping; and,
- Enforcement of access restrictions designed to prevent disturbance of the soil cover and to prevent any non-industrial use of the site.

**Remedy Implementation and Remedial Systems**

160 cubic yards (CY) of soil containing PCB concentrations of 350 mg/kg or greater were excavated and disposed off-site. Approximately 1,312 CY of soil were excavated outside the capped area and relocated to inside the area of the cap. Construction of the cap featured an armored and vegetated soil cover that encompassed an area measuring approximately 300 feet by 400 feet. This capped area covered the soil that contained PCBs at concentrations greater than 2.0 milligrams per kilogram (mg/kg) but less than 350 mg/kg, lead at or greater than 580 mg/kg, and 4,4-DDT at or greater than 5.1 mg/kg. In addition, land use and access restrictions were initiated upon completion of the construction. The cap covers an area of 2.42 acres. **Figure 6** shows the area of the remedial system (i.e., soil cap).

Due to the identification of UXO, the delineation of the PCB contamination at the southeastern end of the site could not be completed. The accepted remedy for this area was to construct a small soil cover over the area in lieu of continuing excavation to remove lead and PCBs. The Army and regulatory agencies agreed to this remedy in the interest of safety for the construction

crew. The additional cap is one-fifth of an acre (7,604 square feet). Following the construction, the site vegetation was restored.

The cost for the construction of the remedial system, wetland mitigation and operation and maintenance totaled $953,316.

**Systems Operations/Operation and Maintenance**

Systems Operations/Operation and Maintenance is not applicable as it is not an active remedy. However, LUC maintenance is applicable and Picatinny Arsenal is in compliance with the Land Use Control Implementation Plan (LUCIP) that was part of the ROD for this site.

Quarterly site inspections and maintenance were initiated in December 2004 and will continue as required. The contractor inspects for damage to the cap through erosion, burrowing by animals, trees or other deep rooted plants growing on the cap, the presence of posted access restriction signs that warn against disturbance of the cap, evidence of trespassing, and the general condition of the overall site and vegetation. Any damages to the cap, vegetation or posted signs are repaired as they are discovered. Certification includes land-use notification and funding assessments.

**Data Review**

Not applicable; data collection is not part of the remedy.

**Technical Assessment**

*Question A: Is the remedy functioning as intended by the decision documents?*

Yes.

The remedy is functioning as intended by the ROD. The remedy prevents exposure to contaminated media by human and ecological receptors. It also protects the adjacent uncontaminated media by minimizing the migration of contaminants.

*Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?*

Yes.

The RG for PCBs calculated for Site 20/24 is the same as the NJDEP Non-Residential Direct Contact Soil Clean-up Criterion of 2.0 mg/kg. RGs for lead and 4,4-DDT were calculated based on the results of the baseline ecological risk assessment. Exposure assumptions and toxicity data used in the calculations remain valid.

*Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

No.

**Technical Assessment Summary**

Based on the results of the quarterly inspections, the remedy is functioning as intended by the ROD. Maintenance and monitoring activities are scheduled to continue. There have been no changes in the physical conditions or land use of the site that would affect the protectiveness of the remedy. Site-specific RGs remain protective of human health and ecological receptors.

**Recommendations**

Reduce the frequency of site inspections and maintenance from quarterly to annually.

**Protectiveness Statement**

The remedy for Site 20/24, the Pyrotechnic Testing Range/Sanitary Landfill, protects human health and the environment. There are no exposure pathways that could result in unacceptable risks and none are expected over the next five years as long as the engineered, access and institutional controls selected and implemented continue to be properly operated, monitored and maintained.

## Site 23 – Post Farm Landfill:

**History of Contamination and Initial Response**

Site 23, the Post Farm Landfill, occupies 10.3 acres in Area C near the southern corner of Picatinny Arsenal along the top of a ridge that forms the eastern boundary of Picatinny Arsenal. Prior to 1940, Site 23 was a farm. From the 1940s to the 1970s, industrial wastes generated at Picatinny Arsenal were disposed at Site 23 in an area known as the drum burial area (DBA). Drummed wastes disposed at the DBA included caustic paint stripper, used hydraulic oils, wastewater from oil reservoirs, and tank-cleaning wastes. In addition, fly ash and solid waste were disposed at the site. In 1993, a removal action took place that removed nearly 400 55-gallon drums (41 of which contained wastes), 38 CY of soil, and 30 CY of scrap steel. After the removal action was completed, the DBA was leveled and covered with clean fill to a thickness of 6 – 8 inches.

**Basis for Taking Action**

The RI for Site 23, which took place subsequent to the removal action, identified the presence of contaminants in surface soil, subsurface soil, and groundwater. PAHs and metals were detected in surface and subsurface soil at levels that exceeded the New Jersey non-residential soil cleanup criteria. However, these contaminants were not detected at a sufficient frequency or concentration to be categorized as COCs. Sampling of sediment and surface water from a downgradient spring and seep indicated metals slightly exceeding comparison criteria in sediment and surface water but were not categorized as COCs. Groundwater sampling detected VOCs, dioxins/furans, metals, and radiologicals above maximum contaminant levels and several were categorized as COCs.

Contaminants

COCs as identified in the ROD for Site 23 include the following:

Groundwater

Aluminum
Cadmium
Iron
Lead
Radium
Silver
1,2-Dichloroethene
2,3,7,8-Tetrachlorodibenzo-p-dioxin

Gross Alpha
Gross Beta

Human Health Risk Assessment

A human health risk assessment was conducted at Site 23 for exposure to surface soil for current outdoor maintenance workers, future commercial/industrial workers, and future construction workers. Exposure to Site 23 soil for these receptors did not result in exceedances of EPA's risk management criteria. A site-specific risk assessment was not conducted for exposure to Site 23 groundwater. However, since several compounds in groundwater exceeded maximum contaminant levels, long-term exposure through drinking, showering, etcetera, could result in excess human health risk.

Ecological Risk Assessment

Site 23 consists of a cleared borrow pit area and a remediated area with a soil cover. It was determined that conducting an ecological risk assessment at the site was unnecessary because the soil cover prevented most future exposures and contaminant migration. In addition, contaminants in surface soil were considered minor and the site represents a small disturbed area in an area otherwise characterized as having suitable habitat for ecological receptors (i.e., forest).

**Remedy Selection**

The ROD for Site 23 was signed on signed on December 20, 2004. The selected remedy for Area 23 included the following components:

- Long-term groundwater monitoring using the existing groundwater monitoring wells;
- Long-term monitoring of surface water and sediment from the off-post spring and seep;
- Collection of one round of surface soil samples from locations that have previously exhibited exceedances of the Levels of Concern (LOCs) to ensure isolated areas of contamination are not more widespread. If unexpected levels of contamination are found in the surface soil samples, additional topsoil may be place at the site; and,
- Implementation of LUCs.

**Remedial Implementation and Remedial System**

Not applicable, remedy has not been implemented.

**System Operations and Maintenance**

Not applicable, no active remedy.

**Data Review**

Groundwater Monitoring

The Long-Term Monitoring Plan (LTMP) for the remedy has not been approved or initiated.

**Technical Assessment**

*Question A: Is the remedy functioning as intended by the decision documents?*

Not applicable, remedy has not been implemented.

*Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?*

Not applicable, remedy has not been implemented.

*Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

No.

**Technical Assessment Summary**

Not applicable, remedy has not been implemented. The Army has been sampling groundwater periodically at the site since 2003 and intends to use these analytical results along with analytical data gathered as part of the LTMP to evaluate the remedy following approval of the Remedial Design Plan.

**Recommendations**

Approve and implement the Remedial Design Plan, including the LUCIP and LTMP.

**Protectiveness Statement**

When implemented, the remedy for Site 23, the Post Farm Landfill, will be protective of human health and the environment. Currently, there is no unacceptable exposure to human or environmental receptors from source area contaminants and none are expected over the next five years.

## Green Pond Brook and Bear Swamp Brook:

**History of Contamination and Initial Response**

GPB and BSB represent the waterways which drain virtually all of Picatinny Arsenal. Numerous stormwater drainage structures exist on Picatinny Arsenal, many of which flow directly into GPB/BSB, including drop inlets with underground conduits, open channels located along road shoulders, and overland flow channels. GPB has received waste from historical operations at Picatinny Arsenal, including sewage and industrial wastewater discharges, stormwater runoff, and discharges from groundwater plumes.

BSB and the upper reaches of GPB in the study area flow through the industrial portion of Picatinny Arsenal. There are numerous buildings that border both brooks. In the past, many of these buildings had drains that discharged directly into the brooks. Currently, waste discharges to BSB no longer occur. The primary sources of contamination in GPB/BSB are past industrial activities at adjacent sites and stormwater drainage. Past operational activities include production of explosives, rockets, munitions, propellants, pyrotechnic signals and flares, fuses, and metal components. In 2003 – 2004, a removal action took place at a sedimentation basin located on BSB. Approximately 632 tons of stabilized sediment was disposed off-site as hazardous waste and 386 tons of excavated soil was disposed as solid waste. Following the removal action, the sedimentation basin was restored to its design function.

**Basis for Taking Action**

The RI of GPB/BSB was conducted under several stages of the Phase I and Phase II RIs between 1993 and 1998. 136 sediment samples and 101 surface water samples were collected in GPB and BSB. These sampling results indicated that past activities at Picatinny Arsenal had

contaminated GPB and BSB. Due to the large area represented by GPB and BSB, they were broken into 4 study areas as follows (**Figure 7**):

- Region 1, GPB and Burnt Meadow Brook above Picatinny Lake;
- Region 2, GPB below Picatinny Lake to the confluence with BSB;
- Region 3, BSB from Area H to the confluence with GPB; and,
- Region 4, GPB from the confluence with BSB to the southern boundary of Picatinny Arsenal.

Contaminants

COCs as identified in the ROD for GPB/BSB per region are as follows:

Region 1 – no COCs were identified in this region. Consequently, it will not be further discussed in this review.

Region 2 Sediment

Benz(a)anthracene
Fluoranthene
Phenanthrene
Pyrene
PCBs
4,4'-Dichlorodiphenyldichloroethane
4,4'-Dichlorodiphenyldichloroethylene (4,4'-DDE)
4,4'-DDT
Copper

Region 3 Sediment

Cadmium
Chromium
Copper
Benz(a)anthracene
Fluoranthene
Phenanthrene
Pyrene
PCBs
4,4'-DDE
4,4'-DDT
Mercury

Region 4 Sediment

Copper

Human Health Risk Assessment

The selected human receptor populations that were used to evaluate exposures to surface water, sediment, and fish in GPB/BSB were trespass swimmers and consumers of recreationally caught fish. It should be noted that fishing and swimming are unlikely and not allowed in the study area. Risk to trespass swimmers was calculated to be within EPA's risk management criteria

while risk to consumers of recreationally caught fish was calculated to be marginally within EPA's risk management criteria.

Ecological Risk Assessment

A baseline ecological risk assessment (BERA) was conducted for GPB and BSB in which constituents measured in surface water and sediment were compared to screening levels that may pose a risk to aquatic life. The ecological receptors selected for the risk assessment were benthic macroinvertebrates and fish. In the wildlife modeling, potential risks to piscivorous, avian, and mammalian wildlife were evaluated through modeling the exposure of wildlife to contaminants in fish and surface water and comparing that exposure to exposures that are associated with effects.

The results of the BERA revealed a high level of sediment toxicity at three locations in BSB and two locations in Bear Swamp (Region 3). Elevated contaminant levels were detected in fish tissues from GPB, while the results of the macroinvertebrate studies indicated moderate impacts at some of the Picatinny Arsenal sample locations in GPB and BSB (although the brooks had similar biotic integrity to other streams in the area). Fish community assessment findings suggested slight fishery degradation in GPB, with the fishery declining in quality from upstream to downstream. The impaired conditions observed in both macroinvertebrate and the fish community assessments are believed to be the result of physical alterations of habitat associated with channelization and development in the watershed. However, because habitat influences may mask influences related to contaminants, the possibility of contaminant effects on the macroinvertebrate and fish community cannot be ruled out.

The results of the exposure modeling for piscivorous, avian, and mammalian wildlife suggest a potential for contaminant-related impacts in GPB. Arsenic and mercury were found to present a risk potential to mink in all Regions and mercury was found to also present a risk potential to great blue heron in Region 3. Based on these studies, LOCs were established for contaminants detected in GPB and BSB. These LOCs were used to determine where elevated levels of contamination exist in GPB and BSB that may need to be addressed.

**Remedy Selection**

The ROD for GPB and BSB was signed on July 18, 2005. The RAOs listed in the ROD for Region 2 are as follows:

- Implement remedial alternatives that can effectively reduce the risks to potential ecological receptors caused by the COCs present at the AOCs;
- Limit human exposure to elevated levels of contaminants in sediment and surface water (Note: Based on a restricted use scenario, there is no unacceptable risk to human health in Region 2 from levels of contaminants in sediment and surface water);
- Protect areas downstream of Region 2 from migration of COCs at levels that could potentially impact ecological receptors; and,
- Avoid disturbance of aquatic habitat in Area G where impacts to ecological receptors are uncertain.

The RAOs listed in the ROD for Region 3 are as follows:

- Mitigate the impact to ecological receptors in the sediment retention ponds and the area near Site 128;
- Avoid disturbance of high-quality habitat in Area H;
- Limit human exposure to elevated levels of contaminants in sediment and surface water (Note: Based on a restricted use scenario, there is no unacceptable risk to human health in Region 3 from levels of contaminants in sediment and surface water); and,
- Prevent contaminants in Region 3 from impacting better quality habitat in Region 4.

The RAOs listed in the ROD for Region 4 are as follows:

- Reduce risks to potential ecological receptors by implementing remedial alternatives for COC source areas selected through Site 34 and Site 20/24 FSs;
- Prevent contaminants in Region 4 from impacting better quality habitat off-site; and,
- Limit human exposure to elevated levels of contaminants in sediment and surface water (Note: Based on a restricted use scenario, there is no unacceptable risk to human health in Region 4 from levels of contaminants in sediment and surface water).

The selected remedy for GPB and BSB includes the following components for each region:

**Region 2**

- Chemical monitoring of surface water and sediment for metals, semi-volatile organic compounds, pesticides, and PCBs;
- Biological monitoring (benthic macroinvertebrate studies and toxicity testing studies);
- Collection and analysis of deep-sediment samples at the AOCs to verify there are no zones of contamination in deeper sediments that could be released in the future. If sample results indicate deep sediment contamination that could be mobilized in the future, the remedy for this region will be reviewed to determine whether the monitoring program needs to be adjusted or more active remedial measures taken; and,
- Implementation of LUCs to ensure protectiveness.

**Region 3**

- Excavation and on-site stabilization of contaminated sediment from the oil/water separator pond, and the hot spot location BSSD-34;
- Chemical monitoring of surface water and sediment for metals, PAHs, pesticides, and PCBs;
- Biological monitoring (benthic macroinvertebrate studies and toxicity testing studies);
- Collection and analysis of deep sediment samples at the AOCs to verify there are no zones of contamination in deeper sediments that could be released in the future. If

sample results indicate deep sediment contamination that could be mobilized in the future, the remedy for this region will be reviewed to determine whether the monitoring program needs to be adjusted or more active remedial measures taken; and,

- Implementation of LUCs.

**Region 4**

- Chemical monitoring of sediment for metals;
- Biological monitoring (benthic macroinvertebrate studies);
- Collection and analysis of deep sediment samples at the AOCs to verify there are no zones of contamination in deeper sediments that could be released in the future. If sample results indicate deep sediment contamination that could be mobilized in the future, the remedy for this region will be reviewed to determine whether the monitoring program needs to be adjusted or more active remedial measures taken; and,
- Implementation of LUCs.

**Remedial Implementation and Remedial Systems**

An Engineering Evaluation and Cost Analysis was finalized in 2002 for the sedimentation basin portion of the remedial action. The removal action included the dredging and ex-situ stabilization of 786 tons of impacted sediment from the sediment basins in BSB (Region 3). The excavated sediment was transferred into a roll-off box. The roll-off box was used to stage the sediment, so it could be placed in the pug mill feed hopper at a constant rate. Portland cement was used as the stabilizing agent. All of the sediment was processed and stockpiled in an on-site pug mill. In addition, another 6 CY of sediment 100 feet upstream and downstream of the sedimentation basins were stabilized in-situ. The excavated and stabilized sediment, soil and remediation-derived waste were disposed of at the appropriately licensed landfills.

**System Operations and Maintenance**

Not applicable; no active remedy.

**Data Review**

The monitoring and data collection portion of the remedy has not yet been initiated.

**Technical Assessment**

*Question A: Is the remedy functioning as intended by the decision documents?*

Not applicable, remedy has not been implemented.

*Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?*

Not applicable, remedy has not been implemented.

*Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

No.

**Technical Assessment Summary**

Not applicable, remedy has not been implemented.

**Recommendations**

Implement remedy. Begin chemical and biological monitoring. Implement LUCs.

**Protectiveness Statement**

When implemented, the remedy for GPB and BSB will be protective of human health and the environment. Currently, there is no unacceptable exposure to human receptors from source area contaminants and none are expected over the next five years.

## Site 34 – Burning Grounds:

**History of Contamination and Initial Response**

Site 34, or the Burning Grounds, comprises approximately seven acres and is located near the southern boundary of Picatinny Arsenal along the banks of GPB. The Burning Grounds has been primarily utilized for the burning of explosive and explosive-contaminated material generated at Picatinny Arsenal. Additionally, the area has been used for landfilling and storage of wastes. The Burning Grounds consists of low-lying swampy areas, with the exception of the Open Burning Area, which is located along the western side of the site. Direct burning on the ground in this area was discontinued in 1985, and wastes have since been placed in large metal pans on concrete supports for ignition, burning, and proper disposal. Operations in the Open Burning Area include the destruction of off-specification explosive constituents and "flashing" of contaminated metal and equipment (the decontamination of surfaces contaminated with explosive residue) within nine metal burning pans. The burning pans are used to dispose of explosives, powder, spent solvents, propellants, dust from wet filtration systems, and explosives-contaminated wastewater treatment sludges and sediment. These operations are regulated under the interim status within a RCRA Part B permit. An incinerator has been constructed at Picatinny Arsenal that will take over the function of the Burning Grounds when it is permitted and functional. The Army has indicated that open burning will still be required for a small amount of material which the new incinerator will not be able to handle. This open burning will be subject to permit and done at a different location at Picatinny Arsenal than the current Burning Grounds.

**Basis for Taking Action**

The Army's RI of the Burning Grounds occurred in 1993 and 1994 and indicated widespread contamination of surface and subsurface soil and to a lesser extent, groundwater. Contaminants in surface soil included PAHs, PCBs, metals, and dioxins and furans. These contaminants were detected to a lesser extent in subsurface soils and to a lesser extent still in groundwater.

Contaminants

COCs identified in the ROD for the Burning Grounds are as follows:

Soil

Benz(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene

Dibenzo(a,h)anthracene
Indeno(1,2,3-cd)pyrene
Arsenic
Cadmium
Copper
Lead
Total PCBs
Dioxins/Furans

Human Health Risk Assessment

A human health risk assessment was conducted for the Burning Grounds which evaluated potential exposure to site contaminants by two worker populations: current site workers and future commercial industrial workers. Under the current site worker scenario, exposure assumptions were less conservative for the commercial industrial worker scenario for ingestion rate, exposure frequency, and exposure duration. Exposure to soil under the current site worker scenario resulted in risk levels within EPA's risk management criteria. Risk levels were not calculated for exposure to groundwater for the current site workers because site groundwater is not currently being used. Exposure to soil and groundwater under the future commercial industrial worker scenario is associated with significant human health risks due to exceedance of EPA's risk management criteria.

Ecological Risk Assessment

The RI includes a screening-level ecological risk assessment to evaluate the potential risks to ecological receptors from exposures to hazardous constituents associated with the Burning Ground. Modeling was conducted for the field mouse and bobwhite quail which are representative of ecological receptors in the area. Results of the modeling indicated that ingestion of dioxin and barium at the Burning Ground may pose a threat to mice and other small mammalian receptors. The results of applying the bobwhite quail food-chain model suggest that, for avian receptors, there is no concern for effects from soil contaminants. GPB, which is located adjacent to the Burning Grounds, is addressed as a separate operable unit and is discussed elsewhere in this document.

**Remedy Selection**

The ROD for the Burning Grounds was signed on September 8, 2005. The RAOs listed in the ROD are as follows:

- Reduce the risk to the future on-site worker form exposure to surface soils with concentrations of the COCs that exceed the respective RGs;
- Reduce the risk to the future on-site worker from exposure to subsurface soils with concentrations of the COCs that exceed the respective RGs;
- Control erosion and transport of sediments from the site to surrounding drainage features;
- Mitigate any potential ecological risk and protect the environment;
- Prevent or mitigate impacts to groundwater that may result from the leaching of contaminants from the Burning Ground soil via groundwater infiltration; and,

- Manage potential groundwater risk at points of compliance.

The selected remedy for the Burning Grounds includes the following components:

- Installation of an impermeable modified asphalt cap;
- Long-term groundwater and surface water monitoring, including the installation of one monitoring well in the shallow unconfined aquifer; and,
- Implementation of LUCs.

**Remedial Implementation and Remedial Systems**

Not applicable, remedy has not been implemented.

**System Operations and Maintenance**

Not applicable; no active remedy.

**Data Review**

Groundwater Monitoring

The LTMP for the remedy has not been approved or initiated.

**Technical Assessment**

*Question A: Is the remedy functioning as intended by the decision documents?*

Not applicable, remedy has not been implemented.

*Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?*

Not applicable, remedy has not been implemented.

*Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

No.

**Technical Assessment Summary**

Not applicable, remedy has not been implemented. The Army has been sampling groundwater periodically at the site since 2003 and intends to use these analytical results along with analytical data gathered from the LTMP to evaluate the remedy following approval of the Remedial Design Plan.

**Recommendations**

Submit the Remedial Design Plan, including the LUCIP and LTMP, to EPA as soon as possible.

Close the current Burning Ground (Site 35) and implement the remedy.

**Protectiveness Statement**

When implemented, the remedy for the Burning Ground will be protective of human health and the environment. Currently, there is no unacceptable exposure to human or environmental receptors from source area contaminants and none are expected over the next five years.

## Sites With RODs Pending

## Area E Groundwater and Site 22 (Building 95 Impoundments):

### History of Contamination and Initial Response

Building 95 and the Area E groundwater plume are located in the southern portion of Picatinny Arsenal. Between 1961 and 1988, printed-board manufacturing operations were conducted at Building 95 which involved degreasing and cleaning with chlorinated solvents. These activities produced contaminated wastewater that contained VOCs and other chemicals. This wastewater was stored and treated in nine underground storage tanks (USTs) that were installed beneath Building 95. After treatment in the USTs, wastewater and sludge were transported by pipeline to the surface impoundments (Site 22, Building 95 Impoundments) located approximately 250 feet from Building 95. Wastewater from the surface impoundment was discharged to GPB via a drainage ditch through the sand filter lagoon. It is estimated that up to 9,000 gallons of treated wastewater and 140 pounds of precipitated sludge were generated daily; although amounts varied over time. The surface impoundment unit was cleaned annually and the sludge was removed for off-site disposal.

In the early 1980s, groundwater beneath the lagoons was investigated under the RCRA program. VOCs were detected in groundwater and as a consequence the lagoons were decommissioned in October 1981. The USTs located below Building 95 were closed in accordance with RCRA regulations by filling them with concrete. Removal of the lagoons took place in 1992 according to RCRA regulations. The surface impoundment was excavated and disposed off-site as hazardous waste. No clean up took place in the drainage ditch into which the surface impoundments discharged.

### Site Investigation Results

Groundwater investigations have indicated that groundwater plume consisting of VOCs extends approximately 1,000 feet downgradient towards GPB from the former impoundment units. VOCs have been detected in GPB where it is thought the Area E groundwater plume would be discharging. However, based on the type and level of contamination seen in GPB, it is thought to be originating from an upgradient source (Area D Groundwater). At its widest, the plume is approximately 1,000 feet in width. Surface water and sediment sampling in the ditch that drained the lagoons found low-level inorganic contamination.

### Recommendations

Approve the ROD and implement the remedy.

## Site 25/26 Soil (Sanitary Landfill/Dredge Disposal Pile):

### History of Contamination and Initial Response

Site 25 (Sanitary Landfill) is located in Area C within the central valley of Picatinny Arsenal near the southern boundary. A wide variety of wastes were reportedly disposed of at Site 25 from the 1940s through the early 1970s. These wastes may have included rubbish, industrial wastes, and sewage-treatment plant sludge. The Army discontinued use of the landfill in 1972. The landfill area was subsequently covered with soil and seeded.

Site 26 (The Dredge Pile) is entirely located Site 25 and consists of an irregularly-shaped pile of sediments (approximately 12,000 CY) dredged from portions of GPB. The sediments were

placed directly on the ground within the area of Site 25. No engineered cover was placed over the sediment pile which is currently covered with grasses, woody shrubs, and trees.

**Site Investigation Results**

The RI of Site 25/26 revealed that site soils have been impacted by organic compounds and metals due to the landfill, staging and dredge-disposal activities. Additionally, based on the site history, buried munitions are a concern here. Groundwater beneath the site is being addressed separately in the Area C groundwater operable unit.

**Recommendations**

Approve the ROD and implement remedy.

**Protectiveness Statement**

The remedy for Site 25/26 is protective of the environment and will protect human health when it is completed. Currently, there is no unacceptable exposure to human health or environmental receptors from source area contaminants and none expected over the next five years.

## Area B Groundwater:

**History of Contamination and Initial Response**

Area B is approximately 28 acres in size and is located in the southern portion of Picatinny Arsenal. Soils at Area B were addressed in the Site 20/24 ROD which is discussed above.

**Site Investigation Results**

The RI of Area B Groundwater revealed VOC contamination in the surficial aquifer and the upper and lower semi-confined aquifers.

**Recommendations**

Approve ROD and implement remedy.

## Site 180 – Waste Burial Area:

**History of Contamination and Initial Response**

Site 180, the former Waste Burial Area, consists of 2.1 acres located in Area C in the southern portion of Picatinny Arsenal. It is believed that Site 180 was used as an unregulated landfill in the 1960s and 1970s. Items that may have been disposed in the landfill include miscellaneous drums, debris, and possible UXO. Propellant canisters and empty projectile bodies were discovered at Site 180 during the RI and removed in 1997. According to the RI, materials were also deposited in the site burial pits including railroad ties, telephone poles, concrete rubble, crushed steel drums, miscellaneous building debris, and a railroad car. A trenching investigation that occurred at the site found buried debris, asbestos insulating material, a drum containing a tar-like substance, and several UXO items identified as 40 mm grenades. The UXO and other buried debris were removed from the excavations and trenching activities were discontinued due to safety reasons. PAH contamination is present throughout surface soils at the site. It is believed that the PAH contamination at Site 180 is the result of windblown contamination from the adjacent Burning Grounds site (Site 34, discussed above). PAHs are typically associated with the incomplete combustion of fossil fuels or the burning of wastes, which occurred regularly during normal operations at the Burning Grounds.

**Site Investigation Results**

The RI for Site 180 found widespread contamination of surface soil. As mentioned above, PAH contamination is present throughout surface soils at the site. In addition, site soils have been impacted by metals, PCBs, and pesticides. Subsurface soil, surface water, sediment, and groundwater have been impacted to a lesser extent by past operations and disposal operations.

**Recommendations**

Approve the ROD and implement the remedy.

## *5.0 FIVE-YEAR REVIEW PROCESS*

Administrative Components

The second five-year review for Picatinny Arsenal was completed in 2001, thus creating the trigger for this third five-year review to be completed in 2006.

For this five-year review, the review team consisted of Ted Gabel (Picatinny Arsenal - Project Manager), Gerard Maresca (Shaw - Project Manager) and Doug Schicho (Shaw - Project Manager). This review was prepared from discussions between the review team members and reviews of documents, data and available information.

Community Involvement

A newspaper notice will be placed in *The Morris Tribune* and *The Star-Ledger* to notify the community that the five-year review process is underway.

Document Review

The five-year review consisted of a review of relevant documents including the following:

- RI/FS Reports (including human health and ecological risk assessments);
- RODs;
- Second Five-Year Review Report for Picatinny Arsenal;
- Site 20/24 – Site Closure Report;
- Site 193 BSB Sediment Removal Action As-Builts Report;
- Draft Remedial design for Site 23; and,
- Draft Remedial design workplan for GPB and BSB.

Data Review

Data reviewed as part of the five-year review included the following:

- Semiannual Ground Water and Surface Water Sampling Results Reports (2002 – 2006) for the Area D/Building 24 plume; and,
- Permit-equivalent reports for current pump and treat system.

Interviews

Interviews consisted of discussions with Picatinny Arsenal and Shaw representatives listed above under the "Administrative Components" heading.

## 6.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

- Approve various RODs and implement as necessary.
- Allow annual inspection of Site 20/24 for certification.

There are no recommendations or follow-up actions directly associated with this review. Picatinny Arsenal has various ongoing RIs, studies, designs and actions. Within this report, there are a number of "recommendations" made in relationship to specific sites and areas. The purpose of these recommendations is to identify and encourage progress for the various ongoing activities needed at the facility. The EPA expects to continue dialog with the Army to resolve a number of the issues currently hindering the progress. EPA and the Army are not bound by any of the specific recommendations presented in this report. However, the Army will take appropriate action to protect human health and the environment resultant of the identification of unacceptable risks.

The previous five-year review also contained a number of recommendations for the interim remedy for the Area D groundwater plume, which was the only remedy being implemented at the facility at that time. EPA requested an additional extraction well be installed and pumping rates increased in order to improve the capture efficiency of the groundwater extraction and treatment system. In 2002, an additional extraction well (WW-4A) was installed and in 2003 the additional withdrawal well was put into service. However, blockages in transmission lines and clogged filter packs have resulted in reduced but still effective extraction and treatment rates.

EPA also recommended that the Army complete RIs and FSs at all contaminated sites. Most of the RIs have been completed at Picatinny Arsenal during this past five-year period. The Army is transitioning many of these sites into the FS phase of the CERCLA process. The Army will initiate appropriate response actions if any of these sites are found to present an imminent and substantial endangerment to public health or the environment.

## 7.0 PROTECTIVENESS STATEMENT

Final site remedy decisions have not been made. Until final remedy decisions are completed, an opinion on site-wide protectiveness cannot be made. 40 CFR 300.430(F)(4)(i) pertains to these remedial actions that have been selected and implemented. The selected remedial actions for this site will protect human health and the environment when they are completed. Existing site use restricts human exposure – so that human exposure is currently under control. While some of the individual groundwater plumes may not be fully under control, these plumes are sufficiently known to not directly threaten drinking-water supplies and are not expected to do so over the next five years. In addition, unacceptable exposure to contaminated soil and sediment is not expected to occur due to restricted site use and site access. Consequently, for this facility, human health is considered adequately protected. The selected remedies also protect the environment. Remedies have not been selected for approximately 139 sites at Picatinny Arsenal. There does not appear to be any unacceptable environmental exposures at these sites under current site use.

## 8.0 NEXT REVIEW

The next Five-Year Review for Picatinny Arsenal should be completed before September 2011.

Approved:

_____ _____

Kerry T. Skelton
Lieutenant Colonel, U.S. Army
Garrison Commander

Date

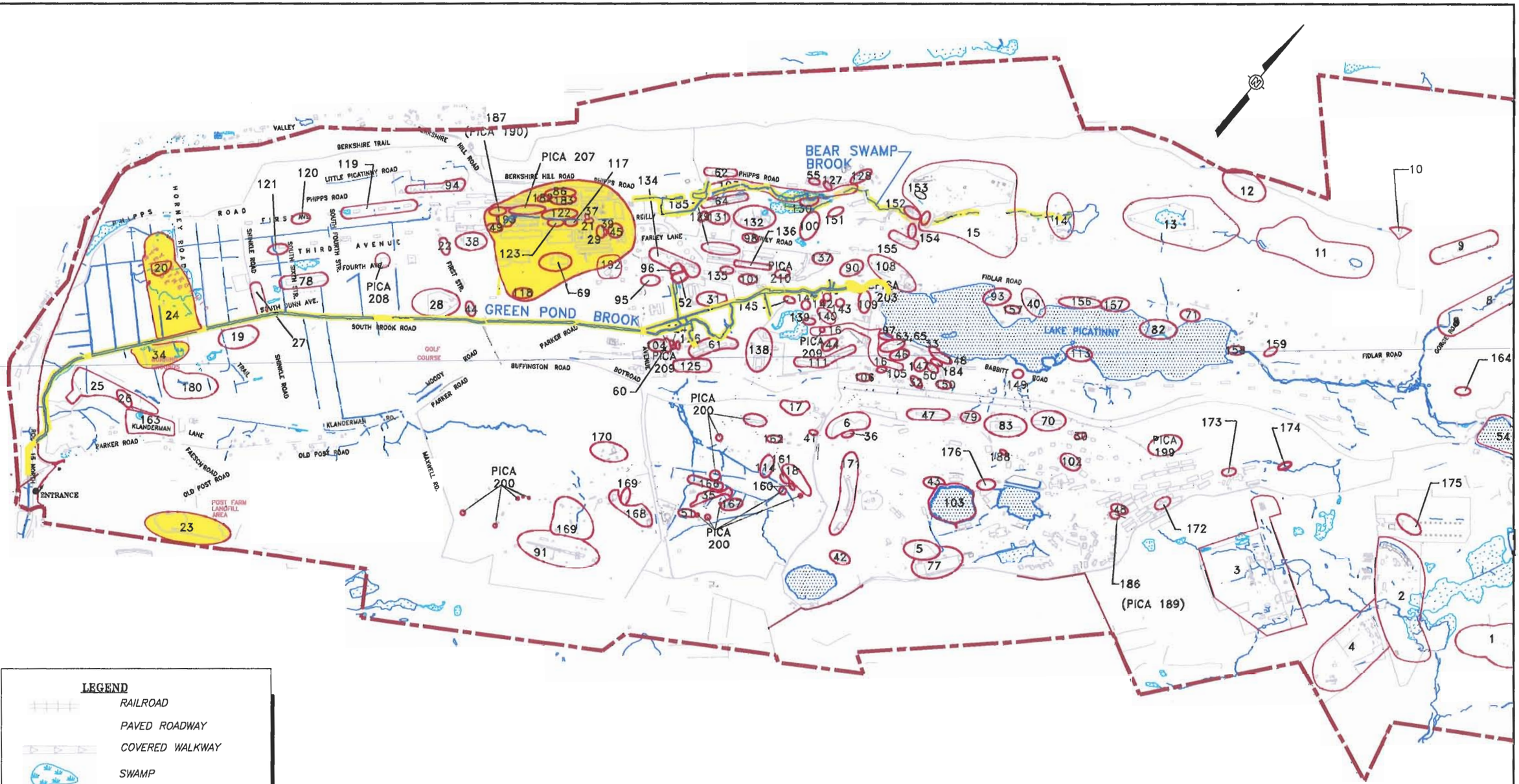
# FIGURES

DRAWING NUMBER: RCRA052506.dwg

APPROVED BY: -- | -- |

CHECKED BY: G. Maresca | 05/25/06

DRAWN BY: S. Wolfe | 02/24/06




**LEGEND**

- RAILROAD
- PAVED ROADWAY
- COVERED WALKWAY
- SWAMP
- LAKE/POND
- STREAM
- DRAINAGE CANAL
- SITE BOUNDARY
- PICATINNY BOUNDARY
- BUILDING
- CERCLA SITE
- ROD SITE

SCALE

0 1600 3200 FEET

Picatinny Arsenal Installation Restoration Program

U.S. Army Corps of Engineers

Shaw Shaw Environmental, Inc.

**FIGURE No. 1**

**CERCLA SITES AT PICATINNY ARSENAL**

**PICATINNY ARSENAL, DOVER, NEW JERSEY**

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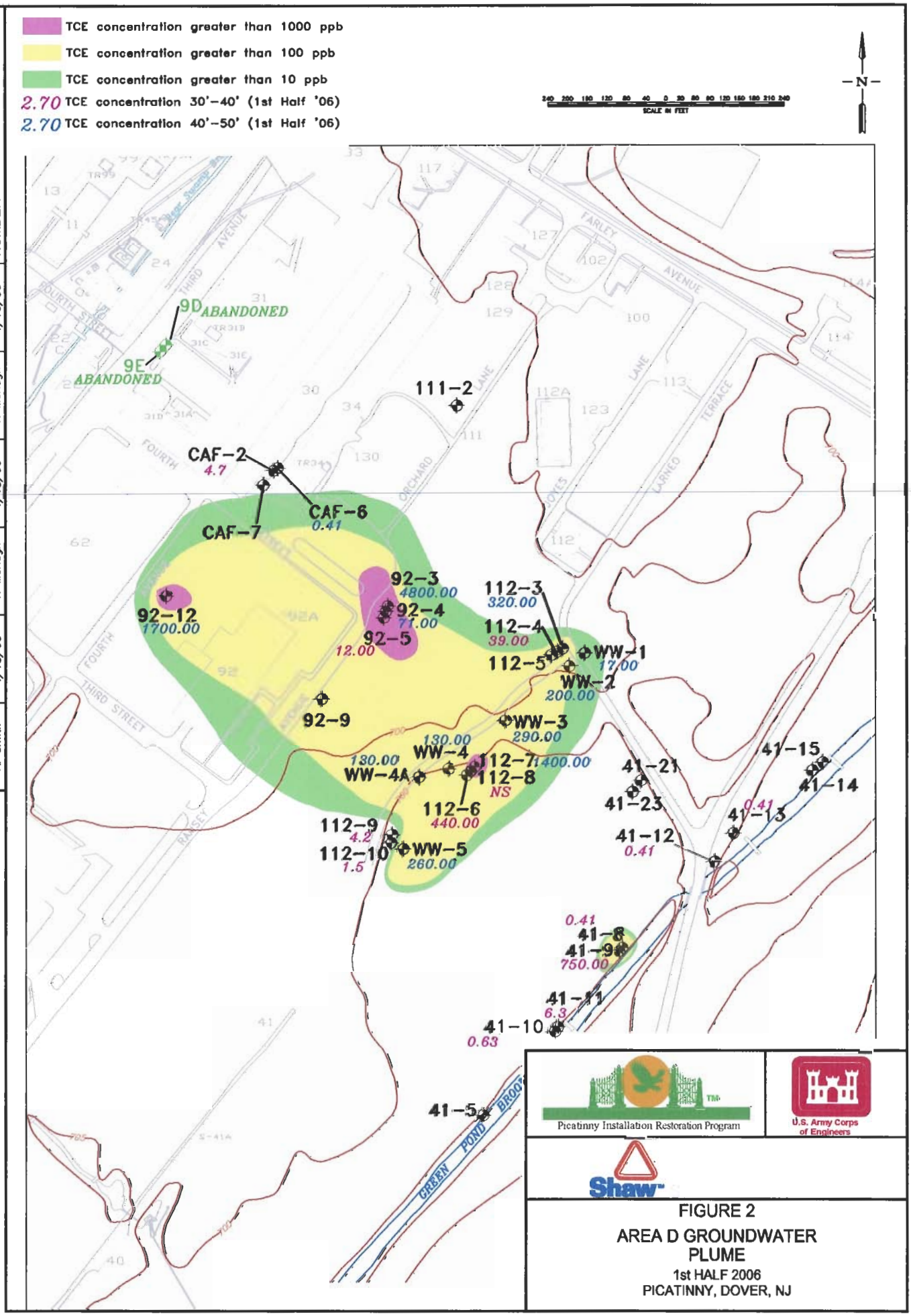
Plotted By: stephen.Wolfe

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|---|---|---|---|
| A. Smith 4/13/06 | T. McHugh 4/13/06 | T. McHugh 4/13/06 | dtce041306.dwg |

FIGURE 2

AREA D GROUNDWATER PLUME

1st HALF 2006

PICATINNY, DOVER, NJ

File: N:\ead\CAD drawings\Picatinny\Area-D\SemiAnnual Report\Plume0704.dwg
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**FIGURE 3**
**PTA - Historical TCE Concentrations - MW 92-3**

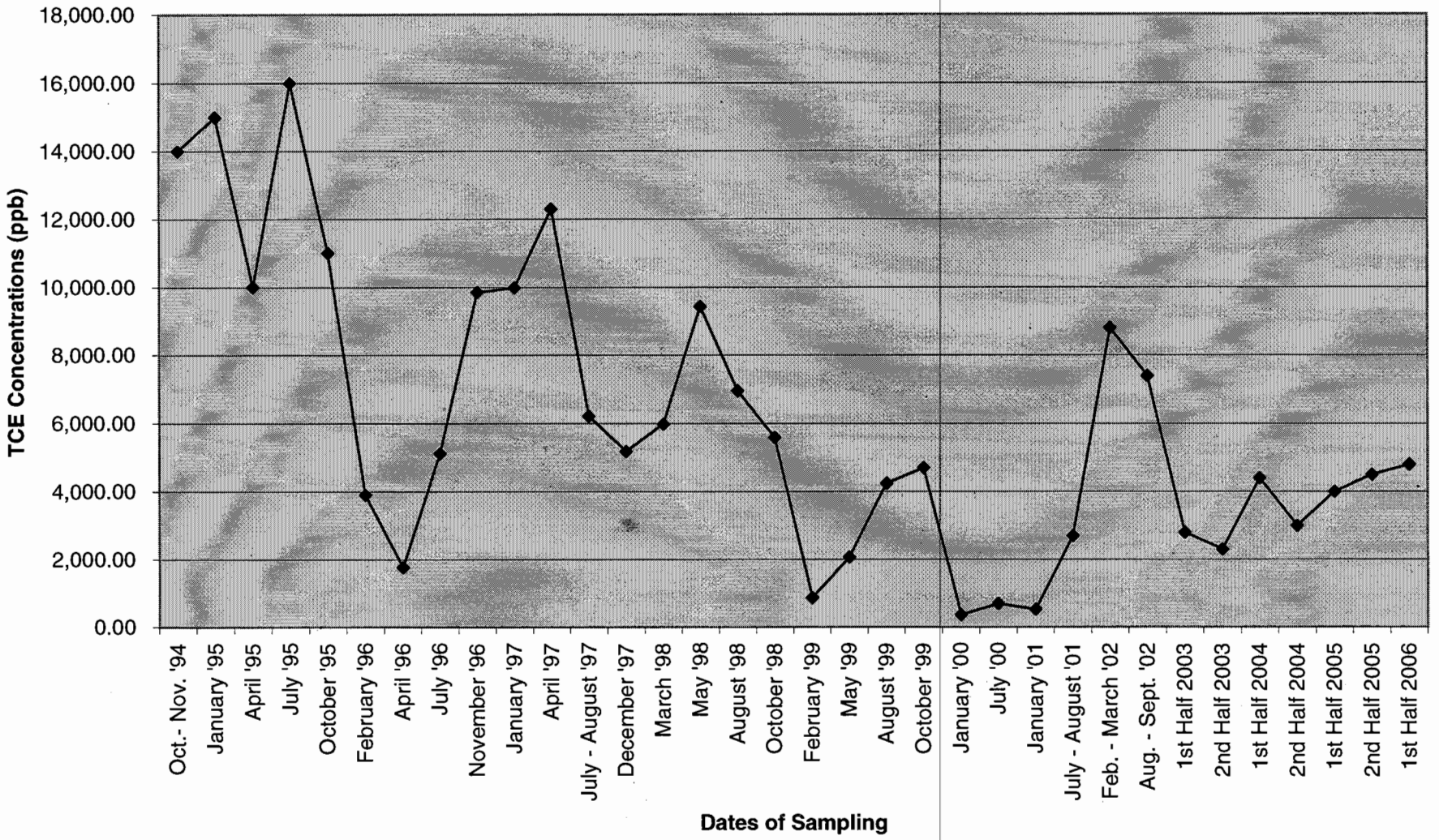


**FIGURE 4**
**PTA - Historical TCE Concentrations - MW 92-12**

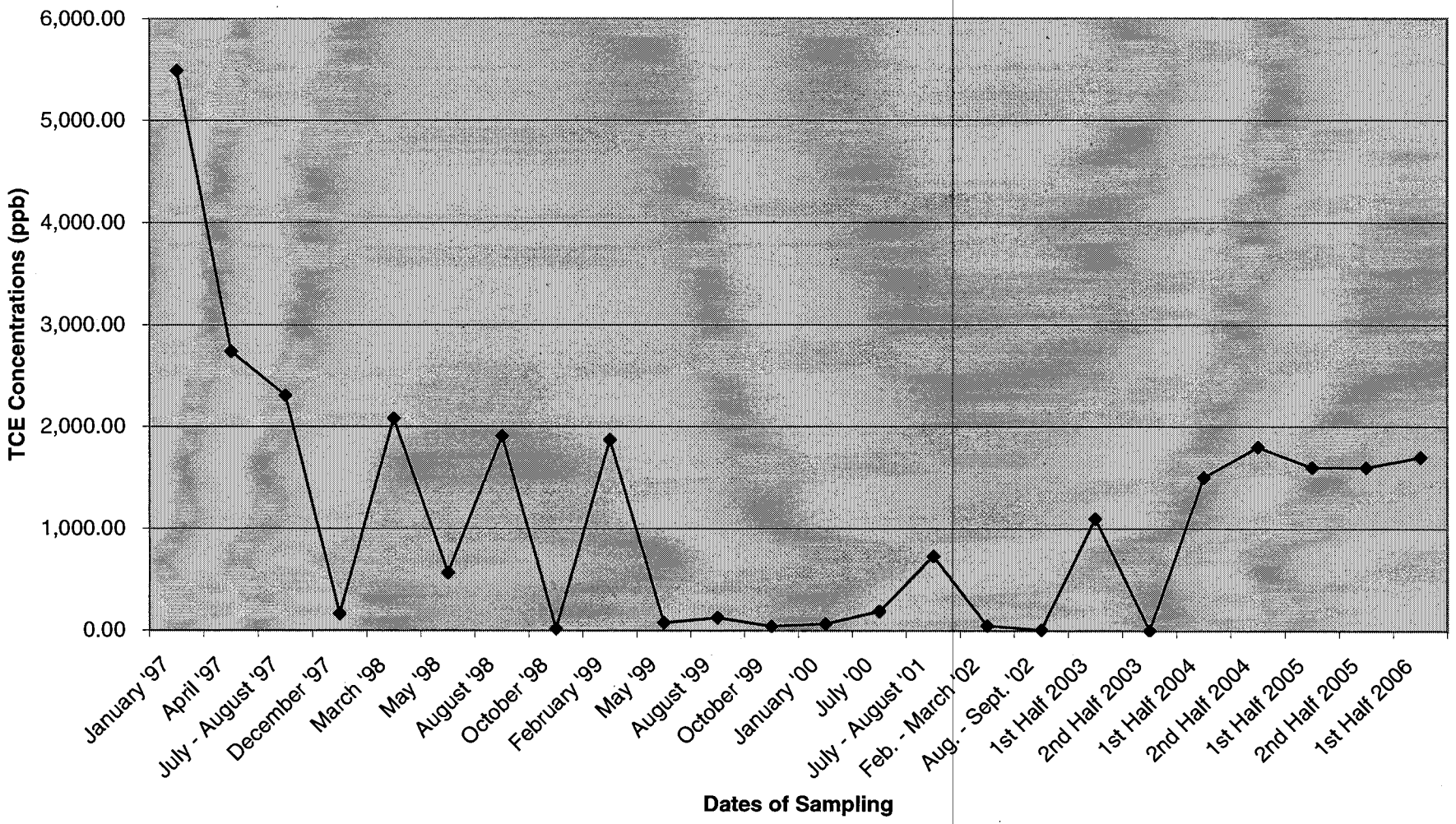
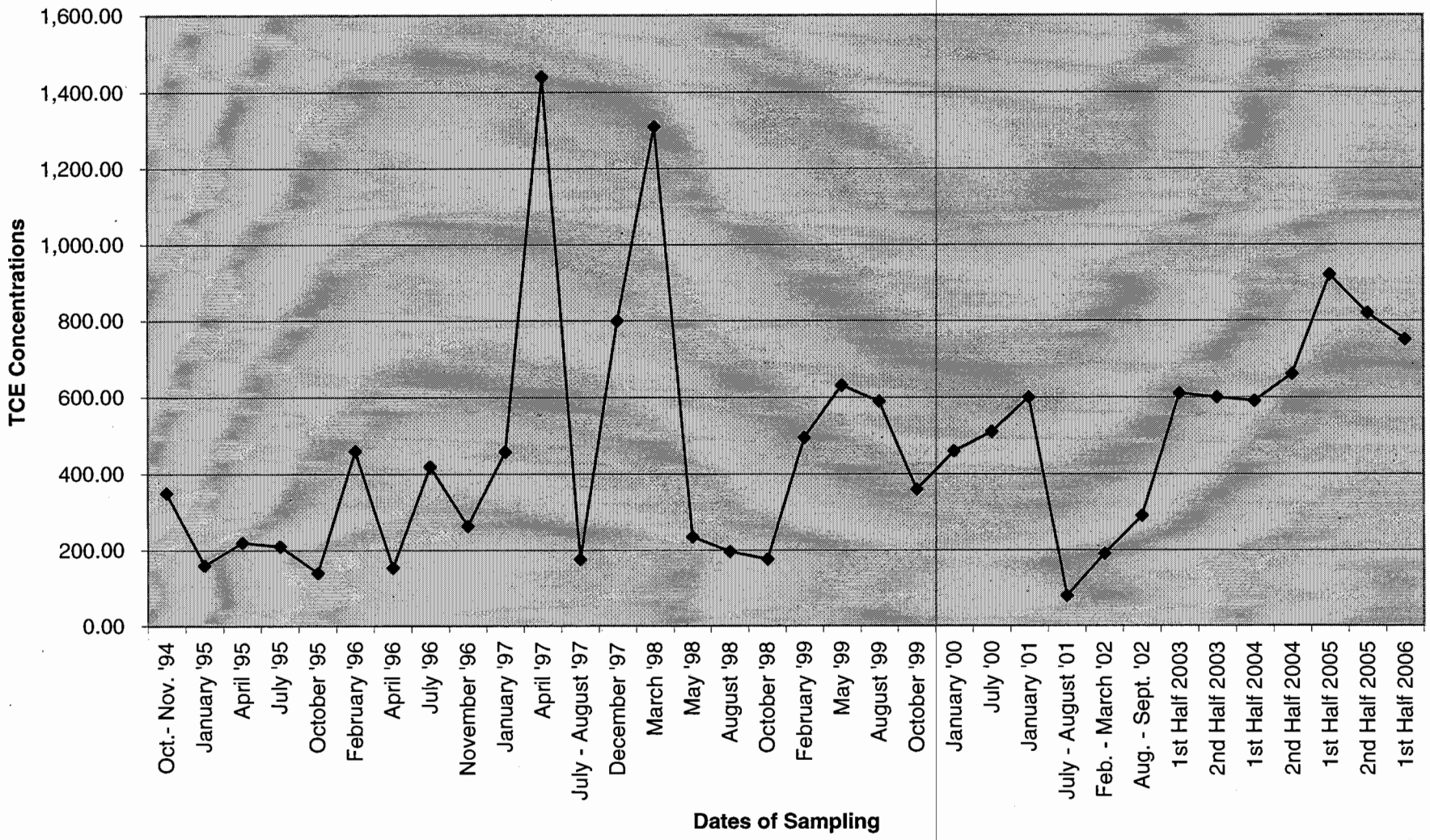


**FIGURE 5**
**PTA - Historical TCE Concentrations - MW 41-9**



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| B2024070605.dwg | G. Maresca 07/24/06 | G. Maresca 07/24/06 | S. Wiafe 07/24/06 |

Volume Report 05/21/2002 10:43
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and GRID file: C:/SC2000/DATA/866719/fg_c.grd
Grid corner locations: 2021823.63,761920.64 to 2022683.63,762655.64
Grid resolution X: 172, Y: 147 Grid cell size X: 5.00, Y: 5.00
Area in Cut : 935.4 S.F., 0.02 Acres
Area in Fill: 113,723.8 S.F., 2.61 Acres
Total inclusion area: 114,659.3 S.F., 2.63 Acres
Cut to Fill ratio: 0.00
Average Cut Depth: 0.08 Average Fill Depth: 2.45
Cut (C.Y.) / Area (acres): 1.03
Fill (C.Y.) / Area (acres): 3916.17
Cut volume: 73.1 C.F., 2.71 C.Y.
Fill volume: 278,321.60 C.F., 10,308.21 C.Y.

GRAVEL ACCESS RAMP MATCH TO EXISTING PAVEMENT
4' SHOULDER
DRAINAGE
CANAL
ROAD
A
23 ft.
60 ft.
GRAVEL ACCESS
20/24MW-5
TP24-5
1270
24 ft.
75 ft.
AREA RESTORED AS WETLAND
693
692
691
50' (TYP. BOTH SIDES)
REFLECTIVE ROAD MARKERS 5' HEIGHT (ORANGE ON LEFT, WHITE ON RIGHT) TYP.
4' SHOULDER
CONDUIT STUB
S72
PROPOSED 25' x 25' CONCRETE SLAB, TOP ELEV. 691± (BY OTHERS)
CONCRETE MONUMENT SET
STATE PLANE COORDINATES=
N 762329.1176
E 2022568.5576
UTM COORDINATES=
N 14863569.35989
E 1755056.39221
ELEV=688.50
4' SHOULDER
RIPRAP FACE
692
691
A
GRAVEL ACCESS RAMP
COMPLETED ORIGINAL CAP
EXTENSION OF CAP
TOP OF SLOPE
LIMIT OF CAP
TOE OF SLOPE
20/24MW-3
20/24MW-2
690
20/24MW-2D
689
CANAL
43'
PYROTECHNIC TESTING RANGE
ADDITIONAL CAP
6.0'

LEGEND:
- EXISTING CONTOUR (SEE REFERENCE)
- 691 TOP OF CAP CONTOUR
- AREA OF 3:1 SLOPE
- AREA OF GRAVEL ROAD REMEDIATION
- RIPRAP SLOPE

NOTE:
1. FOR SECTION A–A, SEE FIGURE 2–3

SCALE
0 60 120 FEET

Picatinny Installation Restoration Program
U.S. Army Corps of Engineers
Shaw Shaw Environmental, Inc.

**FIGURE No. 6**
**SITE 20/24**
**SOIL COVER AS BUILT**
866719-205-00000
PICATINNY, DOVER, NEW JERSEY

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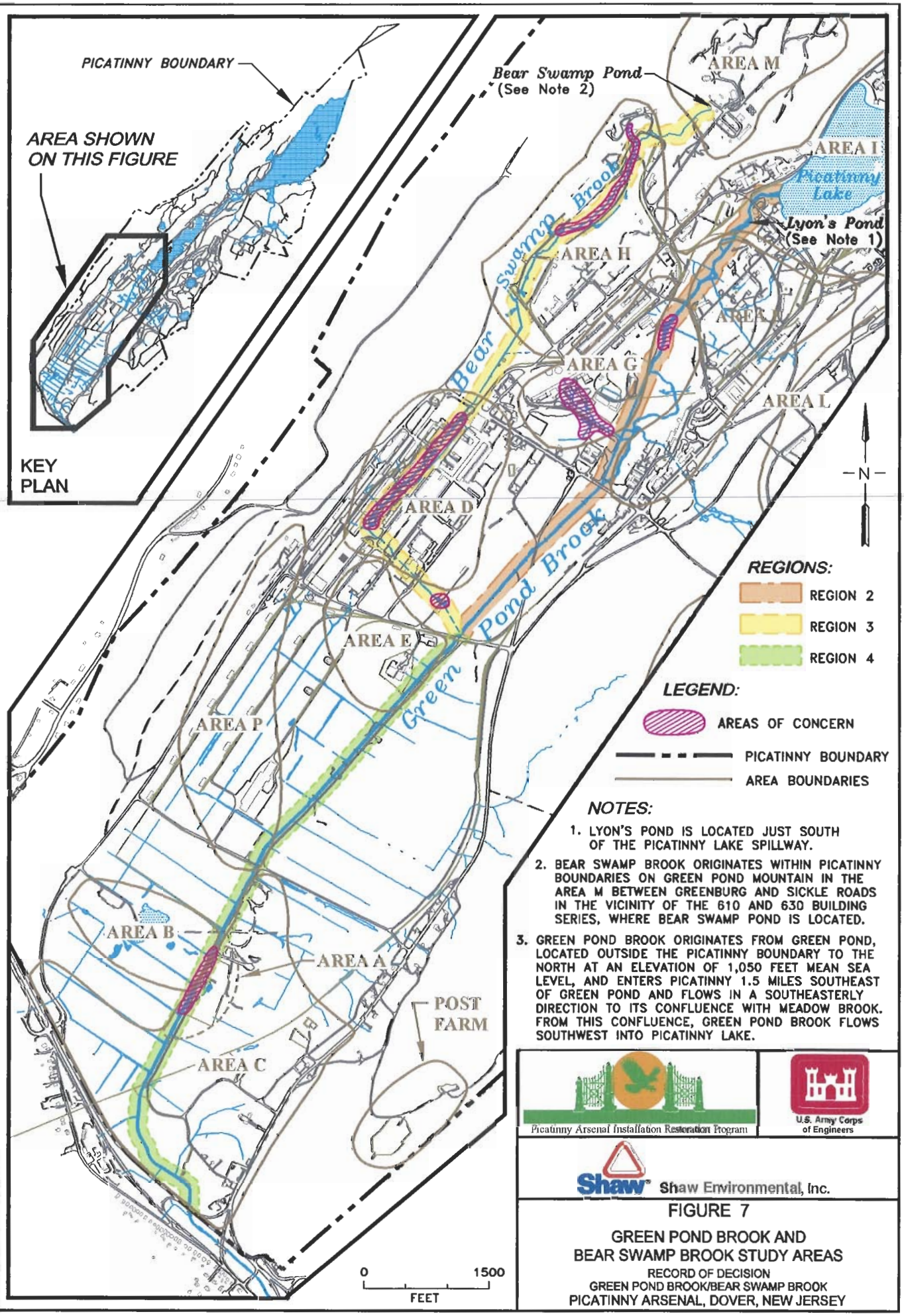


| DRAWN BY | | CHECKED BY | | APPROVED BY | | DRAWING NUMBER |
|---|---|---|---|---|---|---|
| S. Wiafe | 07/24/06 | G. Maresca | 07/24/06 | D. Schicho | 07/24/06 | GPB-BSB-Base.dwg |

File: N:\eed\CAD drawings\Picatinny\BSB\GPB-BSB-Base.dwg
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Plotted By: stephen.wiafe

Picatinny Arsenal Installation Restoration Program

U.S. Army Corps of Engineers

Shaw Environmental, Inc.

# FIGURE 7

## GREEN POND BROOK AND BEAR SWAMP BROOK STUDY AREAS

RECORD OF DECISION
GREEN POND BROOK/BEAR SWAMP BROOK
PICATINNY ARSENAL, DOVER, NEW JERSEY

# TABLES

**Table 1**

**Changes in Chemical-Specific Standards for**
**Area D Groundwater Contaminants of Concern**

| Area D Groundwater Contaminant of Concern | Standard (µg/L) | | Citation/Status/Year |
|---|---|---|---|
| Chloroform | Previous | 6 | NJGWQC/ARAR/1992, 1993 |
| | New | 70 | NJGWQC/ARAR/2005 |
| 1,1 -Dichloroethene | Previous | 2 | NJGWQC/ARAR/1992, 1993 |
| | New | 1 | NJGWQC/ARAR/2005 |
| 1,2 Dichloroethene (total) | Previous | 10 | NJGWQC/ARAR/1992, 1993 |
| | New | 70 | NJGWQC/ARAR/2005 |
| Methylene Chloride | Previous | 2 | NJGWQC/ARAR/1992, 1993 |
| | New | 3 | NJMCL & NJGWQC/ARAR/2005 |
| Vinyl Chloride | Previous | 2 | MCL/ARAR/1996 |
| | New | 1 | NJPQL/ARAR/2005 |

**NOTES:** NJGWQC = New Jersey Groundwater Quality Criteria
ARAR = Applicable or Relevant and Appropriate Requirement
MCL = Maximum Contaminant Level
NJPQL = New Jersey Practical Quantitation Limit