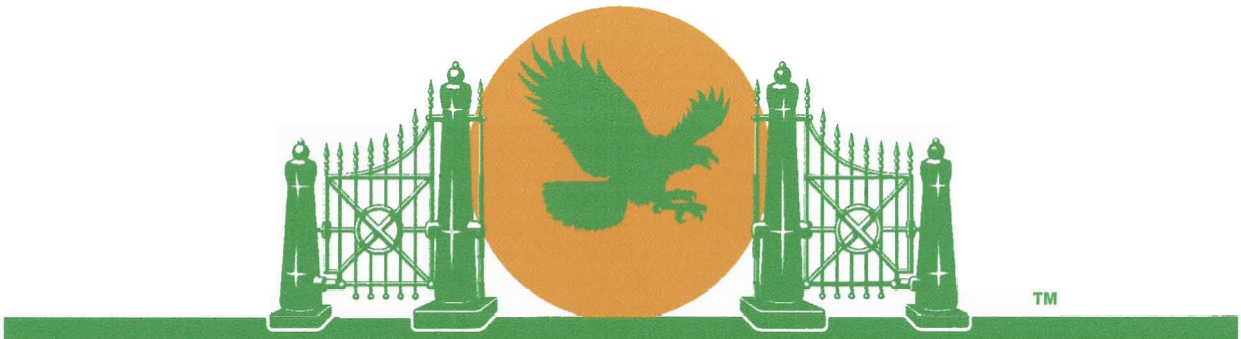

PICATINNY
RECORD OF DECISION

SITE 34 - THE BURNING GROUND

FINAL

JANUARY 2005

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LIST OF ACRONYMS AND ABBREVIATIONS

μg/L .....micrograms per liter
AA.....area of attainment
AR .....Army Regulation
ARARs.....Applicable or Relevant and Appropriate Requirements
bgs.....below ground surface
BMP.....Best Management Practices
CA .....contamination assessment
CAA.....Clean Air Act
CDD/CDF .....chlorinated dibenzo-p-dioxins/furans
CEA.....Classification Exception Area
CERCLA.....Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR .....Code of Federal Regulations
cm/s.....centimeters per second
COC .....contaminant of concern
COPC.....chemical of potential concern
CWA.....Clean Water Act
CY .....cubic yards
EOD.....Explosives Ordnance Disposal
ERA.....ecological risk assessment
ESD .....Explanation of Significant Differences
FS.....Feasibility Study
ft .....feet
ft/yr .....feet/year
GPB.....Green Pond Brook
HHRA .....human health risk assessment
HI.....hazard index
HQ .....hazard quotient
ICs .....institutional controls
IRP .....Installation Restoration Program
IT .....IT Corporation
LOAEL.....lowest-observable-adverse-effect-level
LUC .....land use control
MCL.....Maximum Contaminant Level
mg/kg.....milligrams per kilogram
MNA .....monitored natural attenuation
msl.....mean sea level
NAAQS.....National Ambient Air Quality Standards
NCP.....National Contingency Plan
NJAC .....New Jersey Administrative Code
NJDEP.....New Jersey Department of Environmental Protection
NJPDES .....New Jersey Pollutant Discharge Elimination System
NOAEL .....no-observable-adverse-effect-level
NOD .....notice of deficiency
NPL .....National Priority List
NRDCSCC .....NJDEP Non-Residential Direct Contact Soil Cleanup Criteria
O&M .....operation and maintenance
OE .....ordnance and explosives
OSWER.....Office of Solid Waste and Emergency Response
PAERAB.....Picatinny Environmental Restoration Advisory Board
PAH.....polynuclear aromatic hydrocarbon
PCB.....polychlorinated biphenyl
Pondview.....Pondview Estates, Inc.
PP.....Proposed Plan

RAO.....remedial action objective
RCRA .....Resource Conservation Recovery Act
RD .....Remedial Design
RfD .....reference dose
RG .....remedial goal
RI.....Remedial Investigation
ROD .....Record of Decision
RPM .....remedial project manager
RPO.....Radiation Protection Office
SARA.....Superfund Amendments and Reauthorization Act
SDWA.....Safe Drinking Water Act
SHAW.....Shaw Environmental, Inc.
SI .....site investigation
SVOC .....semi-volatile organic compound
TAL.....Target Analyte List
TAPP .....Technical Assistance for Public Participation
TBC .....to-be-considered
TCLP .....Toxicity Characteristic Leaching Procedure
TERC.....Total Environmental Restoration Contract
TRC .....Technical Review Committee
UCL .....upper confidence limit
USACE.....U.S. Army Corps of Engineers
USAEC.....U.S. Army Environmental Center
USAEHA.....U.S. Army Environmental Hygiene Agency
USEPA .....U.S. Environmental Protection Agency
USGS .....United States Geological Survey
UXO.....unexploded ordnance
WET .....Wetland Evaluation Technique

1.0 DECLARATION

1.1 SITE NAME AND LOCATION

Facility Name and Location:

Department of the Army
Installation Management Agency
Northeast Regional Office
Picatinny Garrison

The facility is located as follows:

- Morris County
- Congressional District 11
- USEPA Region 2
- CERCLIS – EPA ID# NJ3210020704

This Record of Decision (ROD) addresses soil and groundwater contamination identified at Site 34, which is located within Picatinny, Rockaway Township, New Jersey (see **Figure 1**). Site 34 comprises approximately seven acres and is located near the southern boundary of Picatinny. Site 34 consists of three areas: the Open Burning Area, the Landfilled Area, and the Former Waste Pile Area. The site primarily has been utilized as a burning ground for the burning of explosives and explosives-contaminated material. Burning operations at Site 34 are regulated under interim status within a Resource Conservation and Recovery Act (RCRA) Part B permit.

Site 34 is located in Picatinny Study Area A and is bordered by Green Pond Brook (GPB) to the west and by Phase I RI Study Areas B and C to the north, east, and south. The Picatinny Study Areas are presented as **Figure 2**. **Figure 3** illustrates the location of Site 34 within Picatinny.

1.2 STATEMENT OF BASIS AND PURPOSE

This ROD presents the Selected Remedy for contamination identified at Site 34, which is located within Picatinny, Rockaway Township, New Jersey. The remedial action is selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the greatest extent possible, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Because the operations conducted at Site 34 are regulated under interim status within a RCRA Part B permit, the requirements for RCRA closure are considered in addition to the CERCLA requirements. The New Jersey Department of Environmental Protection (NJDEP), which has the authority for RCRA closure at Picatinny, has agreed to defer the closure of the Burning Ground to the ROD provided the selected remedy meets all applicable closure and post-closure requirements of RCRA Subtitle C (NJDEP, 2000). Decisions regarding the Selected Remedy have been made by the Army and the United States Environmental Protection Agency (USEPA). Comments received from the NJDEP were evaluated and considered in the selection of the final remedy. The information supporting the decisions on the selected remedial action is contained in the administrative record, which is available at the following location:

Environmental Affairs Office
U.S. Army Installation Management Agency Northeast
Regional Office Garrison - Building 319
Picatinny, NJ 07806-5000

The Proposed Plan (PP) associated with this action is available at the information repositories listed in Section 2.3.

The NJDEP concurs with the Selected Remedy. The USEPA has approved the feasibility study (FS) and PP for the site.

1.3 ASSESSMENT OF THE SITE

The current and future land use at Site 34 is for industrial military activities. The response action selected in this ROD is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment. Investigations at this site have determined that hazardous substances are present in surface soil, subsurface soil, and groundwater at concentrations that exceed chemical-specific Applicable or Relevant and Appropriate Requirements (ARARs) or To-Be-Considered criteria (TBC). Because no chemical-specific ARARs exist for soil, New Jersey Nonresidential Direct Soil Cleanup Criteria (NRDCSCC) and human health risk-based criteria were considered as TBCs to ensure the protection of public health and the environment.

1.4 DESCRIPTION OF THE SELECTED REMEDY: CAPPING WITH AN IMPERMEABLE MODIFIED ASPHALT PAVEMENT, LAND-USE RESTRICTIONS, AND ONGOING MONITORING

The remediation of contaminated soil and groundwater at Site 34 is part of a comprehensive environmental investigation and remediation process currently being performed at Picatinny. The Army designated over 150 site numbers to the buildings and surrounding land that supported former production operations. The Army further categorized and prioritized the sites into 16 areas based on the potential for environmental contamination, called Area A (highest priority) through Area P, to ensure systematic and prioritized investigation and cleanup of the sites. The boundaries of Picatinny areas are presented as **Figure 2**.

This ROD addresses impacted soil and groundwater within Site 34 (Area A). The remaining areas in Picatinny are being considered separately and remedies for these areas are presented in separate documents. This document represents the fifth ROD being submitted by the Army for Picatinny. The Army anticipates it will submit many other RODs for Picatinny over the next several years.

The Selected Remedy for Site 34 consists of:

- 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 Land Use Controls.

Following construction of the asphalt cap, long-term monitoring of groundwater and surface water would be conducted to verify protection of human health and the environment until remedial goals (RGs) (or background concentrations) are achieved for groundwater/surface water at the site. However, the implementation of the Selected Remedy for Site 34 will not commence until the current operations at the Burning Ground have ceased.

The Land Use Control (LUC) objectives established for Site 34 include preventing human consumption and contact with groundwater, precluding inappropriate contact with impacted soils, and preventing site access for intrusive work without appropriate unexploded ordnance (UXO) screening precautions. The specifics of LUCs and the specifics of implementing, reporting on, and enforcing LUCs will be described in the Remedial Design (RD). Because contamination will remain on-site, five-year reviews will be performed by the USEPA to evaluate the continued protectiveness of the remedy. Failure to achieve these objectives could lead to unacceptable human exposure to environmental contaminants. If it is determined that the LUCs portion of the remedy has failed, the remedy will be re-examined and, if warranted, changes will be made to the remedy. In accordance with CERCLA guidance, these changes will be documented. The documentation of the changes will be completed in accordance with CERCLA guidance. The RD will detail the provisions and requirements of the LUC portion of this remedy necessary to assure that land use remains safe and appropriate for the level of protection afforded by the remedial action.

The Selected Remedy is protective of human health and the environment, and complies with Federal and State laws that are applicable or relevant and appropriate to the remedial action. The remedial action will be considered complete upon agreement with the USEPA Region 2, Picatinny, and the U.S. Army.

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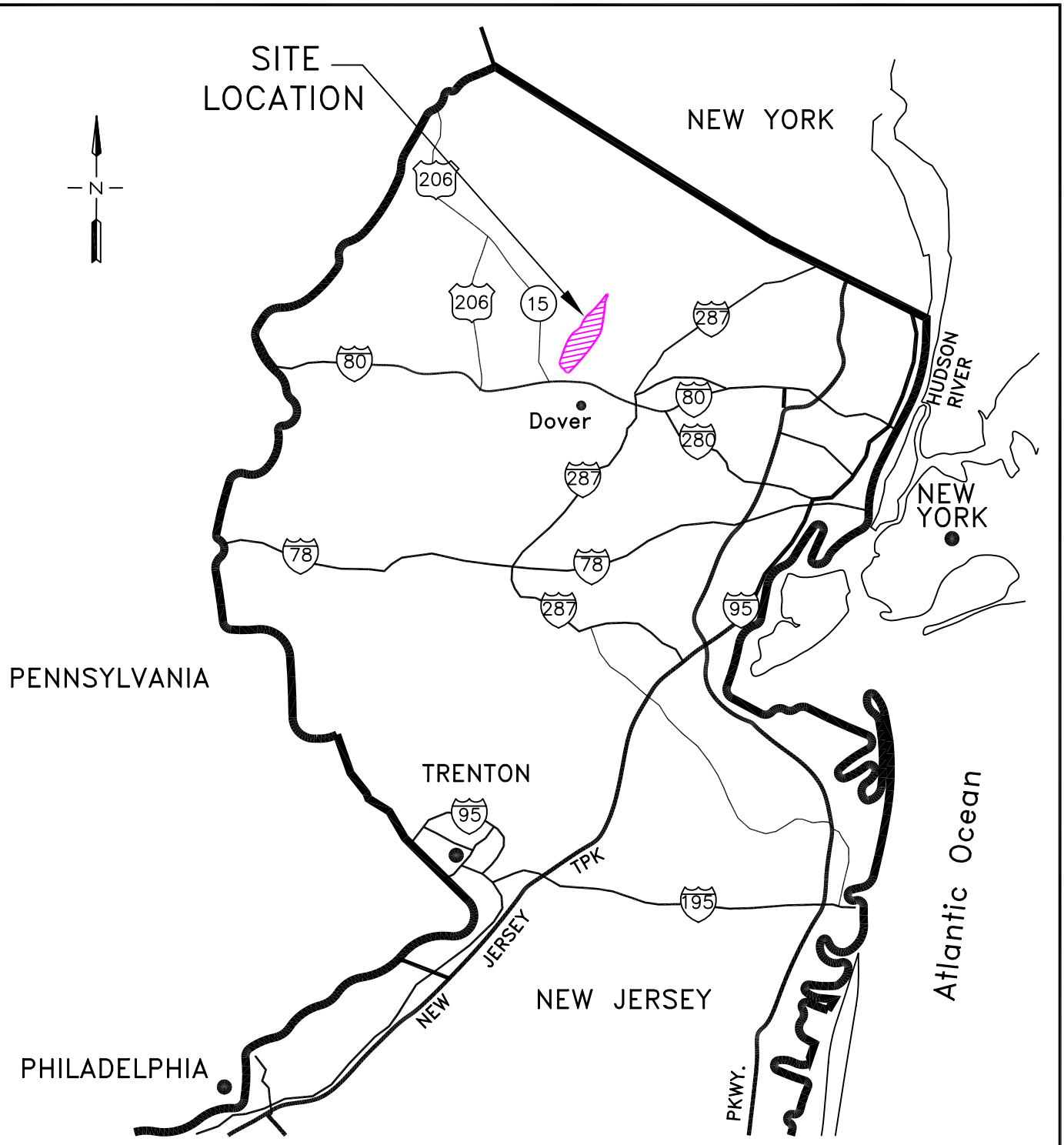

SCALE
0 20 Miles

Picatinny Installation Restoration Program

U.S. Army Corps of Engineers

Shaw Environmental, Inc.

FIGURE No. 1

PICATINNY
SITE LOCATION MAP
SITE 34 ROD
PICATINNY, DOVER, NEW JERSEY

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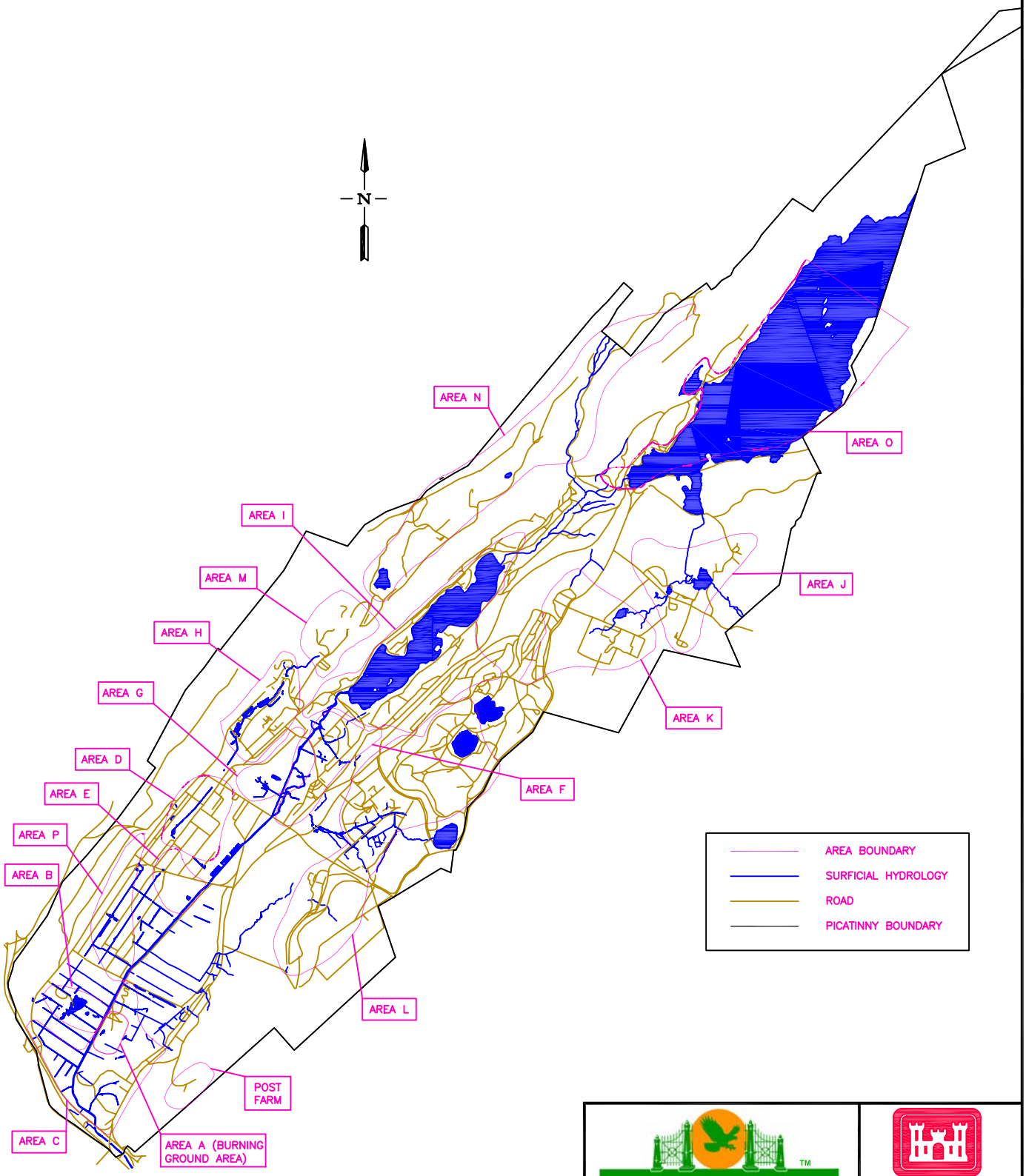

Picatinny Installation Restoration Program

U.S. Army Corps of Engineers

Shaw Environmental, Inc.

FIGURE No. 2

PICATINNY
AREA BOUNDARIES

SITE 34 ROD
PICATINNY, DOVER, NEW JERSEY

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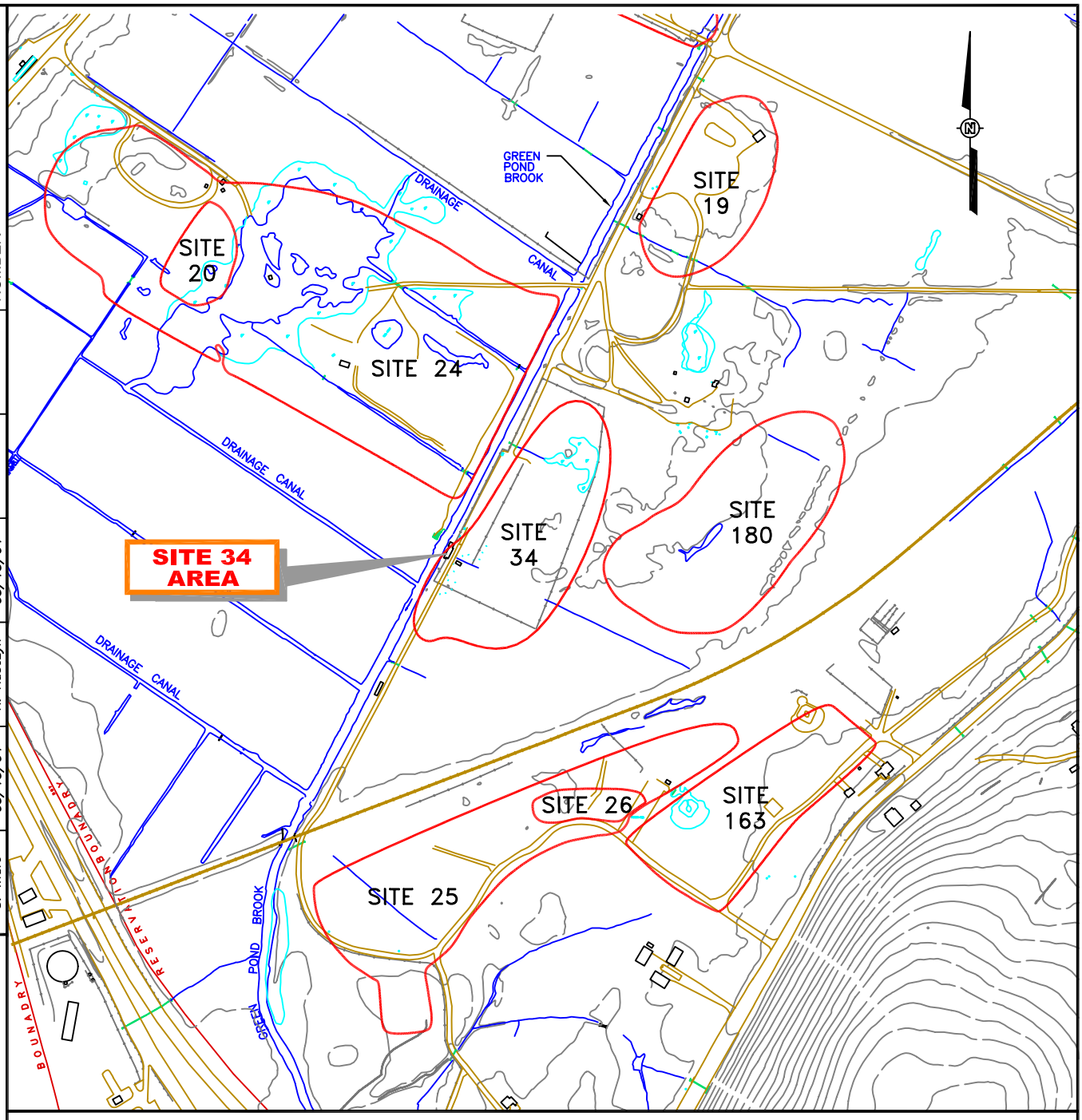

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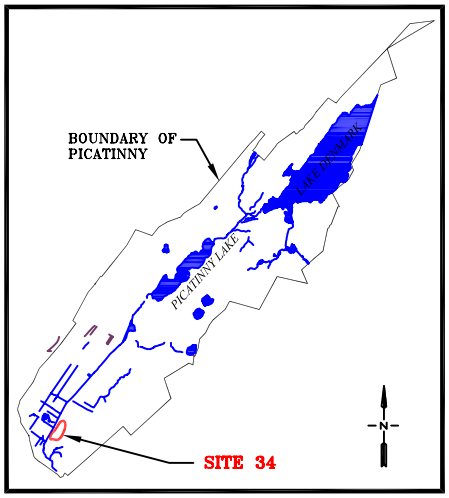

LEGEND

- BLDG. NO. — BUILDING
- BLDG. NO. — FORMER BUILDING
- COVERED WALKWAY
- SWAMPY AREA
- WATER
- RAILROAD
- FENCE
- TR-732 — TRANSFORMER
- BLAST WALL
- ===STS=== OR ---STS--- — STORM SEWER
- ===SS=== OR ---SS--- — SANITARY SEWER
- EARTH MOUND
- CONTOUR LINE

SCALE

0 500 1000 FEET

Picatinny Installation Restoration Program

U.S. Army Corps of Engineers

Shaw Environmental, Inc.

FIGURE No. 3

SITE 34 LOCATION MAP

SITE 34 ROD
PICATINNY, DOVER, NEW JERSEY

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Plotted By: stephen.Wiafe

1.5 STATUTORY DETERMINATIONS

The Selected Remedy is protective of human health and the environment; is compliant with Federal and State ARARs and TBCs; and is cost-effective. The remedy does not satisfy the statutory preference for treatment as a principal element of the remedy because no source materials constituting principal threats were identified at Site 34. However, the Selected Remedy utilizes containment, which ultimately will reduce the mobility of contaminants in soil and prevent direct contact with contaminated soils. Because this remedy will result in hazardous substances remaining on-site above levels that allow for unlimited use and unrestricted exposure, statutory reviews will be conducted every five years after initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment until such time as it may be determined that the site qualifies for unrestricted use. In addition, the selected remedy will meet the closure and post-closure requirements of RCRA Subtitle C.

1.6 ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary (Section 2.0) of this document. Additional information can be found in the Administrative Record for this site.

Criterion	Section	Page Number
Contaminants of Concern and Their Respective Concentrations	2.7.1.1	2-11
Baseline Risk Represented by the Contaminants of Concern	2.7	2-10
Cleanup Levels Established for Contaminants of Concern and the Basis for These Levels	2.7.1.1	2-11
How Source Materials Constituting Principal Threats will be Addressed	2.11	2-33
Current and Reasonably-Anticipated Future Land Use Assumptions and Current and Potential Future Beneficial Uses of Groundwater Used in Baseline Risk Assessment and ROD	2.6	2-10
Potential Land and Groundwater Use that Will Be Available as a Result of the Selected Remedy	2.6	2-10
Estimated Capital, Annual Operation and Maintenance (O&M) and Total Present Worth Costs, Discount Rate, and the Number of Years Over Which the Remedy Cost Estimates are Projected	2.12.3	2-39
Key Factors Leading to Selection of Selected Remedy	2.12	2-33

1.7 AUTHORIZING SIGNATURE

Paul T. Seitz
LTC, MI
Garrison Commander

16 Feb 05
Date

William McCabe, Acting Director
Emergency and Remedial Response Division
U.S. Environmental Protection Agency, Region 2

Date

2.0 DECISION SUMMARY

2.1 SITE NAME, LOCATION, AND DESCRIPTION

This ROD describes the selected action to reduce human health and environmental risks associated with elevated concentrations of select polynuclear aromatic hydrocarbons (PAHs), metals, polychlorinated biphenyls (PCBs), and dioxins/furans in surface soil, and select PAHs and dioxins/furans in subsurface soil at Site 34. Protection of groundwater at the site will be achieved through the implementation of the selected remedial alternative.

Picatinny is a National Priority List (NPL) site and is registered under the CERCLIS number NJ3210020704. The Army is the lead agency for this action. The funding for this action will be provided from the Environmental Restoration, Army (ER, A) account.

Site 34 is located within the southern portion of Picatinny. Picatinny is located approximately four miles north of the City of Dover in Rockaway Township, Morris County, New Jersey. The location of Picatinny is presented on **Figure 1**. Some of the nearby populous areas are Morristown, Morris Plains, Parsippany, Troy Hills, Randolph Township, and Sparta Township. The Picatinny land area consists of 6,491 acres of improved and unimproved land. The installation is situated in an elongated classic U-shaped glacial valley, trending northeast-southwest between Green Pond Mountain and Copperas Mountain on the northwest and an unnamed hill on the southeast. Most of the buildings and other facilities at Picatinny are located on the narrow valley floor or on the slopes along the southeast side.

The remedial alternative that is presented in this ROD was selected by the Army, in partnership with the USEPA, Region 2 and the NJDEP. The remedial action is funded by the U.S. Department of the Army and was selected in accordance with CERCLA as amended by the SARA, the NCP, RCRA, and Army Regulation (AR) 200-1, Environmental Protection and Enhancement, as applicable.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.2.1 Picatinny Background

Picatinny is owned and operated by the U.S. Army. The installation was a major source of munitions for World War I, World War II, the Korean War, and the Vietnam Conflict. During those periods, Picatinny was involved in the production of explosives, rocket and munition propellants, pyrotechnic signals and flares, fuzes, and metal components. Currently, the primary mission of Picatinny is research, development, and engineering of munitions and weapons.

Over the years, environmental investigations into the operations and waste management procedures for Picatinny have indicated the potential for contamination. The facility was included on the NPL in March of 1990.

2.2.2 Site 34 Background

Site 34, also known as the Burning Ground, primarily has been utilized for the burning of explosive and explosive-contaminated material generated at Picatinny. Additionally, the area has been used for landfilling and storage of wastes. Site 34 consists of three main areas (see **Figure 4**):

- Open Burning Area, including the Burning Pan Area,
- Landfilled Area, and
- Former Waste Pile Area.

The majority of the Burning Ground 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 explosives 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 vacuum filtration systems, and explosives-contaminated wastewater treatment sludges and sediment. The pans are lined with different materials that are compatible with the specific types and

burning properties of the wastes to be burned. Materials are placed in the pans with oil and excelsior, and are ignited. These operations are regulated under the interim status within a RCRA Part B permit. After treatment, metal munitions casing material is recycled.

In order to fill the low-lying areas of Site 34, landfilling operations occurred from 1960 to 1980 in the northern portion of the Burning Ground known as the Landfilled Area. "Flashed" metal was stored in the Waste Pile Area until the spring of 1991. Since then, salvageable material has been removed from this area. Residual exposed debris--consisting mainly of cement, bricks, and wood--is evident on the ground in both the Landfill Area and Waste Pile Area.

As a result of former activities conducted at the Burning Ground, a number of investigations were previously conducted at Site 34. These investigations include:

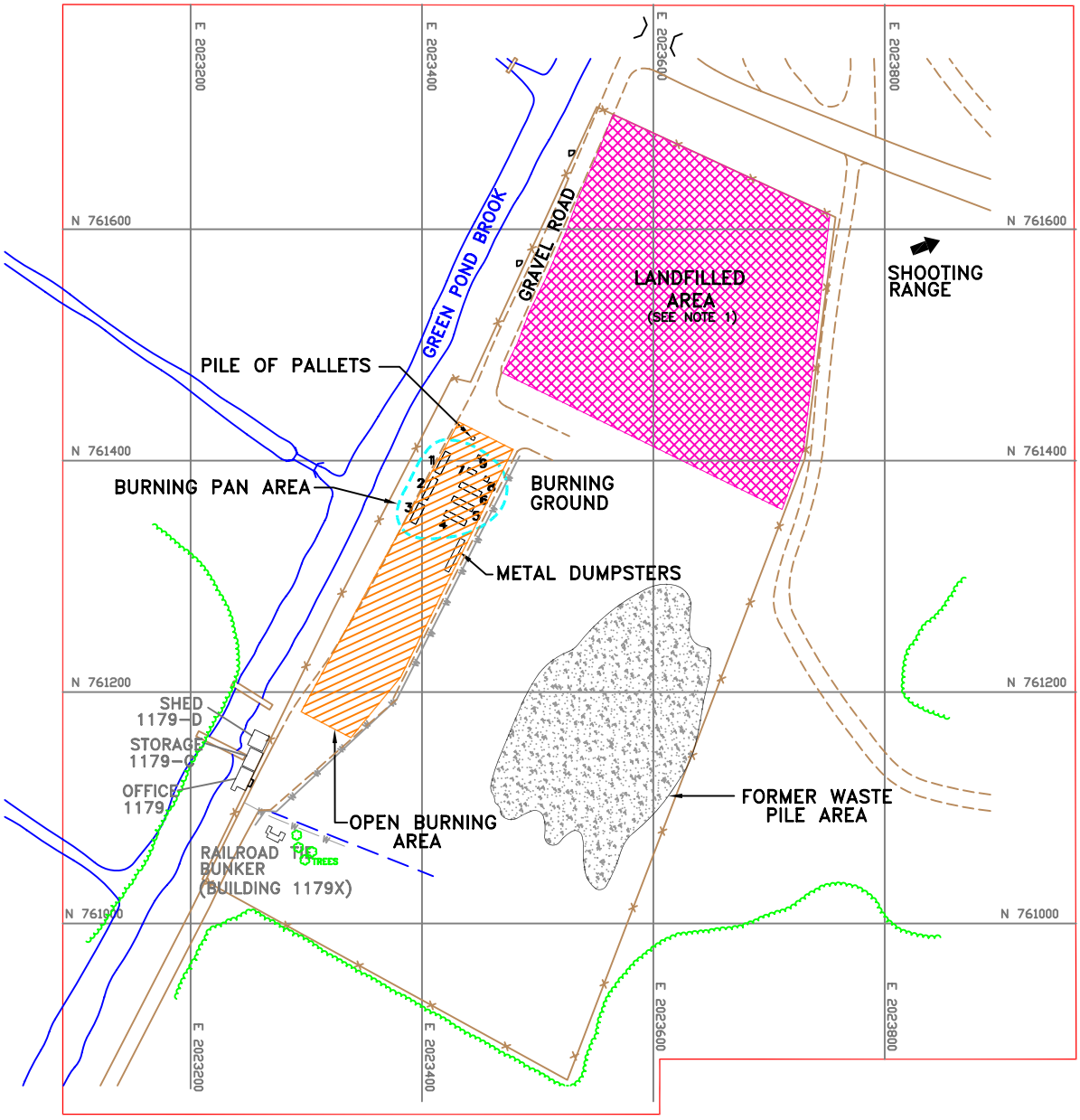
- Surficial Soil Investigation, 1983 [United States Army Environmental Hygiene Agency (USAEHA), 1985]
- Groundwater Investigation, June-November 1984 (USAEHA, 1985)
- Electromagnetic Conductivity Geophysical Survey, 1986 [United States Geological Survey (USGS), 1986]
- Site Investigation (SI), 1987-1989 (Dames and Moore, 1989)
- Air Pollution Assessment, 1989 (USAEHA, 1989)
- Soil Sampling Investigation, January 1990 (USAEHA, 1990)
- Groundwater Quality Investigation, 1989-1990 (USGS, 1990)
- Health Risk Assessment, 1990 (USAEHA, 1990)
- Contamination Assessment (CA), 1990-1991 (Dames and Moore, 1991).
- Remedial Investigation (RI), 1993-1994 (Dames and Moore, 1994)
- Feasibility Study [IT Corporation (IT), 2001b)]
- Site 34 Proposed Plan (Shaw, 2004).

Additionally at the request of the Army, several small investigations were conducted recently to further delineate the extent of soil and groundwater contamination. Additional groundwater samples were collected in 1999 and 2003 from monitoring wells installed at Site 34, and additional surface soil samples were collected from the Burn Pan Area (located within the Open Burning Area) in 2002. In total, 107 surface soil samples and 23 subsurface soil samples were collected from Site 34 as part of the CA, RI, and several small delineation investigations. The majority of data generated has been collected as part of these investigations. Groundwater samples were collected from 17 monitoring wells during two rounds of monitoring in June 1993 and September 1993. Additionally, ten wells which had elevated metals concentrations during previous sampling events were sampled in June 1999 and eight wells were sampled in December 2003.

Additional information regarding the site history and analytical results of the above referenced investigations are presented as part of the *Burning Ground Contamination Assessment* (Dames & Moore, 1991), the *Picatinny Arsenal Burning Ground Remedial Investigation Report* (Dames and Moore, 1994), the *Picatinny Arsenal Site 34 Feasibility Study* (IT, 2001b), and the *Picatinny Arsenal Site 34 Proposed Plan* (Shaw, 2004).

2.2.3 Enforcement Activities

No formalized enforcement activities have occurred at Site 34. Picatinny is working in cooperation with the USEPA and NJDEP to apply appropriate remedies that will preclude the necessity of formalized enforcement actions, such as Notices of Violation.



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S. Wiafe 05/16/04	K. Rusczyk 05/16/04	-- -- --	B34051604.dwg

LEGEND

- BLDG. NO. — BUILDING
- BLDG. NO. — FORMER BUILDING
- WATER
- ROAD
- COVERED WALKWAY
- FENCE
- TREELINE

NOTES:

1. LANDFILL AREA CONSISTS OF PREDOMINANTLY FILL EARTH THAT WAS EXTENDED INTO HISTORICAL WETLANDS AREAS.

SCALE

0 150 300 FEET

Picatinny Installation Restoration Program

U.S. Army Corps of Engineers

Shaw Environmental, Inc.

FIGURE No. 4

BURNING GROUND SITE MAP

SITE 34 ROD
PICATINNY, DOVER, NEW JERSEY

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Plot Date/Time: Feb 02, 2005 - 3:03pm
Plotted By: stephen.Wiafe

2.3 COMMUNITY PARTICIPATION

The Army has involved the public in the CERCLA process at Site 34 through public notification of the proposed remedy and through numerous updates and presentations to the Picatinny Environmental Restoration Advisory Board (PAERAB). The results of the Site 34 FS were presented to the PAERAB on 06 September 2001. Prior to the existence of the PAERAB, the public was kept informed through the Technical Review Committee (TRC). Site 34 was discussed at the following TRC meetings: 19 July 1989, 17 January 1990, 04 April 1990, 17 July 1990, 16 October 1991, 17 February 1993, 12 May 1993, 11 July 1993, 08 November 1993, 16 February 1994, 15 June 1994, 02 September 1994, 14 December 1994, and 05 April 1995.

PAERAB members have provided comments regarding the selected remedial alternative. Courtesy copies of the PP were given to the PAERAB's co-chair, and were offered to any PAERAB member who requested one. A final PP for Site 34 was completed and released to the public in February 2004 at the information repositories listed below:

Environmental Affairs Office
U.S. Army Installation Management Agency Northeast
Regional Office Garrison - Building 319
Picatinny, NJ 07806-5000

Rockaway Township Library
61 Mount Hope Road
Rockaway Township, NJ 07866

Morris County Library
30 East Hanover Ave
Whippany, NJ 07981

Multiple newspaper notifications were made to inform the public of the start of the Proposed Plan comment period, solicit comments from the public, and announce the date of the public meeting. The notification was run in both the New Jersey Star-Ledger and the Daily Record on 06 February 2004 and 13 February 2004. A public comment period was held from 06 February 2004 to 08 March 2004 during which comments from the public were received. A public meeting was held on 19 February 2004, to inform the public about the Selected Remedy for Site 34 and to seek public comments. At this meeting, representatives from the U.S. Army, NJDEP, USEPA, and the U.S. Army Corps of Engineers (USACE) were present to answer questions about the site and the eight alternatives under consideration. The Army's response to comments received at the public meeting, as well as those submitted by other means, is included in the Responsiveness Summary, Section 3.0 of this document.

2.4 SCOPE AND ROLE OF RESPONSE ACTION

As outlined in the Installation Restoration Program (IRP) at Picatinny, the overall environmental cleanup goal is to protect human health and the environment by eliminating or reducing to prescribed, safe levels, any potential risks caused by Picatinny's past activities. The remediation of Site 34 is part of a comprehensive environmental investigation and remediation process currently underway to meet the IRP goals at Picatinny. Presently, Picatinny has two signed RODs. The Army intends to submit numerous RODs for other sites at Picatinny in the coming years.

This ROD addresses the selection of the remedial action for Site 34. Because certain current operations at Site 34 are regulated under RCRA, the requirements for RCRA closure are incorporated with the CERCLA requirements. Currently, burning operations at Site 34 are regulated under interim status. The Army submitted to NJDEP a RCRA Part B, Subpart X permit application in 1992 and a response to Notice of Deficiency (NOD) in 1994. The response to the NOD indicated that remedial actions and groundwater issues would be addressed under the CERCLA program. The State of New Jersey has agreed (via a correspondence dated 08 May 2000) to defer the closure of the Burning Ground to the ROD provided the selected remedy meets all applicable closure and post-closure requirements of RCRA Subtitle C.

The contaminants of concern (COCs) at Site 34 have been identified as select PAHs [benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-

cd)pyrene], metals (arsenic, cadmium, copper, and lead), PCBs, and dioxins/furans in surface soil. Because these COCs were determined to be widespread across the site, the area of attainment (AA) for surface soil is approximately 4.9 acres. An AA is identified as the area over which remedial action objectives (RAOs) and RGs are to be obtained. The surface soil AA includes the entire Burning Ground Area enclosed within the fence line and a portion of adjacent Site 180. The actual volume of soil impacted at Site 180 has not been calculated as part of the total soil volume. Therefore, the total volume of soil contained under the cap ultimately will increase. Four PAHs [benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenz(a,h)anthracene] and dioxins/furans were identified as subsurface soil COCs. Areas where detections exceeded RGs in subsurface soils were relatively small compared to the entire site. The volume of subsurface soil impacted by PAHs and dioxins/furans is approximately 880 cubic yards (CY). The subsurface soil AAs include former sampling locations soil boring BO34-5 and test pit TR34-1. Because groundwater at Site 34 is not adversely impacting the surface water of GPB or used as a source of potable water, COCs were not identified for this media type. However, protection of groundwater is a RAO of the preferred remedy because the potential for a continued source to impact groundwater exists.

Based on the COCs and AAs identified at Site 34, the Army developed and evaluated eight remedial alternatives as part of the FS. The remedial alternatives included: no action, institutional controls (ICs), capping with an impermeable multilayer cap, capping with an impermeable modified asphalt pavement, partial removal and disposal of contaminated soil, in situ and ex situ treatment of impacted soil, and total removal and disposal of contaminated soil. The remedial alternative that has been selected to protect human health and the environment at Site 34 consists of capping impacted soils with an impermeable modified asphalt cap, land use restrictions, and long-term groundwater and surface water monitoring. The containment of contaminated soil will prevent further migration of contaminants or erosion of surface soil. Specific elements of the remedy will include:

- The capping of all impacted soils and debris where contaminants are found at levels above RGs. The cap will be constructed using modified ultra-low permeability asphalt pavement. Field data collected as part of previous studies have demonstrated asphalt impermeability, durability, and longevity. The product objective for reducing permeability is $1X10^{-8}$ centimeters per second (cm/s).
- Installation of one additional monitoring well in the vicinity of the Burn Pan Area.
- Long-term groundwater and surface water monitoring.
- Maintenance and periodic inspections of the cap to ensure the continued protectiveness of the cap.
- Land use restrictions and LUCs.

The groundwater and surface water monitoring programs will provide long-term assurance of the protectiveness of the remedy until the RAOs are achieved. The monitoring program also will comply with RCRA requirements under Subpart F, 40 CFR 265.90-94 and will meet the RCRA Subtitle C closure and post-closure requirements. The long-term monitoring program will be reviewed at a minimum of every five years to determine if the program is adequately monitoring the effectiveness of the remedy and if any modification to the remedy or monitoring program is necessary. In the RD, trigger levels will be established for target analyte list (TAL) metals to indicate the need to either modify the remedy, modify the sampling program, or discontinue the sampling program. Any of the three scenarios would require concurrence from the USEPA and NJDEP. Additionally, if the remedy is shown to be failing and an alternate remedy or more aggressive remedy is necessary, the selection of the alternate remedy would be documented in the administrative record. The documentation will be performed in accordance with CERCLA guidance.

2.5 SITE CHARACTERISTICS

2.5.1 Conceptual Site Model

A conceptual site model has been developed for the soil contamination associated with the Open Burning Area, Landfilled Area, and Former Waste Pile Area at Site 34. As a result of previous site

activities that once occurred within these areas, concentrations of select PAHs, metals, PCBs, and dioxins/furans have impacted the surface and subsurface soil at the site. Contaminants initially identified in soil were likely transported to groundwater through infiltration of surface runoff. Contaminants present in groundwater could potentially be transported by advection towards adjacent GPB, where groundwater eventually discharges to surface water.

The need for construction or excavation activities within these areas of Site 34 may cause exposure to contaminated surface and subsurface soils. Through such soil disturbance activities, contaminated soils may become airborne and transported as dust particles via the wind. However, because the site mostly consists of hard-packed gravel and grass-covered areas, this transport process is unlikely except during construction or soil disturbance activities. **Figure 5** presents a graphical representation of the Site 34 conceptual site model.

2.5.2 Physical Characteristics

2.5.2.1 Topography/Surface Water Hydrology

Site 34 is located near the southern boundary of Picatinny, within the 100-year floodplain of GPB. The topography of the site has little relief, with an average elevation of 688.5 feet (ft) above mean sea level (msl). Site 34 consists of low-lying reclaimed, marshy wetlands; there is approximately 1 foot of vertical relief across the site. The land surface in the western portion of the site slopes toward GPB and the eastern portion of the site is flat.

GPB is located adjacent to and west of Site 34 and flows to the southwest. The brook discharges to the Rockaway River, approximately 1 mile southeast of the Picatinny boundary. In the vicinity of Site 34, GPB is approximately 25 ft wide and 2 to 3 ft deep. Dense vegetation covers both banks of the brook. Additionally within this area, groundwater discharges to GPB. GPB is the receptor for groundwater discharge of the shallow unconfined aquifer that passes under Site 34. Groundwater within this aquifer is typically less than 10 feet from the surface (Sargent et al., 1986). Thus, GPB is a point of compliance for determining the effectiveness of any remedy.

Two intermittent drainage ditches are located in the southern and northern portions of the site. Both ditches drain into GPB. The southern ditch utilizes a conduit located underneath Building 1179. These two ditches drain the western portion of the site. Due to the low relief of the eastern portion of Site 34 and the lack of developed drainage, the eastern area tends to stay wet except during extremely dry periods.

2.5.2.2 Surface and Subsurface Features

Site 34 encompasses approximately 7 acres. The entire area is enclosed by a 6-foot-high chain-link fence, with gates at the northeast and southwest ends. A gravel road runs parallel to GPB inside the fence line. An office building, two storage sheds, and a bunker (used during burning operations) are located in the southwest corner of the site. Additionally, there are nine large metal burning pans on concrete supports in the Open Burning Area.

Land adjacent to Site 34 includes both undeveloped land and areas used for recreational activities (i.e., recreational skeet range and hunting areas). GPB flows to the southwest along the western side of the site.

The area currently occupied by Site 34 is historically a forested wetland. Landfilling of debris and the construction of drainage ditches have significantly modified the land surface. The area was filled to increase usable land. The southern extent of Site 34 and the eastern extent of the adjacent site (Site 180) comprise a pushout zone, which includes common fill and building debris. There is no historic information regarding the nature of all of the material placed in this general location. However, multiple investigative trenches and test pits have been completed in the area. Test pit and trenching investigations have shown the bulk of the material to be composed of building debris and fill. Test pits installed within the boundaries of Site 34 have not uncovered UXO. However, during the trenching investigation of Site 180 conducted on the east side of the Burning Ground, UXO, asbestos containing material, crushed drums, and building debris were discovered.

2.5.2.3 Geology and Soils

The geology at Site 34 was inferred from the installation of soil borings and monitoring wells during the RI. Seven soil borings were drilled (up to a depth of 8 feet) within the site boundary. In addition, 20 monitoring wells were installed along the perimeter or within the vicinity of Site 34. The top and bottom of the screened intervals of the monitoring wells range in depth from 8 to 188 ft below ground surface (bgs). All wells are screened above bedrock in the overlying glacial sediment. Lithologic data obtained from boring logs of these wells were used to construct geologic cross sections as part of the *Picatinny Arsenal Phase I Remedial Investigation Report* (Dames and Moore, 1998).

The total thickness of the unconsolidated glacial overburden ranges up to approximately 210 feet. Information from the boring logs indicates the presence of a surficial fill layer that varies in thickness from 2 to 5 feet. The fill material consists of mottled organic sand and silt. It overlies a peat layer that is approximately 2 to 3 feet thick and represents the original land surface before filling and development activities. Underlying the peat layer are interbedded sand, clay, and silt layers, which are approximately 20 to 30 feet thick. High-energy deposits of sand are located along GPB. These deposits grade from high-energy sands to mainly low-energy silts and clays. Underlying the sand, clay, and silt layers are intermixed layers of sand, silt, clay, gravel, and cobbles. The thickness of the glacial sediment was determined using data from monitoring well MW34-1, which was advanced to a depth of 188 feet.

Bedrock at the site is the Leithsville formation, which consists of fine-grained, medium-gray dolomite (USGS, 1993). It is highly fractured and weathered at the bedrock-overburden interface (approximately 210 feet bgs). The dolomite weathers to a clay that fills the fractures in the bedrock.

2.5.2.4 Hydrogeology

Geologic information obtained from boring logs of 20 monitoring wells installed along the perimeter or in the vicinity of Site 34 was used to interpret the geology of the site. Three hydrogeologic units are identified within the glacial sediment:

- The first unit is the shallow unconfined glacial aquifer, which can be described as organic sands, silt, and peat layers. This aquifer is approximately 10 to 30 feet thick.
- The second unit (the upper semiconfined glacial aquifer) is predominantly composed of interbedded silts and clays. It consists of several intermixed and interbedded clay, clay and silt, and silt beds, varying in thickness from 5 to 20 feet. These layers are encountered between 5 and 60 feet bgs.
- Because the upper semiconfined glacial aquifer consists of multiple interbedded layers rather than a single uniform layer, there is a possibility of interconnections between the first unit and the third unit, the lower semiconfined glacial aquifer. This aquifer is encountered from 40 to 60 feet bgs to the bedrock interface (up to 210 feet bgs) and consists of interbedded sand, silt, gravel, clay, and boulders.

The average hydraulic conductivity in the shallow unconfined glacial aquifer was estimated, through interpretation of the slug tests performed during the RI, to be 884 feet per year (ft/yr). The average hydraulic conductivity of the lower semiconfined glacial aquifer was estimated to be 1,022 ft/yr, with a horizontal hydraulic gradient in September 1993 ranging from 0.002 to 0.005 for the shallow unconfined aquifer and approximately 0.005 for the lower semiconfined aquifer. Assuming a porosity of 25 percent, horizontal groundwater flow velocities are estimated to range from about 7 to 18 ft/yr in the shallow unconfined glacial aquifer and about 20 ft/yr in the lower semiconfined aquifer. Data from June 1999 indicates a steeper average horizontal hydraulic gradient of 0.007 in the shallow unconfined glacial aquifer, resulting in an estimated groundwater flow velocity of about 25 ft/yr.

With these data, it is estimated that groundwater in the shallow unconfined glacial aquifer will move beneath Site 34 in approximately 19 to 48 years. Groundwater in the lower semiconfined glacial aquifer is estimated to move beneath Site 34 in about 18 years. Estimates of hydraulic conductivity and groundwater flow velocity are not available for the upper semiconfined glacial aquifer, because no slug tests were performed on wells screened in this aquifer. However, water level measurements indicate groundwater flow in both aquifers is toward GPB.

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CHECKED BY K. Rusczyk 05/19/04
APPROVED BY K. Rusczyk ---
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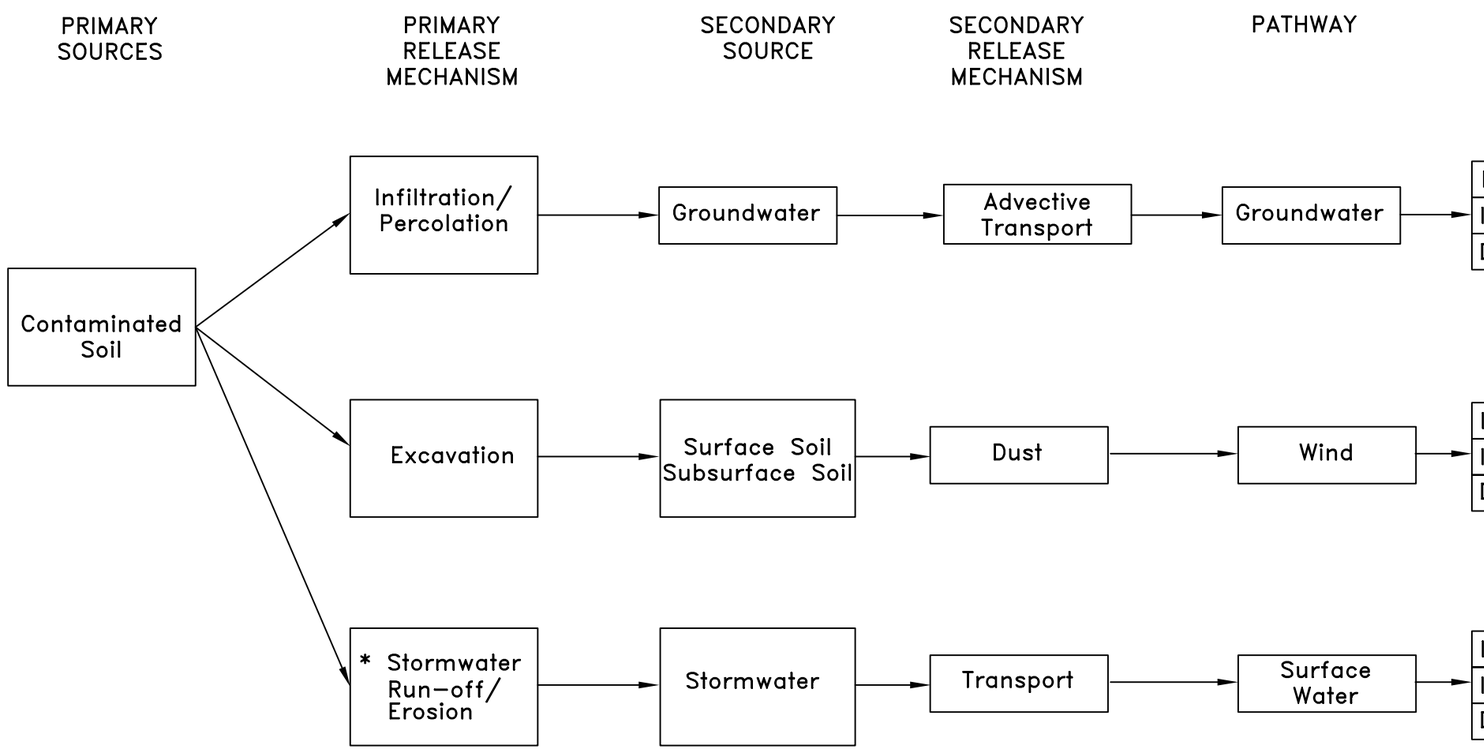

	Future Commercial/ Industrial Workers
Ingestion	●
Inhalation	
Dermal Contact	

	Current Site Workers	Future Commercial/ Industrial Workers (Shallow Soil)	Future Commercial/ Industrial Workers (Total Soil)
Ingestion	●	●	●
Inhalation	●	●	●
Dermal Contact	●	●	●

	Current Site Workers	Future Commercial/ Industrial Workers (Shallow Soil)	Future Commercial/ Industrial Workers (Total Soil)
Ingestion	●	●	●
Inhalation	●	●	●
Dermal Contact	●	●	●

*Note: – This exposure pathway is unlikely to trigger unacceptable risk to either receptor population. However, surface water exposure was not evaluated as part of the Site 34 HHRA.

Exposure routes shown in this model demonstrate possible exposure scenarios, and do not represent the expectation that receptors will be exposed to contaminants. It should also be noted that the Institutional Controls in place would preclude many of the possible exposure scenarios shown herein.

Picatinny Installation Restoration Program

U.S. Army Corps of Engineers

Shaw Shaw Environmental, Inc.

FIGURE 5
CONCEPTUAL SITE MODEL
FOR POTENTIAL HUMAN EXPOSURE
PATHWAYS AT SITE 34
SITE 34 ROD
PICATINNY, DOVER, NEW JERSEY

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Plot Date/Time: Feb 02, 2005 - 3:15pm
Plotted By: stephen.Wiafe

2.5.3 Summary and Findings of Site Investigations

Several environmental investigations have been conducted at Site 34 yielding a significant amount of analytical data. The majority of data generated has been collected as part of the CA, RI, and several small delineation investigations. As part of these investigations, a total of 107 surface soil samples, 23 subsurface soil samples, 3 surface water and sediment samples, and 52 groundwater samples were collected at Site 34. The delineation investigations were conducted at the request of the Army between 1999 and 2003 and included the collection of 30 additional surface soil samples and 18 additional groundwater samples. The soil samples were collected along the perimeter of the site to delineate the extent of soil contamination in preparation for the final placement of the impermeable asphalt cap. Additional groundwater samples were collected from monitoring wells during two sampling events. Ten samples were recollected in June 1999 from monitoring wells that had elevated metals concentrations during previous sampling events conducted in June and September of 1993. Because several years had passed since the previous groundwater monitoring event, eight wells were sampled in December 2003 for informational purposes. A brief summary of the analytical results is provided by media type in the following subsections. Detailed discussions of historical data are included as part of the *Burning Ground Contamination Assessment* (Dames & Moore, 1991), the *Picatinny Arsenal Burning Ground Remedial Investigation Report* (Dames and Moore, 1994), and the *Picatinny Arsenal Site 34 Feasibility Study* (IT, 2001b).

2.5.3.1 Surface and Subsurface Soil

PAHs, metals, PCBs, and dioxins/furans were identified in surface and subsurface soil samples collected as part of the CA, RI, and delineation investigations. The majority of detections were identified in samples collected from the Former Waste Pile Area. Seven PAHs were identified within this area at concentrations exceeding soil criteria. However, more widespread occurrences of PAHs were identified in the southern portion of the site. The maximum concentration of total PCBs in surface soil [18 milligrams/kilogram (mg/kg)] and the highest concentrations of dioxins/furans in subsurface soil (range of 0.000021 mg/kg to 0.025 mg/kg) were detected in two borings drilled in the Former Waste Pile Area. Dioxin/furan concentrations generally decreased with depth.

Metals exceedances (arsenic, cadmium, copper, and lead) also were widespread throughout Site 34. Maximum detected concentrations of arsenic and cadmium were identified in samples collected from the Former Waste Pile Area. Copper and lead were detected at their highest concentrations in the Open Burning Area and the Burn Pan Area, respectively.

2.5.3.2 Surface Water and Sediment

Surface water and sediment samples were collected from GPB during the 1993 RI at locations upstream of Site 34, immediately adjacent to Site 34, and downstream of Site 34. A total of ten metals were detected in surface water and sediment samples. Iron was the only compound identified at levels above surface water criteria. No consistent pattern describes the distribution of these metals in GPB sediment. The highest concentrations of cadmium and copper were detected in sediment upstream of the site. Antimony, chromium, nickel, and zinc were detected at similar concentrations at sediment sampling locations upstream of and adjacent to the site. Iron, lead, mercury, and silver were detected at maximum concentrations either adjacent to or downgradient of Site 34 suggesting a possible impact.

2.5.3.3 Groundwater

Groundwater samples were collected during four sampling events from monitoring wells installed in the unconfined glacial aquifer, semiconfined glacial aquifer, and in the lower unit of the semiconfined glacial aquifer. Analytical results of the 1993 monitoring indicated that metals were detected in samples collected from each aquifer. Additionally, one semi-volatile organic compound (SVOC) was identified in the upper semiconfined aquifer. Aluminum, iron, lead, and manganese were detected above ARARs in all three aquifers. Arsenic, copper, and sodium had concentrations that exceeded these comparison criteria in the unconfined aquifer.

Analytical results from the monitoring conducted in June 1999 showed that metals concentrations were greatly reduced compared to results from 1993. The low-flow groundwater techniques used in the 1999 monitoring are thought to account for the difference. Samples obtained using low-flow techniques

are considered more representative of the constituent concentrations present in the ambient groundwater. Concentrations of manganese exceeded the ARAR value in nine out of the ten wells sampled in June 1999. Lead and arsenic were identified above these groundwater comparison criteria in two and five monitoring wells, respectively.

The last groundwater monitoring sampling event was conducted in December 2003 to monitor constituents in groundwater. Twenty of twenty-three TAL metals were detected, but only five metals (aluminum, arsenic, iron, lead, and manganese) exceeded groundwater comparison criteria.

2.5.3.4 Characterization of COCs

Contaminants identified as COCs in surface soil at Site 34 include five PAHs [benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene], four metals (arsenic, cadmium, copper, and lead), total PCBs, and dioxins/furans. Subsurface soil COCs identified at Site 34 include four PAHs [benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenz(a,h)anthracene] and dioxins/furans. COCs were not identified in groundwater, surface water, or sediment at Site 34. However, protection of groundwater is a RAO of the preferred remedy because the potential for a continued source to impact groundwater exists. Additional information regarding Site 34 COCs is presented in Section 2.7.1.1 of this document.

2.6 CURRENT AND POTENTIAL FUTURE LAND USES

Site 34 is undeveloped, aside from the presence of the three small on-site support buildings and nine elevated metal burn pans. The site is enclosed by a 6-foot-high-chain link fence. Currently, burning operations are conducted at Site 34. These operations are regulated under the interim status within a RCRA Part B permit. The Army has constructed an explosives waste incinerator at Picatinny designed to replace the Burning Ground. However, operations at the incinerator cannot begin until the results of the trial burn are accepted by the NJDEP. As a result, operations at Site 34 will continue until the successful permitting and start-up of the incinerator. Once current operations at Site 34 have ceased, the future land use of the area is expected to be for industrial use not requiring the construction of permanent structures or any type of excavation. Examples of possible future use would include vehicle/equipment staging and storage.

The current usage of site surface waters and groundwater are limited. The surface waters of GPB currently support fish and wildlife populations throughout Picatinny. The potential for environmental contamination in GPB has been examined by the Army. All of GPB has been evaluated and cleanup of some sections of the brook is being addressed under a separate ROD. Recreational activities that surround GPB are restricted, as swimming and fishing are not permitted in this stretch of the brook. Groundwater use at the site has been limited by the NJDEP, which has declared the entire Picatinny Installation as a Classification Exception Area (CEA). A CEA assignment is made where the State is aware that groundwater impacts have made groundwater use limited or unsafe for human consumption. This designation will remain in effect until groundwater beneath the site meets State aquifer standards. Thus, the future use of site surface water and groundwater is not expected to change from current usage.

The area surrounding Site 34 includes Sites 19, 20/24, 25, and 180. Sites 20/24 and 25 currently support the laser guidance mission. Additionally, a soil cap has been constructed at Site 20/24, and the site also is used for intermittent pyrotechnic testing. Sites 19 and 180 are currently inactive, and both sites are used for hunting. The future use of the adjacent sites is not expected to change from current usage.

2.7 SUMMARY OF SITE RISKS

Site 34 has been the subject of several investigations, including risk assessments designed to evaluate potential impacts to human health and the environment. A human health risk assessment and an ecological risk assessment were performed at Site 34 as part of the *Picatinny Arsenal Burning Ground Remedial Investigation Report* (Dames and Moore, 1994) and the *Picatinny Arsenal Phase I Remedial Investigation Report* (Dames and Moore, 1998). As detailed further in the human health and ecological risk sections, receptors were selected to evaluate chemical exposure to shallow soil, total soil (shallow and subsurface soil), and groundwater. The results of each assessment are presented in the following subsections.

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

2.7.1 Human Health Risk Assessment

To determine whether a remedial action is warranted, USEPA requires a baseline human health risk assessment (HHRA) be conducted for each site. The baseline human health risk assessment affords the following: estimates what risks and hazards the site poses if no action were taken, calculates estimates of excess cancer risk and non-carcinogenic hazards, provides the basis for taking action, and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the results of the baseline HHRA for Site 34.

The baseline HHRA evaluated the carcinogenic risk and noncarcinogenic hazard at Site 34 for two populations: current site workers and future commercial/industrial workers. The total carcinogenic risk from exposure to shallow soil (0-1 foot bgs) for current site workers was calculated as $3.4X10^{-5}$, which falls within the NCP target risk range of concern ($1X10^{-4}$ to $1X10^{-6}$) used to establish the need for remediation. Specific responses for sites exhibiting elevated cancer risks between $1X10^{-4}$ (one person in 10,000) and $1X10^{-6}$ (one person in 1,000,000) are discussed in the NCP. This risk was primarily due to dermal absorption of PCBs and dioxins/furans. Ingestion of select PAHs accounted for the remainder of the risk. The total noncarcinogenic hazard was computed as 0.42, which is less than the criterion of 1.0 used to establish the need for remediation. A hazard index (HI) of greater than 1.0 indicates that the exposure level exceeds the protective level for that particular chemical. HHRA calculations for shallow soil are summarized in **Table 2-1**. It should be noted that the contaminants summarized in **Table 2-1** are either COCs for Site 34 or those chemicals that are significant contributors to the overall risk (cancer risk higher than $1X10^{-6}$ or HI greater than 1.0).

The total carcinogenic risks to future workers from exposure to shallow soil and groundwater ingestion were calculated as $3.4X10^{-4}$ and $2.0X10^{-4}$, respectively. This risk in shallow soil is primarily due to dermal absorption of PCBs and dioxins/furans. The total noncarcinogenic hazards for future workers from exposure to shallow soil and groundwater were calculated as 1.3 and 1.5, respectively, both of which slightly exceed the USEPA criterion of 1.0. However, the majority of the total hazard stems from groundwater ingestion, which is unlikely to occur. HHRA calculations for shallow soil and groundwater are summarized in **Table 2-1**.

The total carcinogenic risk to future workers from exposure to total soil (0-8 feet bgs) was $2.4X10^{-4}$, which exceeds the USEPA upper-bound criterion of $1X10^{-4}$. Eighty-three percent of the risk in total soil was found to be associated with dermal absorption of PCBs, and dioxins/furans, though it should be noted that PCBs were not detected in subsurface soil samples. Ingestion of select PAHs and inhalation of chromium accounted for the remainder of the risk. The total noncarcinogenic hazard for future workers from exposure to total soil was 0.92. HHRA calculations for total soil are summarized in **Table 2-1**.

In summary, PCBs and dioxins/furans were identified as the primary risk drivers for shallow and total soil (surface and subsurface soil) at Site 34. Select PAHs and chromium also contributed to a portion of the risk in the future risk scenario for the commercial/industrial worker. As a result, the information acquired through the baseline HHRA was used in part to determine the list of COCs. The criteria utilized to develop the list of COCs are further summarized in Section 2.7.1.1.

2.7.1.1 Identification of COCs

COCs were developed for surface and subsurface soil as part of the *Picatinny Arsenal Site 34 Feasibility Study* (IT, 2001b). COCs were not explicitly derived for groundwater at the site because groundwater has not adversely impacted the surface waters of GPB, nor is it being used as a source of potable water. Analytical results of previous groundwater sampling events indicated that only five metals (aluminum, arsenic, iron, lead, and manganese) were identified above ARARs. These metals concentrations were considered moderate, and a certain percentage of the concentration likely were a result of naturally occurring background concentrations. Because the potential for a continued source to impact groundwater exists, protection of groundwater from infiltration of impacted soils will be a RAO of the selected remedial alternative. Additionally, a long-term groundwater and surface water monitoring

Table 2-1
Risk Characterization Summary

Scenario Exposure: Current
Receptor Population: Site Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Shallow Soil	Benz(a)anthracene	7.8E-08	6.9E-10	NA	7.9E-08
		Shallow Soil	Benzo(a)pyrene	3.4E-07	3.1E-09	NA	3.4E-07
		Shallow Soil	Benzo(b)fluoranthene	6.8E-08	6.1E-10	NA	6.9E-08
		Shallow Soil	Dibenz(a,h)anthracene	6.5E-08	5.8E-10	NA	6.6E-08
		Shallow Soil	Indeno(1,2,3-cd)pyrene	2.4E-08	2.2E-10	NA	2.4E-08
		Shallow Soil	Arsenic	1.7E-07	1.6E-08	NA	1.9E-07
		Shallow Soil	Cadmium	NA	2.3E-08	NA	2.8E-08
		Shallow Soil	Chromium	NA	4.3E-07	NA	4.3E-07
		Shallow Soil	Copper	NA	NA	NA	NA
		Shallow Soil	Lead	NA	NA	NA	NA
		Shallow Soil	PCBs – Total	7.1E-07	NA	1.1E-05	1.2E-05
		Shallow Soil	Dioxins/Furans	1.4E-06	NA	1.9E-05	2.0E-05
						Total Risk =	**3.4E-05**

Scenario Exposure: Future
Receptor Population: Commercial/Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Shallow Soil	Benz(a)anthracene	1.4E-06	1.2E-08	NA	1.4E-06
		Shallow Soil	Benzo(a)pyrene	6.1E-06	5.5E-08	NA	6.2E-06
		Shallow Soil	Benzo(b)fluoranthene	1.2E-06	1.1E-08	NA	1.2E-06
		Shallow Soil	Benzo(k)fluoranthene	7.8E-07	7.0E-09	NA	7.9E-07
		Shallow Soil	Chrysene	1.2E-07	1.0E-09	NA	1.2E-07
		Shallow Soil	Dibenz(a,h)anthracene	1.2E-06	1.0E-08	NA	1.2E-06
		Shallow Soil	Indeno(1,2,3-cd)pyrene	4.4E-06	3.9E-09	NA	4.4E-06
		Shallow Soil	Arsenic	3.1E-06	2.8E-07	NA	3.4E-06
		Shallow Soil	Beryllium	6.9E-07	1.4E-08	NA	7.0E-07
		Shallow Soil	Cadmium	NA	4.1E-07	NA	4.1E-07
		Shallow Soil	Chromium	NA	4.1E-07	NA	4.1E-07
		Shallow Soil	Copper	NA	NA	NA	NA
		Shallow Soil	Lead	NA	NA	NA	NA
		Shallow Soil	PCBs – Total	1.3E-05	NA	9.8E-05	1.1E-04
		Shallow Soil	Dioxins/Furans	2.5E-05	NA	1.7E-04	2.0E-04
						Total Risk =	**3.4E-04**

Table 2-1 (Continued)
Risk Characterization Summary

Scenario Exposure: Future
Receptor Population: Commercial/Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Total Soil	Benz(a)anthracene	9.2E-07	8.2E-09	NA	9.3E-07
		Total Soil	Benzo(a)pyrene	4.2E-06	3.7E-08	NA	4.2E-06
		Total Soil	Benzo(b)fluoranthene	8.3E-07	7.4E-09	NA	8.4E-07
		Total Soil	Benzo(k)fluoranthene	6.0E-07	5.3E-09	NA	6.0E-07
		Total Soil	Dibenz(a,h)anthracene	8.5E-07	7.5E-09	NA	8.6E-07
		Total Soil	Indeno(1,2,3-cd)pyrene	3.3E-07	2.9E-09	NA	3.3E-07
		Total Soil	Arsenic	2.8E-06	2.5E-07	NA	3.0E-06
		Total Soil	Beryllium	5.7E-07	1.2E-08	NA	5.8E-07
		Total Soil	Cadmium	NA	2.8E-07	NA	2.8E-07
		Total Soil	Chromium	NA	6.1E-06	NA	6.1E-06
		Total Soil	Copper	NA	NA	NA	NA
		Total Soil	Lead	NA	NA	NA	NA
		Total Soil	PCBs – Total	9.3E-06	NA	7.2E-05	8.1E-05
		Total Soil	Dioxins/Furans	1.8E-05	NA	1.3E-04	1.5E-04
						Total Risk =	**2.4E-04**

Scenario Exposure: Future
Receptor Population: Commercial/Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Unconfined Shallow Aquifer	Bis(2-ethylhexyl)phthalate	2.5E-07	NA	NA	2.5E-07
		Unconfined Shallow Aquifer	Arsenic	1.8E-04	NA	NA	1.8E-04
		Unconfined Shallow Aquifer	Beryllium	1.4E-05	NA	NA	1.4E-05
						Total Risk =	**2.0E-04**

program will be implemented as part of the preferred remedy to confirm that groundwater is being protected throughout the course of the remedial action. The starting point for developing COCs was the entire list of contaminants that were detected in Site 34 soil samples. These contaminants are listed in Tables 1.4.1 and 1.4.2 of the *Picatinny Arsenal Site 34 Feasibility Study* (IT, 2001b) and are summarized in Sections 2.5.3.1 and 2.5.3.4 of this document. Because no ARARs exist for soil, COCs were established for surface and subsurface soil based on TBC criteria. Contaminants were screened against human health risk-based criteria and NRDCSCC. Therefore, if a contaminant was identified as a human health risk driver and detected at a concentration exceeding the NRDCSCC, then the contaminant was retained as a COC and a RG was calculated. RGs for Site 34 were selected based on the greater of the human health risk-based criteria and the NRDCSCC. The surface soil COCs and their maximum detected concentrations are presented in **Table 2-2**.

Table 2-2
Maximum Detected Concentrations of Site 34 Surface Soil COCs (mg/kg)

Compound	Maximum Detected Concentration	HH Risk-Based Criteria	NJDEP SCC
Benz(a)anthracene	75	6.7	4
Benzo(a)pyrene	28	0.67	0.66
Benzo(b)fluoranthene	50	6.7	4
Dibenz(a,h)anthracene	7.1	0.67	0.66
Indeno(1,2,3-cd)pyrene	20	6.7	4
Arsenic	253	3.1	20
Cadmium	203	86	100
Copper	115,000	77,000	600
Lead	15,900	400	600
Total PCBs	18	2.7	2
Dioxins/Furans	3.766×10^{-3}	3.4×10^{-5}	NA

In addition to the criteria listed above, subsurface COCs were developed based on calculated impact to groundwater limits and current groundwater data from the site. Seven compounds (aluminum, arsenic, copper, iron, lead, manganese, and sodium) were detected in Burning Ground groundwater at levels greater than the groundwater chemical-specific RGs. Impact to groundwater limits were calculated for four of the seven historically detected compounds (arsenic, copper, lead, and manganese). Impact to groundwater limits were not calculated for aluminum, iron, or sodium due to the ubiquitous nature of all these compounds. Copper, lead, and manganese levels in subsurface soil were above the impact to groundwater criteria, but arsenic was not. In addition to impact to groundwater standards, correlation between soil and groundwater was used as a second line of evidence to further screen the COCs for subsurface soil. Upon resampling the wells via the low-flow sampling technique in 1999, only arsenic and lead were still detected above groundwater standards. In 1999, lead exceeded the criterion in two out of eight wells. In 2003, lead exceeded the criterion in two of out seven wells. Upon examining these two lines of evidence, lead-contaminated soils appear to have the potential for acting as a continued source area. Therefore, mitigation of potential continued impact to groundwater will be selected as a remedial action objective for the site. The subsurface COCs and their maximum detected concentrations are presented in **Table 2-3**.

Table 2-3
Maximum Detected Concentrations of Site 34 Subsurface Soil COCs (mg/kg)

Compound	Maximum Detected Concentration	HH Risk-Based Criteria	NJDEP SCC	Impact to Groundwater Cleanup Criteria
Benz(a)anthracene	22	6.7	4	500
Benzo(a)pyrene	11	0.67	0.66	100
Benzo(b)fluoranthene	17	6.7	4	50
Dibenz(a,h)anthracene	1.5	0.67	0.66	100
Dioxins/Furans	4.05×10^{-4}	3.4×10^{-5}	NA	NA

2.7.1.2 Exposure Assessment

An HHRA was conducted for Site 34 as part of the *Picatinny Arsenal Burning Ground Remedial Investigation Report* (Dames and Moore, 1994). The risk assessment evaluated potential human exposure to Site 34 constituents by on-site populations under current and anticipated future land uses. The soil exposure pathways evaluated during the RI included incidental ingestion of soil, inhalation of soil as dust, and dermal contact with soil. Hypothetical future exposure of shallow groundwater was evaluated for ingestion only.

Under the current land-use setting, the carcinogenic risk posed by soils falls within the NCP target range of concern ($1X10^{-4}$ to $1X10^{-6}$) for the current site worker population. Site workers are exposed to airborne contamination from low VOC concentrations and dust levels. Carcinogenic risk exceeds the NCP range for all three future worker scenarios that were evaluated. The primary difference between the current worker scenario and the future worker scenarios are the assumptions used to evaluate the exposure pathway. In evaluating the current worker scenario, the Army used site-specific values derived from the work habits of Burning Ground workers. Due to the uncertainty associated with predicting future behaviors, no site-specific exposure pathway data could be determined for any of the future use scenarios. Therefore, USEPA's conservative default assumptions for a commercial/industrial setting were used to quantify worker exposure to shallow soil, total soil (surface and subsurface), and groundwater. The use of standard default exposure assumptions for future workers rather than current worker site-specific exposure parameters causes roughly an order of magnitude increase in the calculated risk and hazard index in soil.

2.7.1.3 Toxicity Assessment

The potential toxicity of chemicals to humans was presented and the chemical-specific toxicity criteria were compiled for each COC identified within the Site 34 HHRA. Ingestion, inhalation, and dermal absorption are identified as the primary chemical intake routes for humans. The available chemical-specific toxicity values were gathered for the ingestion and inhalation intake routes and extrapolated for several COCs, including lead, PAHs, and chlorinated dibenzo-p-dioxins/furans (CDD/CDF). Because limited guidance was available for quantifying dermal exposure, dermal absorption factors (based on oral RfDs adjusted for oral absorption) were computed only for cadmium, PCBs, and dioxins/furans.

2.7.2 Ecological Risk Assessment

Two ecological risk assessments (ERA) were completed at Site 34 to evaluate the potential risks to ecological receptors from estimated exposures to hazardous constituents associated with Site 34. A screening-level ERA was conducted as part of the *Picatinny Arsenal Burning Ground Remedial Investigation Report* (Dames and Moore, 1994) and a second ERA was completed as part of the *Picatinny Arsenal Phase I Risk Assessment Report* (Dames and Moore, 1998). Different contaminant receptors were assessed as part of each ERA.

2.7.2.1 Burning Ground RI ERA

Based on the location and physical features of Site 34, the absence of aquatic habitat in this area, and the fact that soil and groundwater are the primary contaminated media, terrestrial-based wildlife species were assessed as the primary contaminant receptors. A selected portion of the wetland at Site 34 was evaluated to determine its role in providing habitat and other ecologically relevant functions. Although GPB is adjacent to the site, it is located outside of the fenced area and is considered to be a secondary receptor only because of the potential transport mechanisms of contaminated media. Ecological issues associated with this stretch of GPB are addressed in the *Picatinny Arsenal Green Pond and Bear Swamp Brooks Focused Feasibility Study* (IT, 2001a).

The potential effects to terrestrial receptors were evaluated through the hazard quotient (HQ) approach, which closely follows the dose modeling methodology used in the HHRA to evaluate the potential hazards associated with noncarcinogenic toxicological endpoints. Modeling was conducted for the field mouse (*Peromyscus spp.*) and bobwhite quail (*Colinus virginianus*), which are representative of ecological receptors in the area. For this assessment, the lowest-observable-adverse-effect-level (LOAEL), defined as the lowest exposure level in a long-term experimental study associated with an effect that has adverse health implications. Lacking LOAELs, the no-observable-adverse-effect-level (NOAELs) was used. The NOAEL is defined as the lowest exposure level in a long-term experimental study that is associated with no adverse health effects to the exposed receptor. Based on the exposure and toxicity assumptions of the ecological assessment, select metals, pesticide/PCBs, explosives, PAHs, and dioxins were identified as contaminants of potential concern (COPCs). However, only two compounds (barium and dioxin 2,3,7,8-TCDD) exceeded the HQ of 1 for the field mouse. The barium HQ reflects one elevated soil concentration detected at Site 34. Dioxin 2,3,7,8-TCDD has been identified as a Site 34 COC. The results of the mouse food chain model suggest that the ingestion of dioxin 2,3,7,8-TCDD at a soil concentration of 1.4 micrograms/kilogram (µg/kg) and barium at a soil concentration of 5.38 mg/kg may pose a threat to mice and other small mammal receptors with similar exposure scenarios. The HQs for 2,3,7,8-TCDD and barium were 4.94×10^{3} and 4.47, respectively. The barium result could be considered low enough (between 1 and 10) to suggest that minimal-to-no impact is likely. The HQ for dioxin is elevated and indicates a higher risk potential; however, there are no site-specific data to indicate that actual contaminant-related impacts have occurred. Additionally, it appears that 2,3,7,8-TCDD concentrations in earthworms and vegetation consumed by the mouse receptor may have been overestimated in the Burning Ground RI ERA. Based on the results of the Phase I ERA (presented in Section 2.7.2.2), a substantial difference was observed between the 2,3,7,8-TCDD HQ for the mouse and the mink, which was identified as one of the four modeled receptors in the Phase I ERA. The HQ for 2,3,7,8-TCDD for the mink was 26, which is significantly less than the HQ for the mouse (4,940). As a result, the risk data were compared for each receptor, and it appears that the mouse HQ for 2,3,7,8-TCDD was likely overestimated.

For the bobwhite quail, there is minimal apparent toxicological hazard. The HQ of 1.04 for 2,3,7,8-TCDD is considered to be a conservative estimate. Limited toxicological data was available for the bobwhite quail. The HQs for primary ecological risk drivers and Site 34 COCs are presented in **Table 2-4**.

Table 2-4
Summary of Hazard Quotients for Site 34 COCs and Primary Risk Drivers –
Two Modeled Receptors

Constituent	Hazard Quotient for Field Mouse	Hazard Quotient for Bobwhite Quail
Benzo(a)pyrene	4.77E-04	ND
Barium	**4.47**	ND
Cadmium	0.34	8.30E-02
Copper	3.38E-02	ND
Lead	0.239	0.113

Table 2-4 (Continued)
Summary of Hazard Quotients for Site 34 COCs and Primary Risk Drivers –
Two Modeled Receptors

Constituent	Hazard Quotient for Field Mouse	Hazard Quotient for Bobwhite Quail
PCB (1254)	1.58E-02	4.05E-04
2,3,7,8-TCDD	**4.94E+03**	**1.04**

Italicized font indicates constituent has been identified as a primary ecological risk driver, but not a COC.
ND – Indicates insufficient data to develop a toxicity reference value.
Bolded value indicates exceedance of the 1.0 threshold value.

The Wetland Evaluation Technique (WET) was used to evaluate the health of the wetlands at Site 34 and the potential for future impacts based on a current understanding for the site. This technique is a scientific method used for evaluating and ranking real or potential impacts on wetlands as a result of contamination. The WET results indicate that no wetland functions were highly rated (i.e., low potential impact) for the major evaluation criteria, and that only the function of toxicant retention was rated highly in terms of both opportunity and effectiveness. The primary rationale for this rating was the proximity of the Burning Ground (a potential toxicant source) to a depressional constricted outlet wetland to the east. Materials carried by runoff to the east would likely be retained in the wetland soil. If this function were indeed being performed, the benefit would be delivered to the local aquatic system, but possibly at the expense of increasing the contaminant exposure risk to terrestrial receptors.

2.7.2.2 Phase I RI ERA

A second ERA was completed as part of the Phase I RI Risk Assessment to determine whether ecological impacts are occurring or are likely to occur as a result of historic releases of potentially toxic materials associated with historical ordnance production, storage, and disposal activities in the Phase I assessment area. No further sample collection or investigative work was performed at Site 34 as part of this assessment. The ERA calculated HQs for four representative terrestrial receptor wildlife species (the barred owl, veery, mink, and American woodcock) potentially exposed at Site 34. The maximum detected concentrations in surface soil were used to calculate HQs for each receptor. The barred owl and woodcock HQs were adjusted to take into account an area use factor.

Based on the results of the Phase I ERA, Site 34 was classified as a Group 1 site. Group 1 sites are areas for which both suitable habitat for assessment species and elevated concentrations of COPCs exist, and include those sites that potentially pose ecological risks based on current conditions that are sufficiently elevated to warrant risk management attention. The most potentially impacted receptor species evaluated at Site 34 were the veery and woodcock, with the most elevated HQs estimated for five COPCs: chromium (HQs = 96 and 197, respectively), bis(2-ethylhexyl)phthalate (HQs = 138 and 78, respectively), lead (HQs = 36 and 74, respectively), cadmium (HQs = 27 and 55, respectively), and TCDD (HQs = 26 and 3.1, respectively). Lead, cadmium, and TCDD have been identified as Site 34 COCs. It is important to note that the classification as a Group 1 site is based on modeled HQ results only, as no site-specific impact studies were conducted at Site 34. The HQs for primary ecological risk drivers and Site 34 COCs are presented in **Table 2-5**.

Table 2-5
Summary of Hazard Quotients for Site 34 COCs and Primary Risk Drivers –
Four Modeled Receptors

Constituent	Barred Owl Adjusted HQ	Veery HQ	Mink HQ	Woodcock Adjusted HQ
Arsenic	0.01	**5.2**	0.32	**15**
Cadmium	0.03	**27**	0.04	**55**
Chromium	0.11	**96**	0.05	**197**

Table 2-5 (Continued)
Summary of Hazard Quotients for Site 34 COCs and Primary Risk Drivers –
Four Modeled Receptors

Constituent	Barred Owl Adjusted HQ	Veery HQ	Mink HQ	Woodcock Adjusted HQ
Lead	0.04	**36**	**12**[(1)]	**74**
Bis(2-ethylhexyl)phthalate	0.12	**138**	0.02	**78**
PCB 1254	<0.01	0.87	0.09	**1.9**
TCDD (total)	0.11	**3.6**	**26**	**3.1**

Italicized font indicates constituent has been identified as a primary ecological risk driver, but not a COC.
(1) - The HQs for lead for the mink were below reference/background HQs, thus are not site related.
Bolded value indicates exceedance of the 1.0 threshold value.

The 1994 and 1998 ERAs have different chemicals of concern due to the use of different ecological receptors and the fact that the 1994 ERA used 95% upper confidence limit (UCL) exposure point concentrations, while the 1998 ERA used maximum detected COC concentrations. The 1994 ERA was overly conservative (i.e., overestimated hazards) in that modeled concentrations were used for tissue concentrations (note dioxin difference in Tables 2-4 and 2-5). The 1998 ERA was overly conservative in that maximum soil concentrations, rather than 95% UCL exposure point concentrations, were used in estimating hazards (however, tissue concentrations used 95% UCLs). Overall, the 1994 ERA is considered to be more conservative than the 1998 ERA because the use of modeled tissue concentrations (rather than measured tissue concentrations) outweighs the use of maximum detected COCs in soil (rather than use of 95% UCLs).

2.8 REMEDIAL ACTION OBJECTIVES

RAOs are based on human health and environmental factors that must be considered in the evaluation of response actions. Such objectives are developed based on criteria outlined in Section 300.420(e) of the NCP and Section 121 of CERCLA. The RAOs for Site 34 were developed to assure the protection of human health, ecological receptors, and the environment. Achieving the RAOs signifies the alternative will be protective of human health and the environment and will satisfy the regulatory requirements of CERCLA and RCRA. The objectives are specific to contaminated surface soils, subsurface soils, surface water, groundwater, and sediment originating from Site 34. The RAOs for the site are as follows:

- Reduce the risk to the future on-site worker from 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 Burning Ground soil via groundwater infiltration.
- Manage potential groundwater risk at points of compliance.

2.9 DESCRIPTION OF ALTERNATIVES

Site 34 has undergone a RI and FS according to the CERCLA process. The RI/FS process under CERCLA begins with the RI phase, which is a mechanism for collecting data to characterize the site and assess potential human health and ecological risk. The RI phase is followed by the FS phase, which involves the development, screening, and detailed evaluation of remedial alternatives. Based on the findings presented in the *Picatinny Arsenal Burning Ground Remedial Investigation Report* (Dames and Moore, 1994), an FS was prepared to determine applicable treatment technologies for remedial alternatives. Eight remedial alternatives were identified in the FS and initially screened based on

effectiveness, implementability, and cost. This information is provided in detail in the *Picatinny Arsenal Site 34 Feasibility Study* (IT, 2001b).

The following eight alternatives were proposed for Picatinny Site 34:

- Alternative 1 – No Action.
- Alternative 2 – ICs, including land-use restrictions and ongoing groundwater monitoring/use restrictions.
- Alternative 3 – Capping with an impermeable soil and synthetic multilayer cap, land-use restrictions, and ongoing groundwater monitoring/use restrictions.
- Alternative 4 – Capping with an impermeable modified asphalt pavement, land-use restrictions, and ongoing groundwater monitoring/use restrictions.
- Alternative 5 – Excavation and on-site treatment of organics-contaminated soil using super critical fluid extraction technology, in situ fixation/stabilization of remaining inorganics-contaminated soil, land-use restrictions, and ongoing groundwater monitoring/use restrictions.
- Alternative 6 – Excavation and off-site disposal of organics-contaminated soil, in situ fixation/stabilization of remaining inorganics-contaminated soil, land-use restrictions, and ongoing groundwater monitoring/use restrictions.
- Alternative 7 – In situ fixation/stabilization of all organic- and inorganic-contaminated soil, land-use restrictions, and ongoing groundwater monitoring/use restrictions.
- Alternative 8 – Excavation and off-site disposal of all organic- and inorganic-contaminated soil, land-use restrictions, and ongoing groundwater monitoring/use restrictions.

2.9.1 Alternative 1: No Action

Capital Cost:	$0.00
O&M Cost:	$0.00
Present Worth Costs:	$0.00

CERCLA and the NCP require that a "No Action" alternative be evaluated at every site to establish a baseline for the comparison of other remedial alternatives. Under this alternative, no remedial action would take place. Additionally, no site monitoring or oversight would be performed.

2.9.2 Alternative 2: Institutional Controls, including Land-Use Restrictions, and Ongoing Groundwater Monitoring/Use Restrictions

Estimated Capital Cost:	$57,000
Estimated O&M Cost:	$406,000
Present Worth:	$463,000

(Present worth of the O&M and long-term replacement cost is based on a 30-year project life, calculated using a 7 percent discount rate.)

Remedial Alternative 2 proposes land use restrictions, long-term groundwater and surface water monitoring, and maintenance of any ICs. Because contamination would remain on-site, land use restrictions would be required as part of this alternative. LUCs are administrative measures put in place to affect human activity in order to preclude undesirable land use. ICs are legal and administrative vehicles that act to control land use and exposure to contaminated media. Enforcement of these controls

would preclude unacceptable human contact to site contaminants. The LUC objectives established for Site 34 include:

- Prevent human consumption and contact with groundwater.
- Preclude inappropriate contact with impacted soils.
- Prevent site access for intrusive work without appropriate UXO screening precautions.
- Maintain the integrity of any current or future monitoring wells.
- Prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities, and playgrounds.

Failure to achieve these objectives could lead to unacceptable human exposure to environmental contaminants. Because contamination will remain on-site, the site remedy will be periodically reviewed by the Army and five-year reviews will be performed by the USEPA to evaluate the continued protectiveness of the remedy. Should these reviews reveal that the LUC objectives are not being met, the implementation of the LUCs will be modified. The modification of the remedy will be documented in accordance with CERCLA guidance. The RD will detail the provisions and requirements of the LUC portion of this remedy necessary to assure that land use remains safe and appropriate for the level of protection afforded by the remedial action.

The Army is responsible for implementing, maintaining, reporting on, and enforcing the LUCs. LUCs will be maintained until the concentration of hazardous substances in the soil and groundwater are at such levels to allow for unrestricted use and exposure. A LUC RD will be prepared as a component of the RD. Within 90 days of ROD signature, the Army shall prepare and submit to USEPA for review and approval a LUC RD that shall contain implementation and maintenance actions, including periodic inspections.

As part of this remedy, long-term groundwater and surface water monitoring would be conducted to verify protection of human health and the environment until RGs (or background concentrations) are achieved for groundwater/surface water at the site. The groundwater monitoring program would entail the sampling of six existing wells and one newly installed well in the shallow unconfined aquifer and two monitoring wells in the lower semiconfined aquifer. Three surface water samples would be collected from GPB at the following locations: upstream of Site 34, adjacent to Site 34, and downstream of Site 34. Surface water samples collected upstream of the site would be used as background data. The surface water data collected adjacent to and downgradient of the site would be compared to the upstream data. Both groundwater and surface water samples would be analyzed for TAL metals. The surface water sampling events would coincide with the sediment and biota monitoring to be performed as part of the *Picatinny Arsenal Green Pond and Bear Swamp Brooks Focused Feasibility Study* (IT, 2001a). As part of that remedy, sediment samples will be collected from three locations adjacent to Site 34.

Based on the data collected during the first two years at Site 34, both monitoring programs would be reviewed to determine if a stable or decreasing trend has been established. Assuming a trend was established, the groundwater/surface water monitoring frequency would be reduced. The number of monitoring wells sampled in the unconfined aquifer would decrease, and the constituent list for both media types would be modified based on the analytical results. If a trend was not established, monitoring would continue until a tendency was established. Both monitoring programs would be modified and/or abandoned based upon the site-specific exit strategy that will be outlined in the RD for the site.

The long-term monitoring program will be reviewed at a minimum of every five years to determine if the program is adequately monitoring the effectiveness of the remedy and if any modification to the remedy or monitoring program is necessary. In the RD, trigger levels will be established for TAL metals to indicate the need to modify the remedy, modify the sampling program, or discontinue the sampling program. Any of the three scenarios would require concurrence from the USEPA and NJDEP. Additionally, if the remedy is shown to be failing and an alternate remedy or more aggressive remedy is necessary, the selection of the alternate remedy would be documented in the administrative record. Documentation will be performed in accordance with CERCLA guidance.

LUCs and long-term monitoring are the primary components of Remedial Alternative 2. This remedial action requires no intrusive or earth-disturbance activities, as the other alternatives examined require. However, the LUCs and long-term monitoring proposed as part of Remedial Alternative 2 are incorporated into each of the six active remedial alternatives. Alternative 1, no action, does not include LUCs or long-term monitoring. Because contamination would remain on-site, the expected outcome of Remedial Alternative 2 is restricted use of Site 34.

2.9.3 Alternative 3: Capping with an Impermeable Soil and Synthetic Multilayer Cap, Land-Use Restrictions, and Ongoing Groundwater Monitoring/Use Restrictions

Estimated Capital Cost:	$1,890,000
Estimated O&M Cost:	$603,000
Present Worth:	$2,493,000

(Present worth of the O&M and long-term replacement cost is based on a 30-year project life, calculated using a 7 percent discount rate.)

Remedial Alternative 3 entails the capping of all impacted soils and debris where COCs have been identified at levels above RGs. Contaminated soils would be contained under an engineered soil multi-layer cap designed to prevent surface erosion and dermal exposure. The cap would consist of a synthetic liner placed over a properly prepared subgrade. A component of the total cap construction would include an engineered impermeable barrier. The barrier would consist of a synthetic liner residing atop of an appropriately prepared subgrade. A surface drainage net would be installed above the liner, and topsoil layers added to promote establishment of natural vegetation and habitat. The common fill layer of this cap would be constructed with available fill, potentially including soils reused from other locations at Picatinny. The criteria for the reuse of soils from other areas at Picatinny would be described in the RD, which will be submitted after the ROD. The criteria allowing use of these soils will be that the soils used would not be characterized as hazardous waste per RCRA or fail TCLP testing.

Due to the size of the area that will be capped, storm water management, diversion, and retention features will be incorporated as recommended or required under current local, State, and Federal guidance and Best Management Practices (BMP) for management of storm water associated with construction activities. Additionally, the necessary erosion and sedimentation controls would be installed and dust control measures (i.e., water sprays) would be implemented during construction of the cap. After completion of the action, the site would be revegetated as appropriate. Any wetlands impacted or disturbed would be appropriately restored.

Maintenance/inspections of the cap would be performed annually to ensure the continued protectiveness of the cap. Long-term groundwater and surface water monitoring would be conducted to verify protection of human health and the environment until RGs (or background concentrations) are achieved for groundwater and surface water at the site. Groundwater and surface water monitoring would be conducted for the first two years on a periodic basis (to be specified in the RD workplan), or until a stable or decreasing trend is established. Samples would be analyzed for TAL metals. Based on the results of the monitoring, sample frequency may be decreased, and the list of constituents may be modified based on the analytical data collected over the previous two years. The monitoring results would be reviewed at a minimum of every five years. Both monitoring programs would be modified and/or abandoned based upon the site-specific exit strategy that will be outlined in the RD.

The long-term monitoring program will be reviewed at a minimum of every five years to determine if the program is adequately monitoring the effectiveness of the remedy and if any modification to the remedy or monitoring program is necessary. In the RD, trigger levels will be established for TAL metals to indicate the need to modify the remedy, modify the sampling program, or discontinue the sampling program. Any of the three scenarios would require concurrence from the USEPA and NJDEP. Additionally, if the remedy is shown to be failing and an alternate remedy or more aggressive remedy is necessary, the selection of the alternate remedy would be documented in the administrative record. Documentation will be performed in accordance with CERCLA guidance.

Because contamination would remain on-site, land use restrictions would be required as part of this alternative. The LUC objectives established for Site 34 include:

- Prevent human consumption and contact with groundwater.
- Preclude inappropriate contact with impacted soils.
- Prevent site access for intrusive work without appropriate UXO screening precautions.
- Maintain the integrity of any current or future monitoring wells.
- Maintain the proposed cover over the Burning Grounds.
- Prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities, and playgrounds.

Failure to achieve these objectives could lead to unacceptable human exposure to environmental contaminants. The site remedy periodically will be monitored by the Army and will be reviewed at five year intervals by the USEPA to evaluate the continued protectiveness of the remedy. Should these reviews reveal that the LUC objectives are not being met, the implementation of the LUCs will be modified. The modification of the remedy will be documented in accordance with CERCLA guidance. The RD will detail the provisions and requirements of the LUC portion of this remedy necessary to assure that land use remains safe and appropriate for the level of protection afforded by the remedial action.

The Army is responsible for implementing, maintaining, reporting on, and enforcing the LUCs. LUCs will be maintained until the concentration of hazardous substances in the soil and groundwater are at such levels to allow for unrestricted use and exposure. A LUC RD will be prepared as a component of the RD. Within 90 days of ROD signature, the Army shall prepare and submit to USEPA for review and approval a LUC RD that shall contain implementation and maintenance actions, including periodic inspections.

Remedial Alternative 3 shares several common elements with the other six active alternatives examined. The LUCs and long-term monitoring proposed as part of Alternative 3 are incorporated into each remedial alternative except “no action.” Additionally, both Alternatives 3 and 4 propose the capping of impacted soils. However, the caps proposed as part of each alternative are comparatively different. Alternative 3 requires an engineered multilayer soil cap that would include an engineered impermeable barrier. Because contamination would remain on-site, the expected outcome of Remedial Alternative 3 is restricted use of Site 34. However, all impacted soils would be contained under the cap in order to prevent immediate exposure to human and ecological receptors.

2.9.4 Alternative 4: Capping with an Impermeable Modified Asphalt Pavement, Land-Use Restrictions, and Ongoing Groundwater Monitoring/Use Restrictions

Estimated Capital Cost:	$1,621,000
Estimated O&M Cost:	$374,000
Present Worth:	$1,995,000

(Present worth of the O&M and long-term replacement cost is based on a 30-year project life, calculated using a 7 percent discount rate.

Remedial Alternative 4 involves the capping of all impacted soils and debris where COCs were identified at levels above RGs. Soils would be contained under an engineered rigid cap consisting of modified ultra-low permeability asphalt designed to prevent surface erosion and dermal exposure. The asphalt is blended with a vendor proprietary add-mix, which enhances the performance of asphalt, reducing permeability to $1X10^{-8}$ cm/s. The cap design would be optimized to prevent infiltration and enhance surface durability. The common fill layer of this cap will be made with available fill, potentially including soils reused from other locations at Picatinny, including CERCLA sites. The criteria for the use of soils from other areas at Picatinny will be described in the RD, which will be submitted after the ROD.

The criteria allowing use of these soils will be that the soils used would not be characterized as hazardous waste per RCRA or fail TCLP testing.

Due to the size of the area that will be capped, storm water management, diversion, and retention features will be incorporated as recommended or required under current local, State, and Federal guidance and BMP for management of storm water associated with construction activities. Additionally, the necessary erosion and sedimentation controls would be installed and dust control measures (i.e., water sprays) would be implemented during construction of the cap. After completion of the action, the site would be revegetated as appropriate. Any wetlands impacted or disturbed would be appropriately restored.

Maintenance/inspections of the cap would be performed annually to ensure the continued protectiveness of the cap. Long-term groundwater and surface water monitoring would be conducted to verify protection of human health and the environment until RGs (or background concentrations) are achieved for groundwater and surface water at the site. Groundwater and surface water monitoring would be conducted on a periodic basis for the first two years (to be specified in the RD workplan), or until a stable or decreasing trend is established. Samples would be analyzed for TAL metals. Based on the results of the monitoring, sample frequency may be decreased, and the list of constituents may be modified based on the historical data collected over the previous two years. The monitoring results would be reviewed at a minimum of every five years. Both monitoring programs would be modified and/or abandoned based upon the site-specific exit strategy that will be outlined in the RD.

The long-term monitoring program will be reviewed at a minimum of every five years to determine if the program is adequately monitoring the effectiveness of the remedy and if any modification to the remedy or monitoring program is necessary. In the RD, trigger levels will be established for TAL metals to indicate the need to modify the remedy, modify the sampling program, or discontinue the sampling program. Any of the three scenarios would require concurrence from the USEPA and NJDEP. Additionally, if the remedy is shown to be failing and an alternate remedy or more aggressive remedy is necessary, the selection of the alternate remedy would be documented in the administrative record. Documentation will be performed in accordance with CERCLA guidance.

Because contamination would remain on-site, land use restrictions would be required as part of this alternative. The LUC objectives established for Site 34 include:

- Prevent human consumption and contact with groundwater.
- Preclude inappropriate contact with impacted soils.
- Prevent site access for intrusive work without appropriate UXO screening precautions.
- Maintain the integrity of any current or future monitoring wells.
- Maintain the proposed cover over the Burning Grounds.
- Prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities, and playgrounds.

Failure to achieve these objectives could lead to unacceptable human exposure to environmental contaminants. The site remedy periodically will be monitored by the Army and will be reviewed at five year intervals by the USEPA to evaluate the continued protectiveness of the remedy. Should these reviews reveal that the LUC objectives are not being met, the implementation of the LUCs will be modified. The modification of the remedy will be documented in accordance with CERCLA guidance. The RD will detail the provisions and requirements of the LUC portion of this remedy necessary to assure that land use remains safe and appropriate for the level of protection afforded by the remedial action.

The Army is responsible for implementing, maintaining, reporting on, and enforcing the LUCs. LUCs will be maintained until the concentration of hazardous substances in the soil and groundwater are at such levels to allow for unrestricted use and exposure. A LUC RD will be prepared as a component of the RD. Within 90 days of ROD signature, the Army shall prepare and submit to USEPA for review and approval a LUC RD that shall contain implementation and maintenance actions, including periodic inspections.

Remedial Alternative 4 shares several common elements with the other six active remedial actions, which include the containment of contaminated soils using a cap as presented in Remedial Alternative 3 and the incorporation of LUCs and long-term monitoring. LUCs and long-term monitoring are included in each remedial alternative except "no action." A distinguishing component of Remedial Alternative 4 is the additive that will be mixed with the asphalt to increase the impermeability performance of the asphalt. Field data collected during previous studies have demonstrated asphalt impermeability, durability, and longevity. The permeability of the asphalt is expected to be $1X10^{-8}$ cm/s. Because contamination would remain on-site, the expected outcome of Remedial Alternative 4 is restricted use of Site 34. However, the asphalt cap provides greater flexibility for future land use. After installation, the asphalt surface can be used for activities such as parking, equipment staging, and recreation. Additionally, the asphalt cap is expected to provide a greater degree of protection in the event of precipitation leading to local flooding.

2.9.5 Alternative 5: Excavation and On-Site Treatment of Organics-Contaminated Soil Using Super Critical Fluid Extraction Technology, In situ Fixation/Stabilization of Remaining Inorganics-Contaminated Soil, Land-Use Restrictions, and Ongoing Groundwater Monitoring/Use Restrictions

Estimated Capital Cost:	$5,093,000
Estimated O&M Cost:	193,000
Present Worth:	$5,286,000

(Present worth of the O&M and long-term replacement cost is based on a 30-year project life, calculated using a seven percent discount rate.)

Remedial Alternative 5 requires the excavation of organics-impacted soil identified at levels above RGs to a maximum approximate depth of four feet (or at the depth where groundwater is encountered). Excavated soil would be treated using supercritical fluid extraction and disposed off-site as non-hazardous waste. Supercritical fluid extraction is the cleaning of soil using a liquefied gas (e.g. carbon dioxide or propane) as a solvent to remove the organic chemicals from the soil. Any large debris encountered would be decontaminated using high-pressure water spraying and disposed as nonhazardous municipal waste. Remaining inorganics-contaminated soil would be treated in situ by fixation/stabilization to an approximate depth of two feet or at the depth groundwater is encountered. After completion of the remedy, the site would be revegetated and restored to prevent erosion.

During construction, the necessary erosion and sedimentation controls would be installed and dust control measures (i.e., water sprays) would be implemented. Wastewater generated as a result of remedial or decontamination activities would be treated on-site using a modular wastewater treatment system and released to GPB under New Jersey Permit Discharge Elimination System (NJPDES) to comply with substantive requirements of the permits.

Long-term groundwater and surface water monitoring would be conducted to verify protection of human health and the environment until RGs (or background concentrations) are achieved for groundwater and surface water at the site. Groundwater and surface water monitoring would be conducted on a periodic basis for the first two years (to be specified in the RD workplan), or until a stable or decreasing trend is established. Samples would be analyzed for TAL metals. Based on the results of the monitoring, sample frequency may be decreased, and the list of constituents may be modified based on the historical data collected over the previous two years. The monitoring results would be reviewed at a minimum of every five years. Both monitoring programs would be modified and/or abandoned based upon the site-specific exit strategy that will be outlined in the RD.

The long-term monitoring program will be reviewed at a minimum of every five years to determine if the program is adequately monitoring the effectiveness of the remedy and if any modification to the remedy or monitoring program is necessary. In the RD, trigger levels will be established for TAL metals to indicate the need to modify the remedy, modify the sampling program, or discontinue the sampling program. Any of the three scenarios would require concurrence from the USEPA and NJDEP.

Additionally, if the remedy is shown to be failing and an alternate remedy or more aggressive remedy is necessary, the selection of the alternate remedy would be documented in the administrative record. Documentation will be performed in accordance with CERCLA guidance.

Because contamination would remain on-site, land use restrictions would be required as part of this alternative. The LUC objectives established for Site 34 include:

- Prevent human consumption and contact with groundwater.
- Preclude inappropriate contact with impacted soils.
- Prevent site access for intrusive work without appropriate UXO screening precautions.
- Maintain the integrity of any current or future monitoring wells.
- Prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities, and playgrounds.

Failure to achieve these objectives could lead to unacceptable human exposure to environmental contaminants. The site remedy periodically will be monitored by the Army and will be reviewed at five year intervals by the USEPA to evaluate the continued protectiveness of the remedy. Should these reviews reveal that the LUC objectives are not being met, the implementation of the LUCs will be modified. The modification of the remedy will be documented in accordance with CERCLA guidance. The RD will detail the provisions and requirements of the LUC portion of this remedy necessary to assure that land use remains safe and appropriate for the level of protection afforded by the remedial action.

The Army is responsible for implementing, maintaining, reporting on, and enforcing the LUCs. LUCs will be maintained until the concentration of hazardous substances in the soil and groundwater are at such levels to allow for unrestricted use and exposure. A LUC RD will be prepared as a component of the RD. Within 90 days of ROD signature, the Army shall prepare and submit to USEPA for review and approval a LUC RD that shall contain implementation and maintenance actions, including periodic inspections.

Remedial Alternative 5 shares several common elements with the other six active remedial actions, which include the partial excavation of contaminated soils (Alternative 6), in situ fixation/stabilization of the remaining contaminated soil (Alternatives 6 and 7), and the incorporation of LUCs and long-term monitoring. LUCs and long-term monitoring are included in each remedial alternative except “no action.” The remedial action proposed as part of Remedial Alternative 5 requires the on-site treatment of organics-contaminated soil prior to off-site disposal. Supercritical fluid extraction would be utilized to remove the organics from the soil. No other alternative considered requires on-site treatment of contaminated soil prior to disposal. Because some contamination would remain on-site, the expected outcome of Remedial Alternative 5 is restricted use of Site 34.

2.9.6 Alternative 6: Excavation and Off-Site Disposal of Organics-Contaminated Soil, In situ Fixation/Stabilization of Remaining Inorganics-Contaminated Soil, Land-Use Restrictions, and Ongoing Groundwater Monitoring/Use Restrictions

Estimated Capital Cost:	$4,021,000
Estimated O&M Cost:	$193,000
Present Worth:	$4,214,000

(Present worth of the O&M and long-term replacement cost is based on a 30-year project life, calculated using a seven percent discount rate.)

Alternative 6 involves the excavation of organics-impacted soil identified at levels above RGs to a maximum approximate depth of four feet (or at the depth where groundwater is encountered). Excavated organics-contaminated soil would be disposed off-site at an approved facility. Any large debris encountered would be decontaminated using high-pressure water spraying and disposed as nonhazardous municipal waste. Any inorganic-contaminated soil remaining on-site after the excavation

of organic-contaminated soil would be treated in situ by fixation/stabilization to an approximate depth of two feet or at the depth where groundwater is encountered. After completion of the remedy, the site would be revegetated and restored to prevent erosion.

During construction, the necessary erosion and sedimentation controls would be installed and dust control measures (i.e., water sprays) would be implemented. Wastewater generated as a result of remedial or decontamination activities would be treated on-site using a modular wastewater treatment system and released to GPB under NJPDES to comply with substantive requirements of the permits.

Long-term groundwater and surface water monitoring would be conducted to verify protection of human health and the environment until RGs (or background concentrations) are achieved for groundwater and surface water at the site. Groundwater and surface water monitoring would be conducted on a periodic basis for the first two years (to be specified in the RD workplan), or until a stable or decreasing trend is established. Samples would be analyzed for TAL metals. Based on the results of the monitoring, sample frequency may be decreased, and the list of constituents may be modified based on the historical data collected over the previous two years. The monitoring results would be reviewed at a minimum of every five years. Both monitoring programs would be modified and/or abandoned based upon the site-specific exit strategy that will be outlined in the RD.

The long-term monitoring program will be reviewed at a minimum of every five years to determine if the program is adequately monitoring the effectiveness of the remedy and if any modification to the remedy or monitoring program is necessary. In the RD, trigger levels will be established for TAL metals to indicate the need to modify the remedy, modify the sampling program, or discontinue the sampling program. Any of the three scenarios would require concurrence from the USEPA and NJDEP. Additionally, if the remedy is shown to be failing and an alternate remedy or more aggressive remedy is necessary, the selection of the alternate remedy would be documented in the administrative record. Documentation will be performed in accordance with CERCLA guidance.

Because contamination would remain on-site, land use restrictions would be required as part of this alternative. The LUC objectives established for Site 34 include:

- Prevent human consumption and contact with groundwater.
- Preclude inappropriate contact with impacted soils.
- Prevent site access for intrusive work without appropriate UXO screening precautions.
- Maintain the integrity of any current or future monitoring wells.
- Prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities, and playgrounds.

Failure to achieve these objectives could lead to unacceptable human exposure to environmental contaminants. The site remedy periodically will be monitored by the Army and will be reviewed at five year intervals by the USEPA to evaluate the continued protectiveness of the remedy. Should these reviews reveal that the LUC objectives are not being met, the implementation of the LUCs will be modified. The modification of the remedy will be documented in accordance with CERCLA guidance. The RD will detail the provisions and requirements of the LUC portion of this remedy necessary to assure that land use remains safe and appropriate for the level of protection afforded by the remedial action.

The Army is responsible for implementing, maintaining, reporting on, and enforcing the LUCs. LUCs will be maintained until the concentration of hazardous substances in the soil and groundwater are at such levels to allow for unrestricted use and exposure. A LUC RD will be prepared as a component of the RD. Within 90 days of ROD signature, the Army shall prepare and submit to USEPA for review and approval a LUC RD that shall contain implementation and maintenance actions, including periodic inspections.

Remedial Alternative 6 shares several common elements with the other six active remedial actions, which include the partial excavation of contaminated soils (Alternative 5), in situ fixation/stabilization of the remaining contaminated soil (Alternatives 5 and 7), and the incorporation of LUCs and long-term monitoring. LUCs and long-term monitoring are included in each remedial

alternative except "no action." As part of Remedial Alternative 6, organics-contaminated soil would be removed and disposed off-site. No on-site treatment would occur prior to off-site disposal (as compared to Alternative 5). Because some contamination would remain on-site, the expected outcome of Remedial Alternative 6 is restricted use of Site 34.

2.9.7 Alternative 7: In situ Fixation/Stabilization of All Organic- and Inorganic-Contaminated Soil, Land-Use Restrictions, and Ongoing Groundwater Monitoring/Use Restrictions

Estimated Capital Cost:	$2,120,000
Estimated O&M Cost:	$193,000
Present Worth:	$2,313,000

(Present worth of the O&M and long-term replacement cost is based on a 30-year project life, calculated using a seven percent discount rate.)

Alternative 7 involves in situ fixation/stabilization of all soils to an approximate depth of two feet (or at the depth where groundwater is encountered). Any large debris encountered would be removed and decontaminated using high-pressure water spraying and disposed as nonhazardous municipal waste. During construction, the necessary erosion and sedimentation controls would be installed and dust control measures (i.e., water sprays) would be implemented. Wastewater generated as a result of remedial or decontamination activities would be treated on-site using a modular wastewater treatment system and released to GPB under NJPDES to comply with substantive requirements of the permits. After completion of the remedy, the site would be revegetated and restored to prevent erosion.

Long-term groundwater and surface water monitoring would be conducted to verify protection of human health and the environment until RGs (or background concentrations) are achieved for groundwater/surface water at the site. Groundwater and surface water monitoring would be conducted on a periodic basis for the first two years (to be specified in the RD workplan), or until a stable or decreasing trend was established. Samples would be analyzed for TAL metals. Based on the results of the monitoring, sample frequency may be decreased, and the list of constituents may be modified based on the historical data collected over the previous two years. The monitoring results would be reviewed at a minimum of every five years. Both monitoring programs would be modified and/or abandoned based upon the site-specific exit strategy that will be outlined in the RD.

The long-term monitoring program will be reviewed at a minimum of every five years to determine if the program is adequately monitoring the effectiveness of the remedy and if any modification to the remedy or monitoring program is necessary. In the RD, trigger levels will be established for TAL metals to indicate the need to modify the remedy, modify the sampling program, or discontinue the sampling program. Any of the three scenarios would require concurrence from the USEPA and NJDEP. Additionally, if the remedy is shown to be failing and an alternate remedy or more aggressive remedy is necessary, the selection of the alternate remedy would be documented in the administrative record. Documentation will be performed in accordance with CERCLA guidance.

Because contamination would remain on-site, land use restrictions would be required as part of this alternative. The LUC objectives established for Site 34 include:

- Prevent human consumption and contact with groundwater.
- Preclude inappropriate contact with impacted soils.
- Prevent site access for intrusive work without appropriate UXO screening precautions.
- Maintain the integrity of any current or future monitoring wells.
- Prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities, and playgrounds.

Failure to achieve these objectives could lead to unacceptable human exposure to environmental contaminants. The site remedy periodically will be monitored by the Army and will be reviewed at five

year intervals by the USEPA to evaluate the continued protectiveness of the remedy. Should these reviews reveal that the LUC objectives are not being met, the implementation of the LUCs will be modified. The modification of the remedy will be documented in accordance with CERCLA guidance. The RD will detail the provisions and requirements of the LUC portion of this remedy necessary to assure that land use remains safe and appropriate for the level of protection afforded by the remedial action.

The Army is responsible for implementing, maintaining, reporting on, and enforcing the LUCs. LUCs will be maintained until the concentration of hazardous substances in the soil and groundwater are at such levels to allow for unrestricted use and exposure. A LUC RD will be prepared as a component of the RD. Within 90 days of ROD signature, the Army shall prepare and submit to USEPA for review and approval a LUC RD that shall contain implementation and maintenance actions, including periodic inspections.

Remedial Alternative 7 shares several common elements with the other six active remedial actions. Three of the eight alternatives (Alternatives 5, 6, and 7) considered utilize in situ fixation/stabilization of contaminated soil as a component of the remedial action. Additionally, LUCs and long-term monitoring are included in each remedial alternative except "no action." The remedial action proposed as part of Remedial Alternative 7 requires in situ fixation/stabilization of all impacted soil, whereas in situ fixation/stabilization of inorganics-contaminated soil is proposed as part of Alternatives 5 and 6. Because contamination would remain on-site, the expected outcome of Remedial Alternative 7 is restricted use of Site 34.

2.9.8 Alternative 8: Excavation and Off-Site Disposal of all Organic- and Inorganic-Contaminated Soil, Land-Use Restrictions, and Ongoing Groundwater Monitoring/Use Restrictions

Estimated Capital Cost:	$6,617,000
Estimated O&M Cost:	$82,000
Present Worth:	$6,699,000

(Present worth of the O&M and long-term replacement cost is based on a 30-year project life, calculated using a seven percent discount rate.)

Alternative 8 involves the excavation of organic-and inorganic-impacted soil contaminated at levels above RGs to a maximum approximate depth of four feet (or at the depth where groundwater is encountered). Excavated soil would be disposed off-site at an approved facility. Any large debris encountered would be removed and decontaminated using high-pressure water spraying and disposed as nonhazardous municipal waste. During construction, the necessary erosion and sedimentation controls would be installed and dust control measures (i.e., water sprays) would be implemented. Wastewater generated as a result of remedial or decontamination activities would be treated on-site using a modular wastewater treatment system and released to GPB under NJPDES to comply with substantive requirements of the permits. After completion of the remedy, the site would be revegetated and restored to prevent erosion.

Long-term groundwater and surface water monitoring would be conducted to verify protection of human health and the environment until RGs (or background concentrations) are achieved for groundwater and surface water at the site. Groundwater and surface water monitoring would be conducted on a periodic basis for the first two years (to be specified in the RD workplan), or until a stable or decreasing trend is established. Samples would be analyzed for TAL metals. Based on the results of the monitoring, sample frequency may be decreased, and the list of constituents may be modified based on the historical data collected over the previous two years. The monitoring results would be reviewed at a minimum of every five years. Both monitoring programs would be modified and/or abandoned based upon the site-specific exit strategy that will be outlined in the RD.

The long-term monitoring program will be reviewed at a minimum of every five years to determine if the program is adequately monitoring the effectiveness of the remedy and if any modification to the remedy or monitoring program is necessary. In the RD, trigger levels will be established for TAL metals

to indicate the need to modify the remedy, modify the sampling program, or discontinue the sampling program. Any of the three scenarios would require concurrence from the USEPA and NJDEP. Additionally, if the remedy is shown to be failing and an alternate remedy or more aggressive remedy is necessary, the selection of the alternate remedy would be documented in the administrative record. Documentation will be performed in accordance with CERCLA guidance.

Because contamination would remain on-site, land use restrictions would be required as part of this alternative. The LUC objectives established for Site 34 include:

- Prevent human consumption and contact with groundwater.
- Preclude inappropriate contact with impacted soils.
- Prevent site access for intrusive work without appropriate UXO screening precautions.
- Maintain the integrity of any current or future monitoring wells.
- Prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities, and playgrounds.

Failure to achieve these objectives could lead to unacceptable human exposure to environmental contaminants. The site remedy periodically will be monitored by the Army and will be reviewed at five year intervals by the USEPA to evaluate the continued protectiveness of the remedy. Should these reviews reveal that the LUC objectives are not being met, the implementation of the LUCs will be modified. The modification of the remedy will be documented in accordance with CERCLA guidance. The RD will detail the provisions and requirements of the LUC portion of this remedy necessary to assure that land use remains safe and appropriate for the level of protection afforded by the remedial action.

The Army is responsible for implementing, maintaining, reporting on, and enforcing the LUCs. LUCs will be maintained until the concentration of hazardous substances in the soil and groundwater are at such levels to allow for unrestricted use and exposure. A LUC RD will be prepared as a component of the RD. Within 90 days of ROD signature, the Army shall prepare and submit to USEPA for review and approval a LUC RD that shall contain implementation and maintenance actions, including periodic inspections.

Remedial Alternative 8 shares several common elements with the other six active remedial actions. Three of the eight alternatives (Alternatives 5, 6, and 8) examined utilize excavation as a component of the remedial action. Additionally, LUCs and long-term monitoring are included in each remedial alternative except “no action.” The remedial action proposed as part of Alternative 8 requires excavation of all impacted soil, whereas the other alternatives propose removal of organics-contaminated soil only. Because contamination above NJDEP Residential Soil Cleanup Criteria would remain on-site, the expected outcome of Remedial Alternative 8 is restricted use of Site 34. However, it should be noted that Remedial Alternative 8 affords the most protection to human health and the environment, as contamination above NRDCSCC would be removed and disposed off-site.

2.10 COMPARITIVE ANALYSIS OF REMEDIAL ALTERNATIVES

Section 300.430(e) of the NCP lists nine criteria against which the remedial alternatives must be assessed. The acceptability or performance of each alternative against the criteria is evaluated individually so that relative strengths and weaknesses may be identified. The criteria are as follows:

1. Protection of human health and the environment;
2. Compliance with ARARs;
3. Long-term effectiveness and permanence;
4. Reduction of toxicity, mobility, or volume through treatment;
5. Short-term effectiveness;
6. Implementability;
7. Cost;

8. State acceptance; and,
9. Community acceptance.

The NCP [Section 300.430(f)] states that the first two criteria, protection of human health and the environment and compliance with ARARs, are "threshold criteria" which must be met by the selected remedial action unless a waiver can be granted under Section 121(d)(4) of CERCLA. Criteria three through seven are "primary balancing criteria," and the trade-offs within this group must be balanced. The preferred alternative will be the alternative that is protective of human health and the environment, is ARAR-compliant, and provides the best combination of primary balancing attributes. The final two criteria, regulatory and community acceptance, are "modifying criteria" that are evaluated following the public comment period on the Proposed Plan.

2.10.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled, through treatment, engineering controls, and/or ICs.

Remedial Alternative 1 (No Action) does not include any actions that would satisfy the intent of the evaluation criteria.

Alternative 2 (ICs) would not be sufficiently protective of human health. For ecological receptors, Alternatives 3 through 8 would increase the level of protection while Alternatives 1 and 2 would leave the level of protection unchanged.

Alternatives 3 (Capping with an Impermeable Soil and Synthetic Multilayer Cap) and 4 (Capping with an Impermeable Modified Asphalt Pavement) would prevent infiltration controlling the source, but would not provide permanent removal or treatment of the source. Alternatives 5, 6, and 7, which involve source control using in situ fixation/ stabilization, would be nearly equal in providing protection of human health and the environment.

Alternative 8 (Excavation/Off-Site Disposal) would be the most protective of human health and ecological receptors. This remedy would prevent migration of sediments into GPB through excavation and removal of all contaminated sediments.

2.10.2 Compliance with ARARs

Compliance with ARARs entails meeting applicable regulatory requirements and RAOs established for the site. Alternative 1 (No Action) and Alternative 2 (ICs) do not meet ARARs. All the remaining Alternatives meet ARARs and RAOs for the site.

Alternatives 3 (Capping with an Impermeable Soil and Synthetic Multilayer Cap) and 4 (Capping with an Impermeable Modified Asphalt Pavement) meet ARARs through source control and monitoring. The soil is contained, which prevents direct contact with contaminated soil. Groundwater ARARs would be met through the implementation of monitoring and ICs.

Alternatives 5 (Excavation/On-Site Treatment/In situ Fixation/Stabilization), 6 (Excavation/Off-Site Disposal/In situ Fixation/Stabilization), 7 (In situ Fixation/Stabilization), and 8 (Excavation/Off-Site Disposal) achieve ARARs primarily through source remediation (e.g., treatment and/or removal). However, because Alternative 5 includes on-site treatment, this alternative would require the greatest effort to comply with ARARs due to the volume of impacted soil.

2.10.3 Long-Term Effectiveness and Permanence

Long-term effectiveness is a measure of the ability of the alternative to meet and maintain remedial goals long-term. Alternatives 1 and 2 involving “No Action” and ICs, respectively, provide no long-term effectiveness or permanence because contaminants that represent a potential risk would not be addressed by remedial action, monitoring, or evaluation.

Alternatives 3 and 4, which involve capping, provide a long-term effective and permanent remedy through source containment rather than treatment. The capping alternatives provide less long-term

permanence with regard to UXO, as compared to the excavation alternatives. Because UXO will be potentially left under the cap, permanent restrictions for on-site use will be required. Additionally, the ability of Alternatives 3 and 4 to be effective over the long-term is dependent on the performance of cap maintenance.

Alternatives 5, 6, 7, and 8, involving excavation and/or in situ fixation/ stabilization, provide source control through removal or treatment. Limited residual potential site risks will remain after the completion of Alternatives 5, 6, or 7. Alternative 8 provides the highest level of long-term effectiveness and permanence through the removal of contaminated soils, thereby reducing the long-term risks associated with the impacted soil.

2.10.4 Reduction in Toxicity, Mobility or Volume through Treatment

Reduction in toxicity, mobility, or volume considers the overall level of contaminant control or toxicity reduction that is achieved by the alternative that leads to greater protection of human health and/or the environment. The evaluation considers both the level of reduction in contaminant concentration and the reduction in the volume of impacted media.

No treatment will be performed under Alternatives 1, 2, 3, or 4. The two types of caps proposed under Alternatives 3 and 4 are expected to reduce mobility of contaminants from the source material above the water table, thus providing protection to groundwater. The source area is physically contained under the covers installed by these two alternatives, but leaching could continue from submerged soils. The volume of impacted media is not reduced, and the potential to impact a greater volume of media through groundwater transport is possible with Alternatives 1, 2, 3, and 4, but is greatest under Alternatives 1 (No Action) and 2 (ICs), which provide for no remedial action at all. Natural re-establishment of vegetation when burning activities cease may reduce sediment migration.

Alternatives 5, 6, and 7 all involve in situ treatment using fixation/stabilization. Alternative 5 is the only alternative that reduces the concentration of organics in contaminated soil. Because these alternatives rely on fixation/stabilization, a potential increase in volume of affected media may occur. However, the availability of contaminants and environmental toxicity of the treated media is significantly reduced because chemical and physical transformations take place during stabilization treatment.

Alternative 8 (Excavation/Off-Site Disposal) does not include on-site treatment and does not reduce the volume of impacted media. The risk is transferred off-site; albeit to a much more secure location that ultimately will assure groundwater and environmental protection.

2.10.5 Short-term Effectiveness

Short-term effectiveness addresses both the length of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community, and the environment during construction and operation of the remedy until RAOs are achieved.

Alternatives 1 (No Action) and 2 (ICs) would be ineffective during both the short-term and long-term.

The short-term exposure risks to site workers would be relatively low for Alternatives 3 (Capping with an Impermeable Soil and Synthetic Multilayer Cap) and 4 (Capping with an Impermeable Modified Asphalt Pavement). Additionally, protection would be achieved comparatively sooner as cap installation can be easily and quickly implemented. Alternatives 5, 6, and 7, involving fixation/stabilization, would be the slowest to implement.

Alternatives 5, 6, 7, and 8, which involve excavation or in situ mixing, would have a higher associated safety hazard due to the potential for encountering UXO. Alternative 5 also has a higher associated safety hazard due to handling of flammable liquefied propane in the critical fluid extraction treatment process.

There is a probability that workers and, to a lesser extent, the community, would be exposed to site dust and soils under all the remedial alternatives. This potential exposure would be the greatest for those alternatives involving excavation, and to a lesser extent, soil mixing. These potential risks could be managed effectively using personal protection and engineering controls that are readily available and have been widely demonstrated.

2.10.6 Implementability

Implementability is the measure of ease with which an alternative can be implemented. It includes the consideration of factors such as availability of technology and resources, site conditions that may limit or assist the implementation, the level of effort and schedule that could realistically be accomplished, etc.

"No Action" under Alternative 1 would require no resources or effort to implement. Alternative 2, involving ICs, requires minimal resources and only a limited effort.

Cap installation under Alternatives 3 and 4 would be the easiest active remedial alternatives to implement. The required equipment, services, and materials are readily available, including the sources for sand, soil, and riprap stone that would comprise each cap.

Alternative 5 would likely be the most difficult alternative to implement due to the critical fluid-extraction treatment. Total excavation and off-site disposal under Alternative 8 would be more straightforward to perform than in situ stabilization under Alternatives 5, 6, and 7. However, none of the remedial alternatives are sufficiently burdened based on implementability that they could not be considered for complete implementation.

2.10.7 Cost

The cost evaluation involves calculating, evaluating, and comparing the capital cost (installed cost) and long-term operational cost (converted to a present worth) associated with each alternative. The present worth (discount rate of 7%) of each remedial alternative is summarized below. With the exception of Alternative 1, Alternative 2 has the lowest cost. Alternative 8, which would be the most protective of human health and the environment, would be the most expensive alternative to implement.

Remedial Alternative 1:

Present Worth:	$0.00
Capital Cost:	$0.00

Remedial Alternative 2:

Present Worth:	$463,000
Capital Cost:	$57,000

Remedial Alternative 3:

Present Worth:	$2,493,000
Capital Cost:	$1,890,000

Remedial Alternative 4:

Present Worth:	$1,995,000
Capital Cost:	$1,621,000

Remedial Alternative 5:

Present Worth:	$5,286,000
Capital Cost:	$5,093,000

Remedial Alternative 6:

Present Worth:	$4,214,000
Capital Cost:	$4,021,000

Remedial Alternative 7:

Present Worth:	$2,313,000
Capital Cost:	$2,120,000

Remedial Alternative 8:

Present Worth:	$6,699,000
Capital Cost:	$6,617,000

With the exception of Remedial Alternatives 1 and 2, Remedial Alternatives 3 and 4 have two of the lowest capital costs. However, Alternative 3 also has the highest long-term O&M costs of the alternatives examined ($603,000). Remedial Alternative 4 has the lowest overall cost and a long-term operating cost ($374,000) that slightly exceeds the O&M median cost of the other alternatives. The long-term O&M costs of Remedial Alternatives 5, 6, and 7 are equal at $193,000. Because contaminated soil would be removed as part of Remedial Alternative 8, this alternative has the highest capital cost and the lowest long-term operating costs ($82,000). Even though the O&M costs for Alternative 8 are significantly lower than Alternative 4, the total present worth of Alternative 8 is three-fold higher than Alternative 4 and neither alternative affords unrestricted use of Site 34.

2.10.8 State Acceptance

Based on NJDEP approval of the *Picatinny Arsenal Site 34 Feasibility Study* (IT, 2001b), it is anticipated that the NJDEP will concur with the selection of ***Remedial Alternative 4: Capping with an Impermeable Modified Asphalt Pavement*** as the preferred remedial alternative for Site 34.

2.10.9 Community Acceptance

Community input and participation into the remedy selection process is desired and encouraged. Multiple newspaper notifications were made to inform the public of the start of the Proposed Plan comment period, solicit comments from the public, and announce the date of the public meeting. A public meeting was held on 19 February 2004 to inform the public about the Selected Remedy for Site 34 and to seek public comments. At this meeting, representatives from the U.S. Army, USACE, NJDEP, and USEPA were present to answer questions about the site and the eight alternatives under consideration. The Army's response to comments received at the public meeting, as well as those submitted by other means, is included in Section 3.0 of this document.

2.11 PRINCIPAL THREAT WASTES

The NCP establishes an expectation that USEPA will use treatment to address the principal threats posed by a site wherever practicable [NCP §300.430(a)(1)(iii)(A)]. Identifying principal threat wastes combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Conversely, non-principal wastes are those source materials that generally can be reliably contained and that would present only a low risk in the event of exposure. The manner in which principal threats are addressed generally will determine whether the statutory preference for treatment as a principal element is satisfied.

Source materials that pose a potential risk of $1X10^{-3}$ or greater are considered to be principal threat wastes (USEPA, 1991). The Site 34 baseline HHRA evaluated the carcinogenic and noncarcinogenic risks for both the current site worker and the future commercial/industrial worker. The total carcinogenic risk from exposure to shallow soil for the current worker was calculated as $3.4X10^{-5}$. The total carcinogenic risks to the future commercial/industrial worker from exposure to shallow soil, total soil, and groundwater were calculated as $3.4X10^{-4}$, $2.4X10^{-4}$, and $2.0X10^{-4}$, respectively. Because the risks at Site 34 were identified at levels below $1X10^{-3}$, the source materials at Site 34 are considered to be non-principal threat wastes. Additionally, COCs in surface and subsurface soil at Site 34 are considered as non-mobile contaminated source material of low to moderate toxicity, and therefore do not constitute principal threats. COCs identified in soil include PAHs, PCBs, metals, and dioxins/furans. Since all COCs at this site are considered as non-principal threat wastes, the Army considered less emphasis in meeting the statutory preference for treatment as a principal element of the remedy.

2.12 SELECTED REMEDY

This ROD represents the Selected Remedy for Site 34 at Picatinny, in Rockaway Township, New Jersey, developed in accordance with CERCLA as amended and consistent with the NCP. Additionally because the operations conducted at Site 34 are regulated under interim status within a RCRA Part B permit, the requirements for RCRA closure are considered in addition to the CERCLA requirements. This decision is based on the administrative record for the site. The Selected Remedy for this site is ***Remedial Alternative 4: Capping with an Impermeable Modified Asphalt Pavement***. A detailed description of

the preferred remedial action is provided in this section and the conceptual layout and cap cross-section are presented as **Figure 6**.

The total project estimated capital cost, if approved, is **$1,621,000**, the sum total of which will be paid by the U.S. Army for the Department of Defense.

Remedial Alternative 4 was selected as the preferred remedy for Site 34 because it provides the best balance between the assessed criteria while still providing overall protection of human health, ecological receptors, and the environment for the projected site usage.

2.12.1 Summary of the Rationale for the Selected Remedy

Remedial Alternative 4, ***Capping with an Impermeable Modified Asphalt Pavement***, was selected as the preferred alternative because it represents the best balance of the nine evaluation criteria, as summarized in Section 2.9. As part of this alternative, soils would be contained under an ultra low permeability engineered asphalt cap. The reduction in impermeability using the modified asphalt is expected to be an improvement of at least two orders of magnitude over regular unmodified asphalt. The cap design will be optimized to prevent infiltration and enhance surface durability.

With the exception of Alternatives 1 (No Action) and 2 (ICs), each of the eight alternatives analyzed in detail was found to adequately address the project RAOs. Additionally, the remaining alternatives (3, 4, 5, 6, 7, and 8) comply with ARARs. However, the two capping alternatives (Alternatives 3 and 4) do offer advantages over the remaining alternatives with respect to short-term risk, ease of implementation, and cost. The short-term risk associated with the intrusive alternatives (Alternatives 5, 6, 7, and 8) is greater due to the potential risk from UXO. The potential presence of UXO requires that Explosives Ordnance Disposal (EOD) technicians be on-site during all excavation/construction activities and mandates the creation of a safety zone around the remediation site during specific phases of construction.

Although Alternatives 3 (Multilayer Soil Cap) and 4 (Modified Asphalt Cap) share similar elements with regard to implementation, construction practices, and short-term risk, Alternative 4 is selected over Alternative 3 due to its overall greater performance and durability. Modified asphalt is expected to provide a reduction in permeability comparable to that achieved by synthetic liners. It is expected to be more durable, easier to maintain and repair, and to provide greater flexibility towards future beneficial land use. After installation, the asphalt surface can be used for activities such as parking, equipment staging, and recreation. Additionally, the asphalt cap is expected to provide a degree of greater protection in the event of precipitation leading to local flooding. And finally, Alternative 4 is the less expensive alternative of the two capping options.

Remedial Alternative 4 will be protective of human health and the environment, and this element of the Alternative will be achieved partially through ICs and LUCs. The LUC objectives established for Site 34 include preventing human consumption and contact with groundwater, precluding inappropriate contact with impacted soils, and preventing site access for intrusive work without appropriate UXO screening precautions. Because contamination will remain on-site, five-year reviews will be performed by the USEPA to evaluate the continued protectiveness of the remedy. Failure to achieve these objectives could lead to unacceptable human exposure to environmental contaminants. The site remedy periodically will be monitored by the Army and will be reviewed at five year intervals by the USEPA. Should these reviews reveal that the LUC objectives are not being met, the implementation of the LUCs will be modified. The modification of the remedy will be documented in accordance with CERCLA guidance. The RD will detail the provisions and requirements of the LUC portion of this remedy necessary to assure that land use remains safe and appropriate for the level of protection afforded by the remedial action.

The Army is responsible for implementing, maintaining, reporting on, and enforcing the LUCs. LUCs will be maintained until the concentration of hazardous substances in the soil and groundwater are at such levels to allow for unrestricted use and exposure. A LUC RD will be prepared as a component of the RD. Within 90 days of ROD signature, the Army shall prepare and submit to USEPA for review and approval a LUC RD that shall contain implementation and maintenance actions, including periodic inspections.

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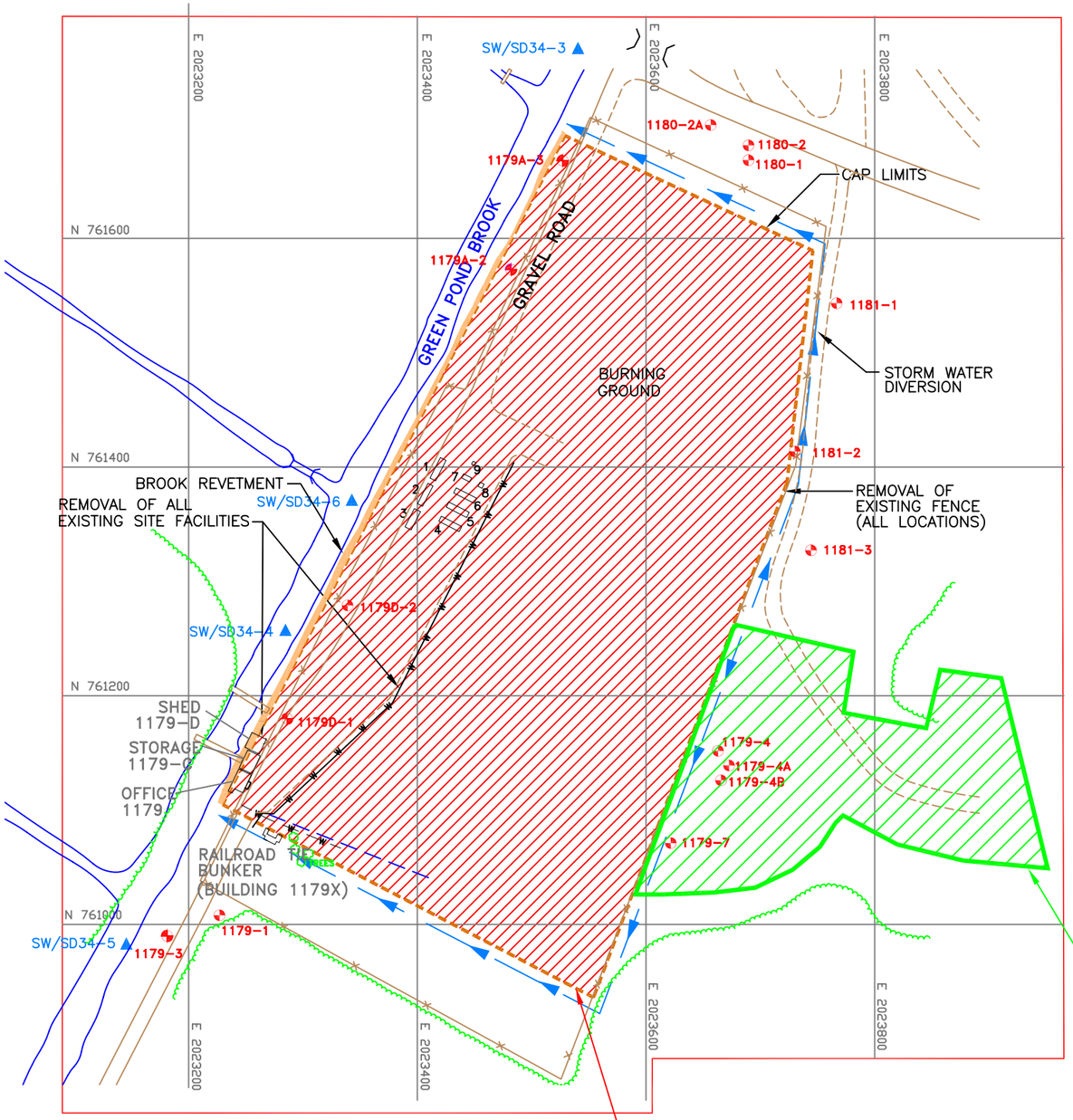
APPROVED BY -- -- --

CHECKED BY K. Rusczyk 05/16/04

DRAWN BY S. Wiafe 05/16/04



LEGEND:

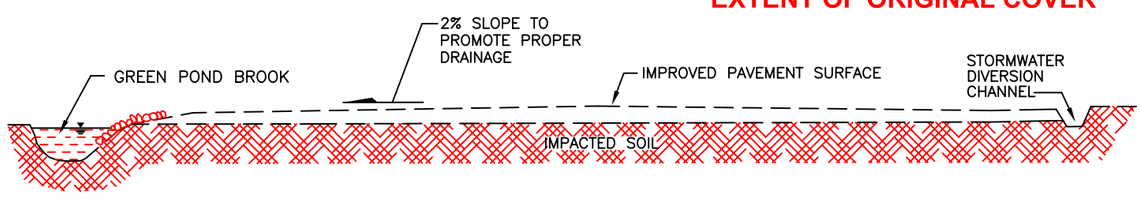
- 1179–3 — GROUNDWATER MONITORING WELL FOR LONG TERM OPERATION AND MAINTENENCE
- SW/SD34–3 — PROPOSED SURFACE WATER AND SEDIMENT SAMPLING LOCATION
- AREA OF CAP SYSTEMS
- BLDG. NO. — BUILDING
- BLDG. NO. — FORMER BUILDING
- WATER
- ROAD
- COVERED WALKWAY
- FENCE
- TREELINE

N

NOTES:

1. SUPER SILT FENCE TO BE INSTALLED AROUND DISTURBED AREAS DURING CONSTRUCTION IN ACCORDANCE WITH APPLICABLE EROSION AND SEDIMENTATION CONTROL PRACTICES.

SCALE
0 120 240 FEET



ALTERNATIVE 4 – ASPHALT CAP
N. T. S.

NOTE:
THIS IS A CONCEPTUAL DESIGN AND THE DETAILS PROVIDED ARE USED AS THE BASIS FOR THE THE COST ESTIMATE.

Picatinny Installation Restoration Program

U.S. Army Corps of Engineers

Shaw Shaw Environmental, Inc.

FIGURE No. 6

REMEDIAL ALTERNATIVE 4 CONCEPTUAL LAYOUT AND CAP CROSS-SECTION

SITE 34 ROD
PICATINNY, DOVER, NEW JERSEY

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Plotted By: stephen.Wiafe

Based on information currently available, the Selected Remedy meets the threshold criteria and presents the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The Army expects the Selected Remedy to satisfy the following statutory requirements of CERCLA § 121(b): 1) be protective of human health and the environment and 2) comply with ARARs. Additionally, the Selected Remedy is expected to: 3) be cost-effective, which is a balancing criteria.

2.12.2 Detailed Description of the Selected Remedy

As the Selected Remedy, Remedial Alternative 4 would consist of capping all impacted soils and debris above RGs with an impermeable modified asphalt cap. Additionally as part of this alternative, long-term groundwater and surface monitoring would be conducted, and LUCs would be employed to prevent exposure to contaminated soils. **Figure 7** presents a map depicting the area surrounding Site 34 in which LUCs will apply. In order to implement this remedial action, the following actions would be conducted:

- Confirmation of the extents of contamination;
- Monitoring well installation in the Burn Pan Area;
- Preparation of the following documents:
  - RD and construction workplans,
  - Site-specific health and safety plan,
  - Quality control/quality assurance plan,
  - Wetlands assessment and restoration plan,
  - Long-term monitoring plan, and
  - Closure report (following completion of the project);
- Acquisition of the required environmental permit-equivalents;
- UXO surveys;
- Erosion and sediment controls;
- Cap construction;
- Disposal of any construction-related debris/ decontamination fluids;
- Site restoration;
- LUCs and ICs; and,
- Long-term monitoring of groundwater and surface water.

2.12.2.1 Planning and Environmental Permitting

The asphalt pavement cap will require an engineering design to construct the cap to sufficiently contain the contaminants identified in surface and subsurface soil. Because this action will be conducted under CERCLA, permit equivalencies will be obtained in lieu of formal permits for all required activities.

2.12.2.2 UXO Surveys

Based on a combination of inspections and research of past ordnance disposal methods at Picatinny, Site 34 has been identified as possibly containing potentially hazardous unexploded ordnance items. UXO have not been discovered within the boundaries of Site 34 during previous sampling events, but there have been discoveries of containers and UXO within 200 feet of the site fence. As a result, qualified EOD technicians will provide UXO support during all remedial/construction activities conducted at Site 34. Additionally, the creation of safety zones will be established around the remediation site during specific phases of construction.

2.12.2.3 Cap Construction

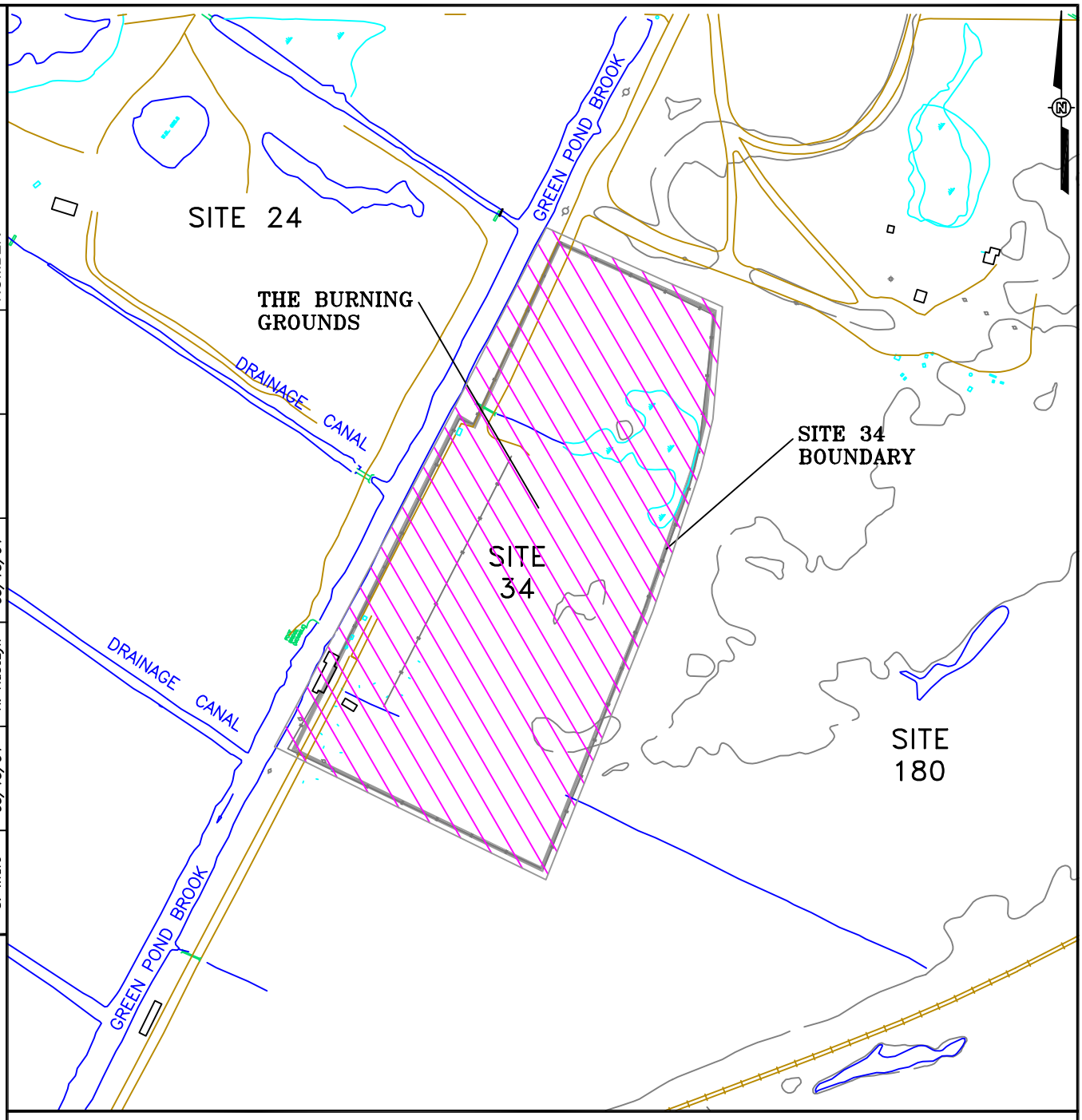
The construction of the asphalt pavement cap will be outlined in the RD workplan, which will be submitted after the ROD. Activities summarized in the workplan will include:

- Site mobilization and site preparation activities (erosion controls, removal of site fence, and site clearing activities);
- Cap design, placement, and implementation;
- Decontamination and disposal of site debris;
- Stormwater management controls;
- Treatment and disposal of decontamination water;
- Site restoration and vegetation; and,
- Site closeout activities (site cleanup, surveying, and demobilization activities).

2.12.2.4 Long-Term Groundwater and Surface Water Monitoring

Following construction of the asphalt cap, long-term monitoring of groundwater and surface water would be conducted to verify protection of human health and the environment until promulgated groundwater standards are achieved for groundwater and background concentrations are achieved for surface water at the site. The monitoring program will also comply with RCRA requirements under Subpart F, 40 CFR 265.90-94 and will meet the RCRA Subtitle C closure and post-closure requirements. The groundwater monitoring program would entail the sampling of six existing monitoring wells and one newly-installed well in the unconfined shallow aquifer and two monitoring wells in the lower semiconfined aquifer. Three surface water samples would be collected from GPB at the following locations: upstream of Site 34, adjacent to Site 34, and downstream of Site 34. Surface water samples collected upstream of the site would be used as background data. The surface water data collected adjacent to and downgradient of Site 34 would be compared to the upstream data. The surface water sampling events would coincide with the sediment and biota monitoring as outlined in the *Picatinny Arsenal Green Pond and Bear Swamp Brooks Focused Feasibility Study* (IT, 2001a). As part of that remedy, sediment will be collected from three locations adjacent to Site 34.

All samples would be analyzed for TAL metals. Both groundwater and surface water samples would be collected on a more frequent basis for the first one to two years until a trend has been established. Increased sampling frequency would aid in eliminating short-term or seasonal effects from the overall data interpretation. If a stable or decreasing trend is established, then the monitoring frequency may be reduced. Additionally, the number of monitoring wells sampled in the upper semiconfined aquifer may decrease, and the constituent list for both media types may be modified based on the analytical results of the first one to two years. If a trend is not established during the first two years, monitoring would continue on a periodic basis until a tendency could be identified. The long-term monitoring program will be reviewed at a minimum of every five years to determine if the program is adequately monitoring the effectiveness of the remedy and if any modification to the remedy or monitoring program is necessary. In the RD, trigger levels will be established for TAL metals to indicate the need to modify the remedy, modify the sampling program, or discontinue the sampling program. Any of the three scenarios would require concurrence from the USEPA and NJDEP. Additionally, if the remedy is shown to be failing and an alternate remedy or more aggressive remedy is necessary, the selection of the alternate remedy would be documented. Documentation will be performed in accordance with CERCLA guidance. Both monitoring programs would be modified and/or abandoned based upon the site-specific exit strategy outlined in Appendix H of the *Picatinny Arsenal Site 34 Feasibility Study* (IT, 2001b).



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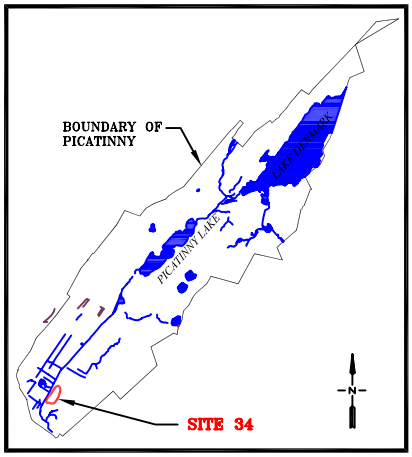

LEGEND

- BLDG. NO. — BUILDING
- BLDG. NO. — FORMER BUILDING
- COVERED WALKWAY
- SWAMPY AREA
- WATER
- RAILROAD
- FENCE
- TR-732 — TRANSFORMER
- BLAST WALL
- ===STS== OR ---STS-- — STORM SEWER
- ===SS=== OR ---SS--- — SANITARY SEWER
- EARTH MOUND
- CONTOUR LINE
- AREA OF APPLICABILITY FOR LAND USE CONTROLS TO BE IMPLEMENTED AS PART OF THIS DECISION

SCALE

0 200 400 FEET

Picatinny Installation Restoration Program

U.S. Army Corps of Engineers

Shaw Environmental, Inc.

FIGURE No. 7

LAND USE CONTROLS
AREA OF APPLICABILITY

SITE 34 ROD
PICATINNY, DOVER, NEW JERSEY

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2.12.3 Summary of the Estimated Costs for the Selected Remedy

The costs associated with the Site 34 Selected Remedy are outlined in **Tables 2-6 through 2-8**.

Table 2-6 Capital Costs for Remedial Alternative 4

Remedial Design	**$94,000**
Monitoring Plan	$30,000
Remedial Design	$64,000
Preliminary Remedial Activities	**$236,500**
Develop Work Plans	$40,000
Additional Soil Sampling/Delineation Activities	$40,000
Prepare Site Maps	$16,000
Mobilization	$28,500
Site Setup and Erosion Control	$45,000
Removal of Existing Site Fence	$12,000
Removal of Existing Site Features	$50,000
Clearing Vegetation	$5,000
UXO/Geophysical Survey	**$103,000**
Initial UXO Survey	$37,000
UXO Avoidance	$66,000
Institutional Controls	**$39,150**
Post Warning Signs	$1,150
Abandonment of Monitoring Wells	$36,000
Picatinny Master Planning Office - Amendments	$2,000
Asphalt Cap System	**$758,490**
Stormwater Management Controls	$15,000
Decontamination of Debris	$10,000
Debris Disposal	$12,000
Treatment of Decontamination Water	$500
Regrade Area	$12,000
Asphalt Cap Material/Installation	$708,990
Site Closeout/Restoration	**$64,500**
Restore Disturbed Areas	$7,500
Cleanup and Demobilization	$25,000
Professional Surveying – Remediation Areas	$14,000
Final Report	$18,000
Additional Costs	**$324,443**
Oversight/QA Costs	$60,082
Contingency Costs	$264,361
TOTAL CAPITAL COSTS	**$1,621,000***

* - Total costs have been rounded to the nearest thousand dollars.

Table 2-7 O&M Costs for Remedial Alternative 4

Initial Monitoring (1 Year)	**$49,600**
Environmental Sampling (4 events)	$24,000
Analytical Costs	$5,600
Monitoring Report/Risk Assessment	$20,000
Long-Term Monitoring Program (29 Years)	**$16,600**
Annual Environmental Sampling	$6,000
Analytical Costs	$5,600
Monitoring Report/Risk Assessment	$5,000
Institutional Controls (30 Years)	**$3,710**
Site Inspection	$2,560
Warning Sign Replacement	$150
Erosion and Vegetation Repairs – Asphalt Cap	$1,000
PRESENT WORTH O&M COSTS (7% INT.)	**$374,000 ***

* - O&M costs are totaled as a present worth cost based on a 7% net investment rate for a 30-year period.

Table 2-8 Total Costs for Remedial Alternative 4

TOTAL PRESENT WORTH	**$1,995,000**

Information provided in the cost estimate summary tables is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost estimates are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record file, an Explanation of Significant Differences (ESD), or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to –30 percent of the actual project cost.

2.12.4 Expected Outcomes of the Selected Remedy

The expected outcome of the implementation of Remedial Alternative 4 is to prevent immediate exposure to contaminated soil and mitigate potential risk to human and ecological receptors. Additionally, it is expected that migration of COCs to site groundwater and surface water be reduced as a result of the cap installation. The cap will control erosion and the transportation of soil from the site to adjacent GPB and other surrounding drainages features. These expected outcomes would be realized following completion of the asphalt cap. To ensure the continued improvement of the quality of groundwater and surface water, long-term groundwater and surface water monitoring will be conducted periodically. However, as the contaminants will be contained under the cap and not removed from the site, and as soils with concentrations of COCs in excess of residential cleanup standards will remain outside the cap, unrestricted use of Site 34 is not afforded by completing this action.

The site will continue to be used for military industrial purposes. The asphalt cover will afford the Army greater flexibility in utilizing the site.

2.13 STATUTORY DETERMINATIONS

Under CERCLA §121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment and permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the Selected Remedy meets these statutory requirements.

2.13.1 Protection of Human Health and the Environment

The Selected Remedy will be protective of human health and ecological receptors because contaminated soils will be contained under the impermeable asphalt cap. Although the contamination would remain in place at the site, direct exposure pathways to contaminated soil will be eliminated. Additionally, long-term monitoring proposed under this alternative would allow for an ongoing evaluation of groundwater and surface water at the site.

2.13.2 Compliance with ARARs

ARARs were considered as part of the FS to develop remedial action cleanup levels, determine the appropriate extent of site cleanup, and govern implementation and operation of the selected remedial action. Three types of ARARs were considered as part of the Site 34 FS:

- Chemical-specific ARARs are generally health- or risk-based concentration values set for specific hazardous substances or other contaminants potentially found in environmental media. The federal government and the State of New Jersey have promulgated chemical-specific ARARs for groundwater. Because no promulgated chemical-specific standards exist for surface or subsurface soil, the NRDCSCC and human health risk-based criteria were considered as TBCs for site soil. TBCs will ensure the protection of public health and the environment at Site 34 (USEPA, 1988a,b). Surface and subsurface soils at Site 34 would be contained under the impermeable asphalt cap, which would prevent direct contact with contaminated soil. This meets the intent of the chemical-specific ARARs and TBCs, but it does not meet the numeric criteria. Chemical-specific ARARs for Site 34 are presented in **Table 2-9**.
- Location-specific ARARs consist of restrictions/requirements for substances or activities based primarily on their specific physical location (USEPA, 1988a,b). In order to comply with federal and State requirements, appropriate distances from remedial activities to wetlands and floodplains will be considered. Location-specific ARARs for Site 34 are presented in **Table 2-10**.
- Action-specific ARARs are generally technology or activity-based requirements on actions taken with respect to cleanup of hazardous substances at a site. The construction practices used to implement the Selected Remedy will comply with all action-specific ARARs or TBCs. Action-specific ARARs are presented in **Table 2-11**.

2.13.3 Cost Effectiveness

In the lead agency's judgment, the Selected Remedy is cost-effective and represents a reasonable value in the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (NCP §300.430(f)(1)(ii)(D)). This was accomplished by evaluating the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility and volume through treatment; short-term effectiveness; implementability, and costs). A comparison of the costs to the overall effectiveness was conducted to determine cost effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs and hence this alternative represents a reasonable value for the money to be spent.

The estimated present worth cost of the Selected Remedy is **$1,995,000**. Although Alternatives 1 and 2 are less expensive than Remedial Alternative 4, neither alternative provides protection of human health, ecological receptors, or the environment. The Army believes that the Selected Remedy is cost-effective and the additional cost provides a significant increase in protection of human health and the environment.

Table 2-9
Identification of Chemical-Specific Cleanup Standards for Selected Remedy (Remedial Alternative 4)

Authority	Medium	Requirement	Synopsis of Requirement	Action to be Taken to Attain Requirement
Federal Regulatory Requirements	Groundwater	Safe Drinking Water Act (SDWA) – Maximum Contaminant Levels (MCLs), 40 CFR 141.11-141.13	MCLs have been promulgated and regulate contaminants in public drinking water.	Groundwater ARARs would be met through the implementation of long-term groundwater monitoring and LUCs at Site 34.
		SDWA – Maximum Contaminant Level Goals (MCLGs), 40 CFR 141 Subpart F	Health-based criteria for drinking water sources.	
		RCRA Release from Solid Waste Management Units, Subpart F, 40 CFR 265.90-94	Promulgated groundwater protection standards.	
State Regulatory Requirements	Groundwater	New Jersey Safe Drinking Water Act – State MCLs, N.J.A.C. 7:10-1 et seq.	MCLs have been promulgated by the state and regulate contaminants in public drinking water.	
		New Jersey Groundwater Quality Standards, N.J.A.C. 7:9-6.1 et seq.	Groundwater quality standards have been promulgated and regulate contaminants in groundwater.	
Federal Regulatory Requirements	Surface and Subsurface Soil	Site-specific risk assessment	Site-specific RGs were developed in the human health risk assessment.	Surface and subsurface soil at Site 34 would be contained under the impermeable asphalt cap, which would prevent direct contact with contaminated soil.
State Regulatory Requirements	Surface and Subsurface Soil	Soil cleanup criteria N.J.A.C. 7:26:D, NJDEP NRDCSCC	Proposed Rule for residential, nonresidential, and impact to groundwater soil cleanup criteria.	

Table 2-10
Identification of Location-Specific Cleanup Standards for Selected Remedy (Remedial Alternative 4)

Authority	Requirement	Synopsis of Requirement	Action to be Taken to Attain Requirement
Federal Regulatory Requirements	Executive Order 11990 § 7 (c) and 40 CFR 6, Appendix A § 4 (j)	Whenever possible, federal agency actions must avoid or minimize adverse impacts on wetlands and act to preserve and enhance their natural and beneficial values. Agencies should particularly avoid new construction in wetland areas unless there are no practicable alternatives. Federal agencies shall incorporate wetlands protection consideration into planning, regulating, and decision-making processes.	A wetlands assessment and restoration plan will be drafted as part of the Site 34 RD workplan.
State Regulatory Requirements	Clean Water Act Section 402 33 CFR 320.4 and NJAC 7:7A (the Freshwater Wetlands Protection Act, P.L. 1987)	To the extent possible, action must be taken to avoid degradation or destruction of wetlands. Discharges for which there are practicable alternatives with less adverse impacts or those that would cause or contribute to significant degradation are prohibited. If adverse impacts are unavoidable, action must be taken to enhance, restore, or create alternative wetlands.	
Federal Regulatory Requirements	Protection of floodplains as defined in Executive Order 11988 § 6(c) and 40 CFR 6, Appendix A § 4(d)	Federal agencies shall take action to reduce the risk of flood loss; minimize the impact of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial values of floodplains. Federal agencies shall evaluate potential effects of actions in floodplains and ensure consideration of flood hazards and floodplain management. If action is taken in floodplains, federal agencies shall consider alternatives to avoid adverse effects, and potential.	The area to be capped at Site 34 is within the 100-year floodplain of GPB. However, impacted soils will be contained under the impermeable asphalt cap. The asphalt cap is expected to provide a degree of greater protection in the event of precipitation leading to local flooding.
State Regulatory Requirements	Within 100 year floodplain as defined in 40 CFR 264.18(b) and NJAC 7:13 (New Jersey Flood Hazard Area Control Regulations)	Facility must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by flooding.	

Table 2-10 (Continued)
Identification of Location-Specific Cleanup Standards for Selected Remedy (Remedial Alternative 4)

Authority	Requirement	Synopsis of Requirement	Action to be Taken to Attain Requirement
Federal Regulatory Requirements	Presence of those species listed in the following acts and regulations: - Endangered Species Act (16 U.S.C. 1531 *et seq*) - Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq*) - 40 CFR 6.302(h) - 50 CFR 402 - CWA § 404 50CFR17.11 and 12	Whenever possible, federal agency actions must avoid or minimize adverse impacts on rare, threatened, or endangered species and act to preserve and enhance their natural and beneficial values. Federal agencies shall incorporate rare, threatened, or endangered species protection consideration into planning, regulating, and decision-making processes. Agencies should particularly avoid new construction in those areas containing these species unless there are no practicable alternatives.	Impacts to endangered species will be considered during the RD of the asphalt cap because clearing, grubbing, and/or excavation activities could impact habitat typical of several sensitive species listed under the Endangered Species Act. Protected species which are resident at Picatinny are the barred owl, blue heron, bog turtle, Indiana bat, timber rattlesnake, and brook trout.
State Regulatory Requirements	NJAC 7:25-4 as being rare, threatened, or endangered species.		
Federal Regulatory Requirement	Army Regulations for Environmental Protection and Enhancement AR 200-1	These regulations are the primary Army environmental policy. A more detailed guidance on compliance with environmental laws and regulations is found in the accompanying draft final technical document DA PAM 200-1.	Army Environmental Policy will be considered during the RD of the asphalt cap.
	Army Environmental Protection and Enhancement Draft Final Document DA PAM 200-1	This technical document accompanies AR 200-1, the main Army environmental regulation document. It details Department of the Army's procedures and methodology to be followed for preserving, protecting, and restoring environmental quality.	

Table 2-11
Identification of Action-Specific Cleanup Standards for Selected Remedy (Remedial Alternative 4)

Authority	Requirement	Synopsis of Requirement	Action to be Taken to Attain Requirement
Federal Regulatory Requirements	40 CFR 266.200 – 266.206, Subpart M [reference 40 CFR 260-270]	Regulations which identify when military munitions become a solid waste and if hazardous.	A certified EOD technician will be on-site during all remedial activities. All activities will be conducted in accordance with the Picatinny UXO policy and the Picatinny UXO avoidance plan (for all site investigation and remedial activities).
	40 CFR 300.120 – 266.206, Subpart M [reference 40 CFR 260-270]	DOD will have removal response authority and Remedial Project Manager (RPM) will be the prime contact for incidents involving military weapons and munitions under control of DOD.	
	ER-1110-1-8153	Adapts criterion of 10% explosive content as a measure of contaminated soil reactivity to differentiate between hazardous and explosive waste.	
	TM-9-1300-214	Defines procedures for detection and identification of suspect explosive materials.	
	TM-9-1375-213-12	Defines the minimum safe distance between emitters of electromagnetic radiation in the radio frequency range and UXO clearance/demolition activities.	
	TM-5-855-1	Defines protective measures to be taken to reduce blast shock and fragmentation damage.	
	DA PAM 50-6 DA PAM 385-61 DA PAM 40-137	Defines procedures for emergency decontamination of site workers.	
	DOD 6055.9-STD	Requires specialized personnel in detection, removal, and disposal of ordnance and explosives (OE); stipulates required safety precautions and procedures for detonation/ disposal; establishes depth of remediation based on land use.	

Table 2-11 (Continued)
Identification of Action-Specific Cleanup Standards for Selected Remedy (Remedial Alternative 4)

Authority	Requirement	Synopsis of Requirement	Action to be Taken to Attain Requirement
Federal Regulatory Requirements	40 CFR 264.310 (a) (Subpart N)	Requirements for the placement of fill for a soil cover and soil erosion and sediment controls.	The placement of the asphalt cap will be in accordance with soil/sediment erosion requirements, and will be outlined in the Site 34 RD workplan.
	40 CFR 264.110-120 (Subpart F)	Requirements for closure plans, post-closure plans, performance standards, and certificates of closure.	The site closure and post-closure plans will be prepared in accordance with RCRA requirements.
	USEPA OSWER Publication 9345.3-03FS, January 1992	Investigation-derived wastes generated from remedial activities (e.g., drilling muds, purged water, etc.) are required to be properly stored, managed and disposed. Guidance given in the publication includes waste material containment, collection, labeling, etc.	Wastes generated during the monitoring well installation and all other remedial activities will be disposed accordingly.
	CWA Effluent Guidelines 40 CFR 401 40 CFR 122 and 125 40 CFR 136.1 – 136.4	Provides requirements for point source discharges of pollutants.	No discharge of pollutants is expected, but all appropriate environmental permit-equivalents will be obtained prior to remedial activities.
	Clean Air Act (CAA) National Ambient Air Quality Standards (NAAQS) Particulates 40 CFR 50 40 CFR 52, Subpart FF	Establishes maximum concentrations for particulates and fugitive dust emissions; and records New Jersey's State Implementation Plan.	The necessity for air monitoring during remedial activities will be addressed in the site-specific health and safety plan.
	33 CFR 320.4 U.S. Army Corps of Engineers, Navigable Waterways	Equivalency permit required for the following activities: - Development or disturbances in floodplain and wetland area - Stream encroachment - Soil erosion and sediment control	All appropriate environmental permit-equivalents will be obtained prior to remedial activities.
	40CFR 264.601 Subpart X	Environmental performance standards for design, operation, and closure of a regulated unit must be maintained to prevent releases to the environment including groundwater, wetlands, surface water, and soil.	The unit will be closed in a manner that prevents further migration to groundwater, surface water, wetlands, and surrounding soils.

Table 2-11 (Continued)
Identification of Action-Specific Cleanup Standards for Selected Remedy (Remedial Alternative 4)

Authority	Requirement	Synopsis of Requirement	Action to be Taken to Attain Requirement
State Regulatory Requirements	Remediation Technical Requirements NJAC 7:26E-3	Requirements of quality assurance for sampling and analysis at remediation sites.	All sampling procedures will be conducted in accordance with the NJDEP Technical Requirements.
	Regulations Governing the Certification of Laboratories and Environmental Measurements NJAC 18:1-3, 5 and 9	Establishes the procedures for obtaining and maintaining certifications and the criteria and procedures that certified laboratories shall follow in handling, preserving, and analyzing regulatory samples.	All samples collected at Site 34 will be analyzed by a New Jersey certified laboratory.
	New Jersey Soil Erosion and Sediment Control Act, NJAC 7:13-3 and NJAC 2:90	Requirements for the placement of fill for a soil cover and soil erosion and sediment controls.	The placement of the asphalt cap will be in accordance with this requirement, and will be outlined in the Site 34 RD workplan.
	Technical Requirements for Site Remediation NJAC 7:26E 1, 4-7	Specifies the minimum technical requirements to investigate and remediate contamination on any site.	The contamination at Site 34 has been delineated and the cap will cover all impacted soils.
	New Jersey Soil Erosion and Sediment Control Act 40 CFR 122.26(c) NJAC 7:13-3 and 4:24 40 CFR 122.26 (c)	Requires the implementation of soil and erosion and sediment control measures for activities disturbing over 5,000 square feet of surface area of land.	The placement of the asphalt cap will be in accordance with soil/sediment erosion requirements, and will be outlined in the Site 34 RD workplan.
	New Jersey Water Pollution Control Act – New Jersey Pollutant Discharge Elimination System (NJAC 7:14A)	Discharge of pollutants to surface water and groundwater from remediation sites is regulated via NJPDES requirements. NJPDES requirements include obtaining a discharge to surface water or groundwater permit equivalent and meeting substantive requirements of the permit. Requirements include effluent limitations, water quality based limitations, monitoring, and monitoring techniques.	No discharge of pollutants to GPB is expected, but all appropriate environmental permit-equivalents will be obtained prior to remedial activities.

Table 2-11 (Continued)
Identification of Action-Specific Cleanup Standards for Selected Remedy (Remedial Alternative 4)

Authority	Requirement	Synopsis of Requirement	Action to be Taken to Attain Requirement
State Regulatory Requirements	33 CFR 320.4 Flood Hazard Area Control (NJAC 7:13-1.1 et seq.) Freshwater Wetland Protection Act Rule (NJAC 7:7A-9, NJSA 13:9A-1) All the regulations require equivalency permit and correlate with location specific requirements.	Equivalency permit required for the following activities: - Development or disturbances in floodplain and wetland area - Stream encroachment - Soil erosion and sediment control	All appropriate environmental permit-equivalents will be obtained prior to remedial activities.
	Air Quality Regulations New Jersey NJAC 7:27-13	Provides requirements applicable to ambient air pollution sources.	The necessity for air monitoring during remedial activities will be addressed in the site-specific health and safety plan.

2.13.4 Utilization of Permanent Solutions and Alternative Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Practicable

The Selected Remedy does not utilize any treatment technologies as principal elements, but the Selected Remedy will provide containment of the contaminants identified in soil at Site 34. Because the modified asphalt used to construct the cap is expected to be durable and easy to maintain and repair, this type of cap should satisfy the long-term effectiveness and permanence criteria with providing greater flexibility towards future beneficial land use. A portion of the protectiveness of the Selected Remedy will be achieved through ICs and LUCs included as part of the remedy. The Selected Remedy does not present short-term risks that cannot be effectively controlled through safe work practices. Additionally, there is a reduced potential for encountering UXO as invasive activities are much more limited under the Selected Remedy. As a result, it is anticipated that the Selected Remedy will be easier to implement than the other alternatives, with the exception of the No Action and ICs Remedial Alternatives. Furthermore, protection would be achieved sooner as compared to the other alternatives.

2.13.5 Preference for Treatment as Principal Element

As presented in Section 2.11, no surface or subsurface soil COCs at Site 34 were identified as principal threat wastes. Thus, the Selected Remedy does not utilize treatment as a principal element, and there is no need to satisfy the statutory preference for remedies that employ treatment as a principal element. The Selected Remedy utilizes containment, which will ultimately reduce the mobility of COCs in soil.

2.13.6 Five-Year Review Requirements

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, statutory reviews will be conducted every five years after remedial action initiation pursuant to NCP §300.430(f)(5)(iii) and CERCLA §121(c). Five-year reviews will be conducted by the USEPA and will ensure that the remedy is, or will be, protective of human health and the environment.

2.13.7 Documentation of Significant Changes

The Proposed Plan presents the selected remedial action as the preferred alternative for Site 34. The Army has reviewed all verbal and written comments received during the public meeting and the public comment period. However, no significant changes have been made based on public comment.

3.0 RESPONSIVENESS SUMMARY

The final component of the ROD is the Responsiveness Summary. The purpose of the Responsiveness Summary is to provide a summary of the stakeholders' comments, concerns, and questions about the Selected Remedy for Site 34 and the Army's responses to these concerns.

In general, the community is accepting of the Selected Remedy. The Army, USEPA, and NJDEP have considered all comments and concerns summarized below in selecting the final remedy for Site 34 at Picatinny.

3.1 PUBLIC ISSUES AND LEAD AGENCY RESPONSES

As of the date of this ROD, the Army endorses the Selected Remedy for Site 34 as ***Capping with an Impermeable Modified Asphalt Pavement***, ***Long-term Monitoring, and Land Use Controls***. USEPA and NJDEP support the Army's plan.

Comments recorded during the public meeting are summarized below in Section 3.1.1. Written comments received during the comment period on the Proposed Plan in addition to those comments expressed at the public meeting are summarized in Section 3.1.2. Written comments were received from Subsurface Solutions on behalf of the Picatinny Restoration Advisory Board. Subsurface Solutions is under contract to the Army under the Technical Assistance for Public Participation (TAPP) program. Written comments also were received from the Law Offices of Schwartz, Tobia, Stanziale, Sedita, and Campisano on behalf of Pondview Estates, Inc, (Pondview). Pondview is large residential development being constructed across Route 15 from the southern boundary of Picatinny.

3.1.1 Summary of Comments Received During the Public Meeting on the Proposed Plan and Agency Responses

A public meeting was held on 19 February 2004, at which the site history and the eight remedial alternatives under consideration were presented. Additionally, the public meeting provided the public with the opportunity to raise any questions that they may have with regard to Site 34. Specific comments raised during the public meeting are summarized below.

Comment from Mr. Michael Glaab, Picatinny Restoration Advisory Board (PAERAB)

Comment 1: First, I would like to make just a comment. For future reference, the Army might want to consider beginning the public comment period on either the day of the public hearing or on the day after the public hearing. This would afford members of the general public who are attending the hearing, and for those who the hearing is really the only first exposure to the material, additional time to respond. Thirty days isn't a great deal of time.

Response: Yes. Although the timetable utilized in this public comment period is permissible, in the future, the Army also will issue the notice of availability of the Proposed Plan and administrative record two weeks prior to the start of the public comment period. Additionally, the public meeting will be held within the first week of the public comment period. This will enable the public to obtain the Proposed Plan and review the administrative record prior to the public meeting in addition to allowing ample time for the submission of written comments.

Comment 2: I understand that the Army has financial pressures and wants to receive funding. Second, I know that you did very clearly and explicitly say there are dioxin/furan contaminants in the area. Because dioxin/furans don't migrate readily in soil, there's less of a concern of them being extracted from the soil by groundwater. Therefore, the concern regarding dioxin/furans isn't as great. However, we still have dioxins/furans in the soil and I think that we should remember that this site is immediately adjacent to Green Pond Brook.

Response: The comment is correct in stating that dioxins/furans do not readily migrate in soil. As summarized in Section 2.11 of this document, the Army evaluated the potential for dioxins/furans to migrate into groundwater and determined it was not likely. It should be noted that dioxins/furans were selected in the feasibility study as contaminants of

concern. These compounds are of concern due to the potential level of human health risk from these compounds as estimated in the baseline HHRA as summarized in Section 2.7.1 of this ROD. The selected remedial alternative effectively mitigates this potential for excess human health risk by precluding human contact with soils that contain dioxins/furans contamination.

Comment 3: I'm very concerned that when we think in terms of long-term, that we are thinking in terms of 30-year intervals. Many of these contaminants will remain in the soil, and they will be issues of concern for longer than 30 years. The EPA had a five-year study in which I believe said that it would require roughly 175 years for the groundwater underneath the Arsenal to naturally remediate it to general drinking water standards. Therefore, I'm very concerned about our thinking only in terms of 30 years. When it comes to costs, I don't think we should only be calculating over a 30-year time interval, unless we are certain that the contaminants will break down after 30 years. TCE might breakdown, but I doubt that dioxin/furans would break down after 30 years.

Response: It should be noted that the 30-year time period was utilized only for the cost estimate in the FS. The FS and ROD acknowledge that cap maintenance and land used controls will be required for a very long period of time. The documents also specify that the maintenance and land use controls will be continued until the Army and USEPA determine that they are no longer necessary. As is the case with the selection of this remedial alternative, the NJDEP will be consulted on this decision. For cost comparison, the Burning Ground FS used present value analysis to compare costs for each alternative. Present value analysis is a method by which costs occurring over multiple time periods can be directly compared. Present value determines the amount of funding that would need to be set aside prior to project initiation in order to complete the project. Present value analysis uses a discount rate to account for the time-value of money. By this method, funding needed in the distant future impacts the present value very little. For instance, the present value of $10,000 in year one is $9,523.81 using a 5% discount rate. The present value of $10,000 in year 50 is $872 (using the same 5% discount rate). So funding needed in the distant future impacts the present value very little.

Comment 4: Please elaborate about the long-term monitoring program. What types sampling are proposed? Would water samples be collected from the wells? Also, I understand there would be an additional well installed. Please elaborate on the installation.

Response: The long-term monitoring program for Site 34 will include sampling groundwater and surface water. Although there is no unacceptable risk associated with site groundwater, the objective of the monitoring program is to ensure that conditions remain safe and there are no adverse changes to groundwater conditions. While the exact details of the sampling program will not be set until the remedial design is approved, the objective of the program will be to monitor metals in groundwater to ensure concentrations do not go up and continue to decrease with time. This remedial action is also being performed and partially funded by the RCRA program so the groundwater monitoring program will also need to comply with RCRA requirements. Section 2.9.2 of this ROD explains how long term monitoring fits into the overall remedial alternative.

Additionally, as part of the site remedy for the Green Pond Brook/Bear Swamp Brook, sediment and biota adjacent to Site 34 will be monitored. This monitoring will include sediment sampling for chemical parameters as well as ecological toxicity testing of the sediments to assess the potential for a healthy aquatic ecosystem in the sediments. The Army will coordinate the remedies for these two sites and report the data accordingly.

As part of the remedy, the Army has agreed to install an additional shallow groundwater well downgradient of the Burning Ground. The well location will be proposed in the remedial design and this well will be sampled as part of the long term monitoring program for the site.

Comment 5: I know it would be expensive, but I would like to see some of the contaminated soils immediately adjacent to the Green Pond Brook, say, within five to ten feet, excavated and moved. There ought to be something that could be worked out because it is immediately adjacent to Green Pond Brook.

Response: Yes, the Army will consider moving some site soils from the stream bank of Green Pond Brook further to the east toward the center of the cap. This concept will be evaluated at the time of remedial design. It may be possible to move this soil as part of the site grading without any appreciable additional cost.

Comment 6: Will you be taking both sediment and surface water samples?

Response: As part of the remedy for the Burning Ground, surface water samples will be collected and chemical analysis will be performed. Additionally, the long term monitoring of Green Pond Brook adjacent to the Burning Ground will include sampling of sediment for chemical analysis as well as the collection of benthic macroinvertebrates from the surface water and sediment.

Comment 7: When it comes to actually calculating the long-term costs of these alternatives, there's a general rule in terms of 30 years. If you only think in terms of thirty years, one set of numbers will be calculated. However, the costs could dramatically change in 50 or 175 years. The cost to the environment, to the Arsenal, and potentially to the Army are not being considered. For example, in 20 years the Army may want to break through the cap and remove some of the contaminated soil. We should consider the long-term costs of that, not only the potential long-term costs of pollution migration. I know that's not an issue here, but because the contaminants are not expected to migrate, we shouldn't be thinking in terms of 30 years in calculating the long-term costs.

Response: The remedy selection process involves the performance of a feasibility study, which is an engineering study. With all engineering studies assumptions must be made to provide some framework for the technical analysis. With all CERCLA sites at Picatinny, including the Burning Ground, one underlying assumption is that the site will remain under active military control. The military currently has no plans for changing the land use of the Burning Ground so the document assumed the land use would remain military industrial. Because there is no reason to assume that these underlying assumptions are incorrect, the engineering analysis did not evaluate the types of changes listed above. With that being said, if Picatinny were to close and the government determine that the land use had to change, the remedial alternative will be reevaluated. It would mean amending this ROD and determining whether or not a new site remedy would have to be sought.

Comment from Peter Massardo, Stillwater Township

Comment 1: You mentioned that the future land use of Site 34 could be used for basketball courts. If the Army selected Alternative 8 and removed the soil, could those seven acres be put to a more productive use (rather than recreation and parking)? It was also mentioned that the area will be under land use control and access restrictions.

Response: Yes, it was mentioned at this meeting that basketball courts could be a potential use of the cap. That example was provided for illustrative purposes only. There are no current plans for the Burning Ground after burning operations cease. It should be noted that all of the alternatives analyzed in the FS anticipated continued military industrial land use. Alternative 8 estimated the cost of excavating and disposing of all soil above the industrial soil cleanup level. Contamination above the residential cleanup level would remain behind. Therefore, the excavation alternative (Remedial Alternative 8) would also require that land use controls remain in place.

Comment 2: Are there any other potential uses for which the Army could use the seven acres? Additionally, if the land was cleared, could those seven acres be used for something more productive by the Army?

Response: According to the Picatinny master planner, there are no plans for the site. The Arsenal is looking to redevelop land to the south and east of the Burning Grounds, but that redevelopment plan does not include the Burning Ground.

Comment 3: I know the limiting factor would be land use restrictions due to wetlands regulations. The floodplain and wetlands at Site 34 would limit the area for certain types of development.

Response: Yes, compliance with wetlands regulations has been factored into the decision process. This is discussed in Section 2.13.2 of the ROD. The remedial design will detail exactly how compliance with the wetlands regulations will be attained.

Comment 4: What is the anticipated yearly cost for analyzing the groundwater and soil samples?

Response: All alternatives with the exception of "No Action" include groundwater monitoring. The cost estimate assumed groundwater would be sampled quarterly for the first one year at approximately $50,000, and at a cost of about $16,000 annually every year thereafter.

Comment 5: Does the cost of Number 4, the proposed alternative, include the cost of monitoring for a certain number of years? Is that timeframe for 30 years? Is that factored into the two million dollar plus cost?

Response: Yes.

Comment from Michael Glaab, PAERAB

Comment 1: I understand that the O&M cost is $374,000. Does that include the cost for sampling? Is that for 30 years?

Response: Yes, on a present value basis.

Comment 2: Does that cost also include maintenance of the cap? If there were a crack in the cap, would it be repaired? Also, does that include sampling?

Response: Correct.

Comment from Sue Ellen Mikowski

Comment 1: Obviously, there is some hazardous significance associated with Site 34 or else we would not be here. What is the significance of this cap? Will the cap prevent water from infiltrating through the ground, running off into Green Pond Brook and into to that aquifer? Also, will the cap protect the future site workers from coming in contact with contaminated soil?

Response: The concern at the Burning Ground that prompted the Army to propose a remedial action was based on the potential for unacceptable risk to human health. As summarized in Section 2.7.1 of this ROD, the HHRA estimated that excess cancer risk was greater than the upper bound (one in ten thousand) of the USEPA cancer risk range. The upper bound of this risk range was exceeded for all three future worker risk assessment scenarios. A second factor in the remedy selection was comparison of concentrations of soil contaminants to NJDEP NRDCSCC.

The idea of the cap is that it mitigates this risk to hypothetical future workers by precluding contact with contaminated soil. Although continued groundwater impact is not anticipated, the cap also has the advantage of being impermeable and precluding percolation of surface water though the contaminated soil and causing groundwater contamination. The cap will also preclude erosion of the contaminated surface soils into Green Pond Brook.

Comment 2: Regarding the potential [future] worker, did I understand that there are no future plans for this particular site?

Response: Yes, there are no definite plans. The Army has selected a remedy that will allow use of this acreage at the Arsenal, but currently there are no specific plans.

Comment 3: Over the years that I have lived in Jefferson, and we have experienced earthquakes in the past. I'm just very curious about any fault lines that may run through the site.

Response: There are faults at Picatinny. Most of them are very old and are considered to be inactive faults.

When the ground shakes in Jefferson Township it is probably not earthquakes. There are two other more likely reasons. The first reason is blasting conducted at the Mt. Hope mine. The second likely explanation is the testing of munitions on Green Pond Mountain within Picatinny. There are over a dozen test areas at Picatinny.

Comment from Bill Solow, White Meadow Lake

Comment 1: Does anyone live at Site 34? Where are the closest houses with regard to the site?

Response: No one lives on the site. To the south on the other side of Route 15 (off of Picatinny property), the closest houses are over 2,000 feet away. These are the closest off-post houses to the Burning Ground. On post, there are three houses on Parker Road, all of which are occupied. The remainder of the houses on Parker Road are unoccupied. Once those units are vacated, the Army plans to remove these houses from the housing inventory. The houses are expected to be removed over the next two years.

Comment 3: Why is that? Is it too risky?

Response: No, it actually has nothing to do with Burning Ground operations. The Army has built a military housing community on Navy Hill (in the northeast section of Picatinny).

Comment from Sylvia Zisman, the New Jersey Military Toxics Project, Springfield, New Jersey

Comment 1: You mentioned a testing ground is close to Site 34. Is the testing ground a bombing range? What is it?

Response: Yes, there are a number of test ranges that are part of the Arsenal's mission. That's part of why Picatinny is here. We need testing ranges to continue our mission.

Comment 2: At one time you did test depleted uranium weapons at one of these testing grounds. Has there been any effort to remediate that testing site to remove any possible radioactive material that may have migrated into the groundwater?

Response: Depleted uranium has been handled at Picatinny. However, the use of this material is controlled by the Picatinny Radiation Protection Office (RPO). We're trying to limit the discussions tonight to Site 34. There is no depleted uranium at Site 34. Let me [Ted Gabel] invite everybody to the restoration advisory board meetings. We talk about other sites and other remediation projects at those meetings.

Comment 3: Also, you mentioned metals are present at the Burning Ground.

Response: There are metals at the Burning Ground. The metals have been released into the soil at the Burning Ground as a result of burning operations. Metals have been targeted for cleanup as part of this remediation. The metals will be contained under the cap, which will preclude contact with site soils contaminated with metals at concentrations that could result in unacceptable risk.

Comment from Bill Solow, White Meadow Lake

Comment: Did you say there was radioactive material at the site?

Response: No. The Army tested for radioactive material in 1993. Based on this testing it was determined that radioactivity was not a concern at the Burning Ground.

Comment from Diane Beeny, Westfield, the New Jersey Military Toxics Project

Comment 1: What other heavy metals are at Site 34?

Response: The metals of concern are arsenic, cadmium, copper, and lead. Let me just say that the presence of metals in soil is common. Many times it is the result of metals being in the minerals present in the soil. In this case, the metals of concern listed above are at concentrations above comparison criteria and are believed to have resulted from burning operations.

Comment 2: You mentioned there were three metals above the groundwater standards.

Response: The analytical results of the 1999 groundwater monitoring indicated that three metals were detected above groundwater standards. Arsenic, lead, manganese were detected in one well in excess of groundwater standards.

Comment 3: Will the asphalt cap reduce the runoff? Will the runoff penetrate through the asphalt?

Response: The modified asphalt cap will eliminate the entrainment of contaminated soils in surface runoff. Additionally the cap is impermeable to water. The cap will have permeability less than $1x10^{-8}$ cm/sec, which is the standard mandated for caps on hazardous waste landfills.

Comment 4: But it also changes the pattern of the rainfall. It changes the pattern of the flow, which creates paving in more areas and creates more flooding problems. Therefore, can't some of the water migrate underneath the asphalt?

Response: There will still be groundwater under the asphalt. What the cap will do is reduce the amount that's percolated through the contaminated soil and minimize the ability to impact the groundwater.

Increasing the amount of pavement in a given area can increase the potential for flooding. However, this cap is only about five acres, relatively small in size compared to the size of the entire watershed. The concern for increased flooding is minimal.

Comment 5: Because the wetlands serve as a natural aquifer, wouldn’t the paving change the drainage patterns?

Response: Yes.

Comment 6: Do you know exactly how that's going to change it or do you just have a general idea?

Response: One part of a feasibility study is to examine all Applicable or Relevant and Appropriate Regulations (ARARs). One ARAR identified as being applicable to this project is an executive order for the protection of floodplains. This order mandates that when construction is undertaken in a floodplain, actions must be taken to avoid adverse effects from this construction. At this stage of the project, there is a general idea of the impact and protection of the floodplain has been flagged as an ARAR which means it must be obeyed. After signature of the ROD the next step of the project will be a design, and the design will be put in front of the regulators, as well as the U.S. Army Corps of Engineers. One aspect of the design will be to ensure this ARAR is obeyed.

Comment 7: I'm also concerned, because I know trichloroethylene has been detected in the neighboring wells. Is that in the same area?

Response: Trichloroethylene is not a contaminant of concern at the Burning Ground. The groundwater at the Burning Ground has been analyzed for it and it has not been found above comparison criteria. Picatinny does have volatile organics in the area, but on the other side of Green Pond Brook. This groundwater plume is being addressed. Currently the Army is conducting a pilot study to help identify the best treatment technology for this plume.

Comment 8: What are the other volatiles besides TCE?

Response: At this site, no other volatiles were identified at concentrations above comparison criteria. Therefore, volatile organic compounds are not a chemical of concern at this site.

Comment from Bill Solow, White Meadow Lake

Comment 1: I understand that Site 34 is perfectly flat. However, I want to know about the edges. If you install a fence, will some type of footing be installed around the edge? Is that in the plan?

Response: Yes, it would be factored into the design. The section of the Burning Ground facing the brook would be reinforced so that there could be no washout from underneath the cap. The edges of the cap could also be protected with stone. Details such as this will be specified at the time of the final remedial design.

Comment 2: You say "could be." I don't know how this procedure works. Are you the contractor?

Response: Yes, he's [Doug Schicho] the contractor doing the feasibility study. The Army has to go through a process in order to produce the Record of Decision. Once the Record of Decision is signed, then the Army makes a decision on what contractor is to be used for the design and construction. So there's no contract or even funding to perform the design or construction until the Record of Decision is signed by both the Army and USEPA and concurred with by DEP.

Comment 4: How does the Army select the contractor? Did the Army select him already?

Response: No. Picatinny can use different contracts for this type of project. One method would be to utilize the U.S. Army Corps of Engineers to manage the contract. The Corps of Engineers would then have an acquisition strategy meeting, which says what is the best contract vehicle to use for this project. In some cases it's an existing contract that the Army has available. In some cases, it's determined the best way to proceed is competitive bid. You just go through an entire process where the shareholders decide what the best contract mechanism is.

Comment 6: You mentioned shareholders. Who are the shareholders?

Response: Stakeholders. For the technical design, it's primarily Picatinny. At this point it's the Corps of Engineers, the State of New Jersey, and the USEPA. It's also any local agencies that have regulatory authority over the project.

Comment from Sylvia Zisman, the New Jersey Military Toxics Project, Springfield, New Jersey

Comment 1: I'd like to know if perchlorate is a problem at Picatinny? Perchlorate is a compound that has been found at a number of bases where open burning was conducted, such as Badger Air Force base in Wisconsin.

Response: No. The Army has sampled the groundwater at the Burning Ground for perchlorate and has not found any perchlorate in site groundwater.

Comment from Peter Massardo, Stillwater Township

Comment 1: Am I correct in assuming that the final decision on the selection of an alternative has not been made yet? Has the Army selected Alternative 4?

Response: That's correct.

Comment 2: Has the USEPA finalized their decision? At what point will the decision be finalized? Will this public meeting be influential in any way in making that decision?

Response: The management of the Army will sign this Record of Decision. The Record of Decision will then go to the USEPA. In the back of that document is a summary and transcript of this meeting. And USEPA management will review the ROD and get advice from the project manager, Bill Roach. The USEPA then determines if the Army has been solicited and been responsive to the concerns of the public. Once the USEPA determines that the Army has met that objective and concurrence from the State has been received, the USEPA will sign the ROD.

The purpose of this meeting is to get public comment. One of the criteria for remedy selection is community acceptance. If the community shows strong opposition to the remedy that's being proposed, then it becomes a factor in the remedy selection and the USEPA has the opportunity not to concur with the remedy at that point.

Comment from Sue Ellen Mikowski

Comment: Can you summarize for me, what effects on the environment have you seen over the years since you have been studying this site (including Green Pond Brook, the vegetation, and the little animals)?

Response: As part of the remedial investigation for the Burning Ground, an ecological risk assessment was performed. And part of the assessment, the effects of the contaminants were calculated for mice and quail at the site using a hazard quotient approach (food chain model). This model indicated that for the bobwhite quail there was very little concern for effects from soil contaminants. The model indicated that there was a potential for an effect to the mouse. However, it should be noted that the model is a conservative estimate of a potential effect. It is not a quantitative measurement of an actual effect. The food chain model used contains some conservative assumptions that may overestimate the quail and mouse's exposure. Additionally, it should be noted that the modified asphalt cap will mitigate the type of exposure that the food chain model predicted could have an effect. The model predicted that exposure of the mouse to contaminated soil could potentially cause an effect. Installation of the cap would preclude that type of exposure. The ecological risk assessment performed for the Burning Ground will be summarized in the ROD.

Comment from Sylvia Zisman, the New Jersey Military Toxics Project, Springfield, New Jersey

Comment 1: You mentioned that the incinerator will be coming on line at the end of the summer. Is that correct? Has there been a trial burn since the changes were made? Can we find out what is being emitted from the incinerator?

Response: Picatinny will be doing a trial burn soon. Although there has been testing, this will be the first trial burn of the incinerator. Any information on the trial burn would be open to the public since it's part of the air permit. Additionally, you can ask the Installation for that information during that time or through a letter to our public affairs office.

Comment from Peter Massardo, Stillwater Township

Comment: I appreciate that you are answering these questions. I didn't know a lot about this before I arrived here. I know a lot more now, and I am at that point where I can make my own informed opinion about the Remedy. I understand that everyone is thinking in terms in of 30 years, 50 years, or 100 years ahead. I do not believe that's far enough in the future. I think we should be thinking many generations ahead, because of our responsibility to the people and the land. Therefore, I would prefer that the soil were totally excavated. It's a few more millions of dollars, but then it's not a problem for my grandchildren or yours to have to consider in the future. I think at some point, you put aside the difference of a few million dollars for the real long-term effect on the people and the environment in our area. I'd like to see the whole area be excavated under Alternative 8, and then many people can use the area for many activities without having to worry what's underneath the cap.

Response: The remedial alternative was selected with future site use in mind. At an active military installation, land use is already restricted by many of the ongoing site activities and security concerns. The additional cost associated with Alternative 8 (Excavation Alternative) would also carry with it greater short term risk. The completion of "complete" excavation as assumed for Alternative 8 would not allow for unrestricted land use because that alternative was also predicated on industrial land use and would leave low-levels of contamination present in the soil that would preclude free release of the site. It

should be noted that to clean this area in preparation of unlimited land use would cost substantially more than Alternative 8.

Comment from Diane Beeny, Westfield, the New Jersey Military Toxics Project

Comment 1: You mentioned the different sampling methods, including monitoring well installation and subsurface soil sampling. At the time when the open burnings were conducted, were air samples collected? I'm concerned about the air quality in the State.

Response: The purpose of this discussion here is not to talk about the operation of the Burning Ground because we're trying to get the decision made on how to close the Burning Ground. However, the results of the air sampling should be included in the 1989 Air Pollution Assessment report. We could provide you with a copy of that report.

Comment from Mike Glaab, PAERAB

Comment 1: Could you outline the guidelines that will govern the possible placing of soil from other parts of the Arsenal under the cap? I would like to ensure that we don't remove highly contaminated soil from another area and place it under the cap, which could potentially cause a problem.

Response: Picatinny is continually involved in removal actions, including some soils that are contaminated with lead at sites other than the Burning Ground. As part of that remedial action the Army negotiated to use these soils as fill underneath this cover. At a minimum the cover will require a slope to minimize ponding of water. It may also be necessary to place an additional thickness of soil to safeguard against UXO. No definitive decision has been made regarding this proposed soil re-use. The exact guidelines for placing contaminated soil under the cover have yet to be established but every pile of soil that the Army reuses at the Burning Ground will have concurrence from the USEPA and NJDEP. Rather than take the soil and ship it in a truck to Buffalo or to Albany or down to Delaware, we'd be reusing soil and saving taxpayer dollars.

In addition to possibly using fill from the cleanup of other soils at the Arsenal, the Army is doing a major project to upgrade the facilities heating system. This project involves installing gas lines through Picatinny. This project will generate a great deal of soil that could be used to pitch the cap.

Comment 2: I understand why the Army would want to use soil that's relatively uncontaminated, but I'm concerned that the proper guidelines will not be established to assure the contamination problem is not compounded. Some contaminated soil located at the Arsenal probably should be removed. However, some soils are relatively benign and could be used as fill. I'm just concerned about the guidelines. We are relying on the NJDEP and the USEPA to establish proper guidelines to ensure that that the right type of soil is used as fill.

Response: The soil reuse plan is the guidance that is typically used, and given careful consideration by the NJDEP. All the concerns that you have will be taken into consideration when the Army submits that plan to the NJDEP.

Comment from Sylvia Zisman, the New Jersey Military Toxics Project, Springfield, New Jersey

Comment: You mentioned that there are metals at Site 34. I wondered whether there could be a reclamation project to recover any valuable metals. If there is any loss of jobs due to the BRAC decision, the Army might need jobs and projects that would reclaim valuable substances. Is there any possibility that any of these metals might have value?

Response: The metals in the soil at the Burning Ground are in very low concentrations (parts per million). At these very low concentrations, the amount of material present would be insufficient to recover. Any scrap metal found at the site will be removed and decontaminated. Some of the scrap metal may be reclaimed, as Picatinny has a reclamation project for scrap metal generated at the facility.

Comment from Robert Crothers, representative of Denville Township, PAERAB

Comment: I want to make a comment to the gentleman in the red sweater [Peter Massardo]. This discussion has been ongoing for the last several years. I was always violently against any remedy but total removal and decontamination. I felt if the money is spent now, a lot of money will be saved in the future. Ted [Gabel] and Michael [Glaab] both know that I was violently in favor of total removal. With respect to the costs and the constraints of the RAB, I feel this probably is the best remedy that can be selected at this time. But if there's a problem with this cap, the Army can remove the soil in the future. It may cost a significant amount more, but the Arsenal may have to learn a lesson because of that. But I feel at this time, I have to agree with Ted [Gabel] and concur with the decision. Although, I am against any remedy but total removal, capping with an asphalt pavement the best course of action at this time.

Response: Brownfields and other state and federal programs allow contaminated soil to be left in place under certain circumstances and/or be reused. I [Ted Gabel] think we're [the Army] consistent with that philosophy. Thank you, Mr. Crothers.

3.1.2 Summary of Comments Received During the Public Comment Period and Agency Responses

The following comments were received from Subsurface Solutions LLC on behalf of the Picatinny Restoration Advisory Board (PAERAB) during the Public Comment Period.

Excavation of Contaminated Soil Adjacent to Green Pond Brook

Comment: Site 34 is directly adjacent to Green Pond Brook and is located within the 100-year floodplain of the brook. As such there is the potential for contaminated soil to enter the brook through flood events and through erosion of stream banks, especially during high flow periods associated with heavy precipitation. The RAB requests that consideration be given to removal of contaminated soil adjacent to the brook Soil removal adjacent to the brook was brought up at the public meeting and the Army Project Manager, Ted Gabel, stated that the Army would consider the removal. The RAB is in favor of this action and supports Mr. Gabel's willingness to consider this proactive measure.

Response: Yes. As discussed in the Response to Comment #5 made by Michael Glaab at the public meeting, the removal of contaminated soil in the vicinity of Green Pond Brook will be evaluated as part of the remedial design of the asphalt cap.

Nature of Fill Material for Site 34

Comment: Soil from other parts of the Arsenal may be brought to Site 34 and used as fill beneath the MatCon cover. The nature of the material being used should be carefully reviewed before placement. No material that contains contaminant concentrations exceeding those already present at the site should be used as fill. Site 34 has already been characterized for the purpose of determining risk and performing a feasibility study; as such, the use of materials other than those that could be characterized as clean fill could adversely affect site conditions. The Proposed Plan states that the "criteria for use of soils from other areas on the Arsenal will be described in the remedial design." The Proposed Plan goes on to state that the "criteria allowing use of these soils will be that the soils used would not be characterized as hazardous waste per RCRA or fail TCLP testing." The RAB is concerned that the stipulated criteria may be too broad. The criteria should include a consideration of the NJDEP Impact to Groundwater Soil Criteria among other things. The RAB would appreciate being informed of the soil re-use selection criteria during development.

Response: The RAB will be kept informed of the projects progress. The soil re-use proposal described in the Proposed Plan is the most accurate information currently available. But it should be noted that the specifics of the soil reuse criteria have not been developed

yet. A soil reuse plan for Site 34 will be drafted as part of the asphalt cap remedial design. The plan will be carefully considered by the NJDEP and USEPA and will be approved by both regulatory agencies prior to the commencement of remedial activities.

Length of Time for Cost Estimating of Remedial Alternatives

Comment: U.S. Environmental Protection Agency (USEPA) guidance states that "in general, the period of performance for costing purposes should not exceed 30 years for the purpose of the detailed analysis." The qualifier "in general" indicates that there may be situations where the period of performance should exceed 30 years. In some cases, a longer time period of performance may provide more realistic estimates for comparing alternatives. The USEPA's "Second Five-Year Review Report" for Picatinny Arsenal (dated September 26, 2001), in referring to the use of monitored natural attenuation (MNA) for Area D ground water states that "…MNA will take 170 years to reach drinking water standards." Therefore, it may be unrealistic to suppose that 30 years is an adequate time period for many of the alternatives considered. For example, if in situ treatment were considered and the treatment would render the contaminants harmless within a period of 30 years or less, then a 30-year time frame is reasonable. However, for alternatives where long-term operation and maintenance may be required, the 30-year time frame is unsuitable. For example, the MatCon cap preferred for Site 34 will require maintenance essentially in perpetuity or until some other alternative is selected in the future that would be able to render the contaminants harmless. Further discussion related to the time period of performance associated with costing is provided below.

Response: As stated in the comment, the 30-year time period for cost estimating is in USEPA guidance. It is also routinely used in feasibility studies. Using the present value estimate for comparing costs of remedial alternatives is the accepted method. By this method, O&M costs occurring in the distant future impact the present value very little.

Potential Future Costs Associated with Capping Alternative

Comment: Costs for the MatCon cap are permitted to be calculated such that they may underestimate the cost by 30 percent or overestimate the cost by 50 percent. Furthermore, costs may typically include a contingency for capital costs but not for operation and maintenance. However, there is no provision for the inclusion of contingency costs such as might be incurred if excavation of the contaminants beneath the cap is required at some future date or if the cap fails and a portion of it needs replacement. While no one is able to predict future contingencies, it would be a useful exercise to include a discussion of potential contingencies and relative costs for future discussion of those alternatives retained for detailed analysis. While this may be a departure from typical procedures at Picatinny Arsenal, it would be helpful for the RAB members to consider.

At least one RAB member advises that this would be in accordance with the underlying concept of conducting an accurate cost/benefit analysis which considers all plausible factors and quantitatively calculates their potential impact. Although opportunity costs/alternative costs are not typically entered into accounting records precisely because they are difficult to quantify, they are nevertheless commonly and typically considered while assessing worst–case scenarios and they often influence the decision making process. It is obviously difficult, and perhaps impossible, to accurately calculate all potential costs to the environment, to the adjacent communities, and to the individuals working and/or living at the Arsenal. However, we can reasonably extrapolate such factors as probable sampling and monitoring costs, and probable MatCon maintenance/repair costs. It may not be currently possible to accurately quantify the potential harm due to soil erosion alongside the stream bank but it would seem that we this likely occurrence could be anticipated as a worst-case scenario. Cost/benefit calculations for options which assume the continued on-site presence of significant contaminants should ideally take into consideration the potential costs associated with

their possible future excavation or remediation due to unforeseen and/or incorrectly evaluated factors. Potential costs associated with such probable and foreseeable factors as the erosion of the soil alongside the brook should definitely be considered, if not as quantified values then as worst-case scenarios to be avoided.

Response: While this type of exercise may be enlightening for the RAB it is not routinely performed in FSs. The Army must act as a steward of the federal funds it is provided for environmental restoration. This is not only true for the remedy itself but also for the effort and expense expended on decision documents. The Army believes the level of effort expended and the detail provided in the final FS for the Burning Ground is appropriate.

Preference for Removal Action

Comment: Given the much higher costs that would be associated with the MatCon cap if a longer time period of performance were used, other alternatives might have fared differently during the detailed analysis of alternatives, at least from a cost perspective. Certainly, there has been fairly widespread opinion amongst the RAB membership that removal of contaminated waste/soil from Picatinny Arsenal to a controlled off-site waste facility may be preferable in many situations. Such an option can result in the land being dedicated for unrestricted use. In more pristine areas of the over 6,000 acres comprising the Arsenal, the removal option has distinct advantages. Apart from the industrialized areas and waste disposal sites, the Arsenal has some of the largest contiguous open space areas in northern New Jersey. Site 34 is located in an area that has already been severely degraded by waste disposal activities and the MatCon cap is not expected to significantly detract from the area. If the MatCon cap can be put to beneficial use, the inherent limitations of restricted use may be overlooked. However, the removal option remains a preferred alternative to be considered at other sites, especially those removed from the industrialized centers of the Arsenal, for the benefit of future unrestricted land use.

Response: The Army believes that calculating the Alternative 4 costs for a longer period of time would not change the outcome of the remedy selection. It should be noted that every alternative would require the continued implementation land use controls and site inspections because they are all predicated on industrial land use. Therefore, costs would be incurred for an extremely lengthy period of time for all of the alternatives.

Presence of Dioxins and Furans

Comment: Dioxins and furans have been detected in both surface and subsurface soils. These compounds can be harmful even at extremely low concentrations. In the opinion of some RAB members, the potential presence of such contaminants immediately next to the brook constitutes a potential hazard that justifies the implementation of appropriate and reasonable measures to minimize the possibility of those contaminants migrating off-site via the brook.

It is alleged that many of the site's contaminants have a low probability of migrating through soil. However, the close proximity of the brook increases the probability that the contaminants could eventually migrate due to soil erosion. Therefore, the limited excavation of contaminated soil immediately adjacent to the brook would tend to mitigate the potential for migration of contaminants due to erosion.

A limited amount of contaminated soil within a suitable distance from the brook could be excavated to an appropriate depth. This excavated soil could then be either completely removed and transported off-site to an appropriate facility or it could merely be displaced to the interior of the site such that it would then be further away from the brook and therefore less likely to migrate off-site. Excavated soil could conceivably be used to fill in interior sections of the site to assure the desired grade of the MatCon cover.

The expected rate of erosion of the soil alongside the brook would be crucial to the determination of the depth of excavation and the distance from the brook to which soil should be excavated. Such factors as likely future on-site activities, the extent of the 100-year floodplain, likely stream flow discharge, likely storm water flow rates, ground-water velocity, and soil conditions would seem to be relevant factors to be considered when determining the bank erosion rate.

Response: Yes. As discussed in the Response to Comment # 5 made by Michael Glaab at the public meeting, the removal of contaminated soil in the vicinity of Green Pond Brook will be evaluated as part of the remedial design of the asphalt cap. The bank erosion rate will not be a factor. The stream bank will be protected with rock to preclude erosion. This stream bank will be inspected and if necessary repaired so that erosion is prevented.

Long-Term Monitoring of Site

Comment: Once the remedial design has been initiated, the RAB would appreciate the opportunity to learn the details of the intended monitoring program in the preliminary planning stages. The concern is that there is a sufficiently long-term schedule of on-site sampling and monitoring (cover integrity) to assure that the cap remains protective. In addition, the RAB would expect that long-term sampling will be inclusive of all of the site's known principal contaminants and that the sampling program will be sufficiently comprehensive to include all affected and potentially affected media as follows: soil, sediment, ground water, and surface water. A future RAB meeting would be an appropriate forum for disseminating such details.

Response: Yes. The Army will keep the RAB informed of all aspects of the project as they develop. The long-term monitoring program to be conducted in support of Site 34 will include periodic groundwater and surface water sampling. The existing monitoring wells installed at Site 34 in addition to one newly-installed well and three specific locations in Green Pond Brook will be sampled as part of the monitoring program. The samples will be analyzed for target analyte list (TAL) metals, which were identified as contaminants of potential concern (COPCs) at the site. Sediment samples will be collected in Green Pond Brook, in the area adjacent to the Burning Ground, as part of the Selected Remedy for Green Pond and Bear Swamp Brooks.

Stormwater Discharge to Green Pond Brook

Comment: The present conceptual layout for the MatCon cap shows that stormwater will be collected along the perimeter of the cap and routed to Green Pond Brook. At least one RAB member has expressed a concern for downstream flooding associated with the creation of numerous additional impervious surfaces at Picatinny Arsenal. While the MatCon cap for Site 34 represents a relatively small impervious area unlikely to result in sufficient additional flow to create concerns, it is the creation of multiple such impervious areas that is of concern. Furthermore, the use of the MatCon cap area for parking will necessitate treatment of the diverted stormwater. The RAB requests that in the Remedial Design phase of the project, that consideration be given to creation of infiltration basins or some other means of recharge for stormwater so that it can be recharged to ground water. Recharge would have to be designed such that deleterious effects on ground water beneath the cap would not be produced.

Response: The concern of stormwater discharge from the MatCon cap will be considered during the remedial design phase of the project. Ultimately, the design of the cap and associated engineering controls, such as stormwater diversion, must be approved by the Army, the U.S. Army Corps of Engineers, and the regulatory agencies prior to construction.

Extension of MatCon Cap to Cover NJDEP Exceedances

Comment: The Proposed Plan states that the MatCon cap alternative "involves the capping of all impacted soils and debris where contaminants are found at levels above RGs." The RAB

is concerned that in some cases the remedial action RGs are higher than the NJDEP Soil Cleanup Criteria. Based on discussion at past technical meetings, it was our understanding that the NJDEP Soil Cleanup Criteria would prevail if those criteria were more stringent than risk based calculations. The RAB would appreciate clarification on this matter as to what the prevailing standard will be in regard to establishing the area to be covered.

Response: The Army has agreed to use the NJDEP soil cleanup criteria in the evaluation of remedial alternatives. The Army does not think that using these criteria as cleanup levels in all cases is appropriate. For the remediation goals (RGs) at Site 34, the Army selected the greater of the human health risk-based criteria and the NJDEP Soil Cleanup Criteria (NJ Nonresidential Direct Soil Cleanup Criteria). It should also be noted that the Army is proposing to cover the entire Burning Ground and part of Site 180, which is immediately adjacent to the Burning Ground, with modified asphalt as part of the Burning Ground remedy.

Timeframe for Implementation of Remedial Action

Comment: Once all administrative requirements have been met and funding has been procured, the remedial action for Site 34 still cannot be implemented until the incinerator is fully operational and permitted. The construction of the incinerator was completed in 2002. Yet, many months later the system is still not running. The RAB is concerned that delays associated with the incinerator will adversely affect the remedial action implementation at Site 34 and potentially jeopardize available funding. We kindly request that representatives of the NJDEP, USEPA, and Picatinny Arsenal make every effort possible to expedite getting the incinerator online so that there are no delays at Site 34.

Response: Comment noted. The Army shares this concern and is working to speed regulatory approvals.

The following comments were submitted by the Law Offices of Schwartz, Tobia, Stanziale, Sedita, & Campisano on the behalf of Pondview Estates, Inc. (“Pondview”) during the Public Comment Period.

Future Potable Use of Area Groundwater at Pondview

Comment: As the Army is well aware (and has been for some time), Pondview and Rockaway Township have had a joint application pending since 2000 with NJDEP for a Water Allocation Permit. This NJDEP permit would allow supply wells at Pondview (located less than a mile from the entrance gate from Route 15 for Picatinny Arsenal) to withdraw for potable use up to 1.3 million gallons per day of groundwater from the same source aquifer as located beneath the Site. Recent well testing shows that the tapped aquifer is capable of supporting a minimum pumping rate of 1,110 gpm or 49.6 million gallons per month. Pondview’s currently contemplated location for its supply wells is approximately 3,700 feet from the SB-4 monitoring well cluster installed by the Army downgradient of Picatinny Arsenal in connection with the site remediation. Additionally, in August 2001, Pondview was issued a Water Use Registration by NJDEP that currently allows Pondview to use up to 100,000 gallons per day from the existing wells. Accordingly, the Army has certainly been on notice for some time of the planned groundwater use in the immediate area.

Response: As stated in the comment, the Army is aware of the pending application with the NJDEP. That application is not germane to this proposed action. Because it has not been shown that Site 34 groundwater is within the capture zone of the Pondview production wells, there is no technical basis for linking the Pondview Estates water allocation permit and this remedial action.

Burning Ground Site and Remediation History

Comment: The Fact Sheet distributed at the public hearing on the Burning Ground proposed remedial action describes Site 34 as comprised of about 7 acres of level land near southern boundary of the Arsenal along the bank of Green Pond Brook. The Burning Ground is located in a section of the Arsenal surrounded mostly by forested wetlands and meadow. Until approximately 1985, standard Army practice was to burn energetic wastes directly on the ground surface. During these burning operations, the underlying soil was not protected; as a result, surface soil, subsurface soil and groundwater have been affected. According to the Proposed Plan dated February 2004 for Picatinny Arsenal-Site 34 (hereinafter "Proposed Plan"), historic site operations at Burning Ground resulted in contaminated soils that has subsequently impacted adjacent surface water, sediment, and groundwater. Remedial Investigation undertaken by the Army determined that soils at the Burning Ground were impacted with metals, PAHs, PCBs, and dioxin and furans. In addition, previous groundwater sampling has detected the presence of TCE, bis(2-ethylhexyl)phthalate, explosives, radiological parameters and numerous metals, several of which, including arsenic, lead and manganese, exceeded groundwater standards.

Remedial Action Objectives for the Site

The proposed remediation plan is purportedly intended, among other things, to address the potential for future impacts to groundwater from the Burning Ground. The Proposed Plan (at p. 7) states that "the Army has determined that contamination above soil RGs [remedial goals] for the site and groundwater above applicable or relevant and appropriate requirements (ARARs) is present. This contamination provides the potential for impacting human health and the environment at levels exceeding CERCLA protective standards." (Emphasis supplied.) As further stated in the Proposed Plan, the Army has concluded that there exists "potential for contaminants to migrate from the subsurface soils … into groundwater." The remedial alternatives investigated for Site 34 were purportedly developed with the objective of eliminating exposure of contaminants to humans and stopping the spread of contamination from the Burning Ground that could impact both ecological receptors and human health. (Proposed Plan, p. 7) Included among the remedial action objectives enumerated in the Proposed Plan are (1) prevention or mitigation of impacts to groundwater that may result from the leaching of contaminants from Burning Ground soil via groundwater infiltration; and (2) management of potential groundwater risks at points of compliance (Proposed Plan, p. 36). As set forth below, it is clear to Pondview that the Army's selected Remedial Alternative No. 4 does not adequately address and/or satisfy a host of the above enumerated Remedial Action Objectives (RAOs).

Response: The Selected Remedy satisfies the RAOs identified in the Proposed Plan. It is unclear what text is being referenced on page 36 of the Proposed Plan, however the remedial action objectives listed above are achieved by the preferred remedy (Alternative 4). Because the cap is impervious to water, contaminants cannot be leached by infiltration. Therefore, the cap prevents/mitigates this leaching potential. Currently, there is no unacceptable risk as a result of groundwater beneath the Burning Ground. The selected alternative will ensure that this does not change. The remedial design will include an exit strategy that will dictate when monitoring will cease. The remedial design also will specify when the results of the monitoring program dictate that the remedy be re-evaluated. Trigger levels would be developed for groundwater and surface water compounds to indicate if a more aggressive remedial alternative should be considered or when the monitoring programs may be terminated.

The Shortcomings of the Army's Selected Remedy

Comment: The Army's preferred Remedial Alternative for Site 34 is capping of the former Burning Ground area, implementation of land use controls, and groundwater monitoring. One of the primary land use controls that the Army would implement includes the establishment of a Classification Exception Area ("CEA") for groundwater at this Site. As explained in the Proposed Plan (at p.25), a CEA may be established by NJDEP based on its conclusion that groundwater impacts at the Site have made groundwater use limited or unsafe for human consumption. A CEA designation institutionally restricts the installation of groundwater wells until groundwater beneath the site meets applicable NJDEP standards. It is Pondview's understanding that, in July 2002, the Army received approval from NJDEP for a groundwater CEA coextensive with the boundaries of the entire Picatinny Arsenal facility, which covers approximately 6,500 acres. However, upon information and belief, the Army may not have fully disclosed to NJDEP all relevant information specifically in regard to future area groundwater use as required by NJDEP regulations in order to obtain this CEA approval. If, indeed, the Army's CEA application failed to comply with NJDEP regulations requiring disclosure of specified information, then it is arguable whether this CEA for the Site, which is inextricably part of the proposed remedial action plan proposed for the Burning Ground, was validly issued. If the CEA was issued based on the absence of information required to be disclosed, then the CEA may potentially be invalid, which would effectively vitiate the Army's proposed remedy for this Site.

Response: Picatinny is a federal facility. The CERCLA program at Picatinny is being performed under an interagency agreement that was signed by the Army and USEPA. With respect to remedy selection at the Burning Ground, the Army is the lead agency and the remedy approval ultimately comes from USEPA. While the issuance of the CEA approval by the NJDEP was made after receiving full disclosure, the remedy itself does not rely upon the CEA. The comment correctly identifies the CEA as one of the land use controls. It will not be the sole land use control.

Comment: Additionally, Pondview asserts that the Army's selected Remedial Alternative fails to adequately address the above referenced RAOs. The first of the above-referenced two RAOs (preventing or mitigating impacts to groundwater) is not adequately addressed because the selected Remedial Alternative does not address the potential for subsurface soil and sediment contaminants to leach into groundwater. In the Proposed Plan (at p. 25), the Army acknowledges that the "leaching of contaminants could contribute to an ongoing impact on groundwater resources." Nevertheless, the Army, in selecting its preferred remedial alternative, eschewed other alternatives that not only address, but effectively, comprehensively and permanently eliminate or neutralize contaminated soils that are potential ongoing sources of contamination impacting groundwater. These other remedial alternatives accomplish the foregoing RAOs through insitu treatment and/or excavation and off-site disposal of contaminated soils. (See Remedial Alternatives Nos. 5-8 at pp.28, 31 and 34 of Proposed Plan.) The abovementioned Remedial Alternatives are notably absent from the Army's Selected Remedy.

Response: The selected remedy attains all remedial action objectives. Because the cap is impervious to water, contaminants cannot be leached by infiltration. Currently there is no unacceptable risk as a result of groundwater beneath the Burning Ground. The selected alternative will ensure that this does not change. The remedial design will include an exit strategy that will dictate when monitoring will cease. The remedial design will also specify when the results of the monitoring program dictate that the remedy be re-evaluated.

The comment overstates the permanence of treatment that could be obtained by Remedial Alternatives 6 and 7. Alternatives 6 and 7 rely upon insitu fixation/stabilization of contaminants in the soil profile. These alternatives to not destroy contamination, but

they immobilize contamination much in the same way that the selected alternative does. As explained in the Proposed Plan, Alternative 4 was selected over Alternatives 5 through 8 primarily because of less short-term risk and less expense.

Comment: Despite the Proposed Plan's acknowledgment (at p. 25) that the objective of the proposed remedial action is "protection of the groundwater … due to the fact that a potential for a continued source to impact groundwater exists," the Army's preferred remedy once again falls far short of sufficiently addressing this concern. Remedial Alternative No. 4 only addresses potential surface source impacts to groundwater occurring from infiltration of rainwater and surface runoff. Notwithstanding the fact that addressing such concern is a stated RAO, the Army readily acknowledges that its chosen remedy does not take any steps to address ongoing subsurface impacts to groundwater from contaminants already detected in the soil column and/or in sediments, even though such subsurface contaminants are and will continue to leach into and adversely impact groundwater. (See Proposed Plan, pp. 7 and 25.) Moreover, as a result of an apparently incomplete exposure assessment performed in connection with this work plan, the proposed remedy only seeks to address concerns as to on-site receptors (e.g., workers who would be expected to be aware of the risks involved) and not off-site receptors (i.e., current and future potable use by groundwater users, who likely will not be nearly as aware of such potential significant risks).

Response: The selected remedial alternative attains all of the remedial action objectives. Despite the fact that after decades of operation at the Burning Ground, no unacceptable risk to humans from site groundwater exists, the Army is taking steps to ensure that this unlikely event does not take place in the future. With regard to the exposure assessment, the comment is in error. The exposure assessment is complete. There is no complete exposure pathway to off-site receptors. It has not been demonstrated that contaminated groundwater from the Burning Ground is migrating off-site. Without a completed exposure pathway, there is no need to evaluate alternatives to mitigate a risk that does not exist.

Comment: The second of the two RAOs referenced above appears intended to be addressed by the proposed groundwater monitoring component of the proposal remedial action. Pondview contends that the contemplated monitoring program is insufficient in both duration and scope to satisfy this above stated Remedial Action Objective. Although federal regulations may, when site conditions necessitate, require up to 30 years of periodic groundwater monitoring at RCRA or CERCLA hazardous waste sites such as Picatinny Arsenal, it nonetheless appears from the comments offered at the February 19, 2004 public meeting by the Army's environmental engineering consultant that the Army anticipates only monitoring the groundwater at and around Picatinny Arsenal for perhaps as little as two years. Such a minimal duration of groundwater monitoring would be woefully insufficient either to address existing site conditions and potential concerns described above, or ensure that off-site migration of contaminants is not belatedly occurring. In short, Pondview cannot begin to fathom how the Army's contemplated Remedial Alternative would satisfy the basic threshold NCP requirements to demonstrate long-term effectiveness and adequately protect human health and the environment.

Response: The comment is in error regarding the duration of monitoring. As stated in the Proposed Plan and at the public meeting, long-term monitoring of groundwater and surface water will take place for many years. It should be noted that groundwater monitoring would be conducted on a more frequent basis within the first two years of monitoring until a trend is established. Increased sampling frequency will aid in eliminating short-term or seasonal effects from the overall data interpretation. If a stable or decreasing trend is established, then the monitoring frequency may be reduced. However, groundwater and surface water monitoring would be conducted at Site 34 until the remediation goals (RGs) or background concentrations are achieved throughout groundwater at the site. Cessation of monitoring will be allowed only after the tenants of the exit strategy are met. The details of the exit strategy will be finalized in the remedial design for the site.

Other Remedial Alternatives Reportedly Considered by the Army

Comment: In its Proposed Plan, the Army attempts to justify the rejection of Remedial Alternative Nos. 5-8, despite the admission therein that these other Remedial Alternatives offer both greater long-term effectiveness and permanence, and would significantly reduce or eradicate the toxicity, mobility and volume of contamination at the Site (See Proposed Plan, p. 38.). These other Remedial Alternatives which the Army spurned (or never seriously considered) clearly would be substantially more effective in addressing RAOs and other stated environmental and human health risk concerns. As reasons for rejecting the foregoing Remedial Alternatives, the Army contends that the risk of exposure to workers, additional time and costs necessary in order to carry out and complete these more costly Remedial Alternatives outweigh their potentially greater efficacy. Pondview respectfully submits that the Army's safety hazard concern is somewhat overstated. Remediation workers performing similar projects at this and other sites have long been able to maintain adequate protection from such exposures, and there is no reason to assume that worker protection cannot also be adequately addressed for such alternative remedial action at this Site.

Response: A remedy selection under CERCLA utilizes nine selection criteria. Two of these criteria are threshold criteria that must be met by the selected alternative. The threshold criteria are overall protection of human health and the environment and compliance with ARARs. Alternative 4 meets these threshold criteria. The two criteria listed in the comment are primary balancing criteria. Primary balancing criteria identify major trade-offs between the remedial alternatives that are being evaluated. The remedy selection appropriately selects Alternative 4 which meets the remedial action objectives and threshold criteria. The FS for the site discusses in more detail the trade-offs between the remedy of choice and the remaining remedial alternatives.

Comment: Insofar as the Army's attempted justifications for selecting its preferred remedy based on extra time and additional costs, these appear to be transparent excuses on the Army's part that would result in improperly shifting these time and cost burdens from the Responsible Party that polluted the Site to innocent area residents surrounding Picatinny Arsenal and, particularly, current and future users of area groundwater for potable use. For decades to come, local residents may have a cloud of a potential threat hanging over them (i.e., that groundwater contamination from Picatinny Arsenal may migrate off-site and potentially impact area groundwater intended for potable use), because of the non-permanence of the remedy that the Army would prefer to implement at this Site. Furthermore, because the Army seeks to implement a Remedial Alternative that is neither comprehensive nor most effective, the resultant cost savings to the Army would unfairly and impermissibly shift costs onto area resident groundwater users and developers of property that must rely on area groundwater as a water supply source for future potable use. Both current and future groundwater users may likely find it advisable (in the case of the former) or be compelled (in the case of the latter) to install water treatment or other groundwater interceptor systems designed to ensure that any contaminants which may migrate off-site through the groundwater do not reach nearby potable water sources.

Response: It should be noted that it is the responsibility of the Army to ensure that funding for CERCLA cleanup is expended appropriately and efficiently. Using funds to perform additional remediation not warranted by the degree of contamination at the site would be a waste of taxpayer dollars. There is no information indicating that contamination will migrate off of the Burning Ground. Should the long-term monitoring program indicate that this is happening at unacceptable levels, the Army would be obligated to re-evaluate the Selected Remedy for the site.

Comment: The aquifer which underlies the Picatinny Arsenal facility is a major source of drinking water for Morris County as well as outlying communities. The Army's preferred remedial action alternative spurns source stabilization and/or removal of contaminated soils and

sediments that, by the Army's admission, are "leach[ing] into groundwater" beneath the Site "and could contribute to an ongoing impact to groundwater resources", including potential impact to off-site groundwater (Proposed Plan, p.25). Under a conceivable worst case scenario, the inability of the Selected Remedy to prevent such impacts would threaten to write off for many decades to come the future potable use of groundwater located beneath the Site, preventing such use by generations of existing and future Morris County residents. Both the State and local governments in Morris County and other parts of Northern New Jersey are already grappling to address growing concerns about the potential future shortages in the potable water supply in the region, as well as protecting and preserving the valuable Highlands region in this area of the State. Given the recent drought conditions experienced in Northern New Jersey, this potential long-term loss of significant groundwater resources that could result under the Army's contemplated remedial action for the Burning Ground/Site 34 should not be deemed acceptable.

The groundwater is a natural resource which is held in public trust by the State for the people of New Jersey. The Army's proposed remediation plan could result in impermissibly and unjustifiably usurping from the current and future residents of Rockaway Township and surrounding communities the right to enjoy unrestricted use of this valuable natural resource. As the polluter responsible for the contamination, the Army must aggressively step up to the plate in terms of remediation and do the utmost to ultimately restore the condition of the groundwater to unrestricted use, in order to ensure that contaminants do not further migrate to potentially threaten to permanently restrict or condition potable use of additional area groundwater. The Proposed Plan fails to satisfy these threshold requirements.

Furthermore, the health risk assessment for the Army's Proposed Plan appears to completely overlook potential off-site receptors and does not even attempt to address such related concerns. These concerns ought to be seriously considered in assessing whether the Army's preferred Remedial Alternative is sufficiently protective of human health and satisfies the applicable regulatory requirements. Given the proposed Pondview potable wells' location and the planned groundwater use, the detection of several MCL exceedances and the potential risk they present to human health, cannot be lightly regarded or dismissed.

In sum, the Army's selected Remedial Alternative does not satisfy fundamental regulatory requirements and criteria relating to either long-term effectiveness, permanence or reduction of toxicity, mobility or volume. Nor, as set forth above, does this remedy adequately address potential concerns, particularly relating to possible off-site impacts to groundwater from existing contamination in the soil, sediments, and groundwater at the Site, which remedial investigation undertaken to date has not ruled out. Accordingly, the Army's chosen remedy does not pass regulatory muster and must be disapproved.

Response: The remedy proposed in this document is for one 7-acre site within a large facility. This site does not impact the groundwater of a major aquifer in Morris County. The remedies for other groundwater operable units within Picatinny have yet to be selected. However, it should be noted that the Army has begun the process for active groundwater remediation at many sites within Picatinny. The choice to pursue active remediation is being made in accordance with the CERCLA process. This process requires that cost reasonableness and technical implementability be factors in remedy selection. It would be inappropriate to use taxpayer's dollars to attempt active remediation at the Burning Ground where no unacceptable risk has been identified from site groundwater.

The health risk assessment differentiates between receptors that have a reasonable chance of facing an impact and those that do not. In the case where there is no legitimate receptor, there is no need to generate a hypothetical one. The Burning Ground administrative record documents a reasonable attempt to identify receptors. For off-site groundwater at this site, no receptors were identified.

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