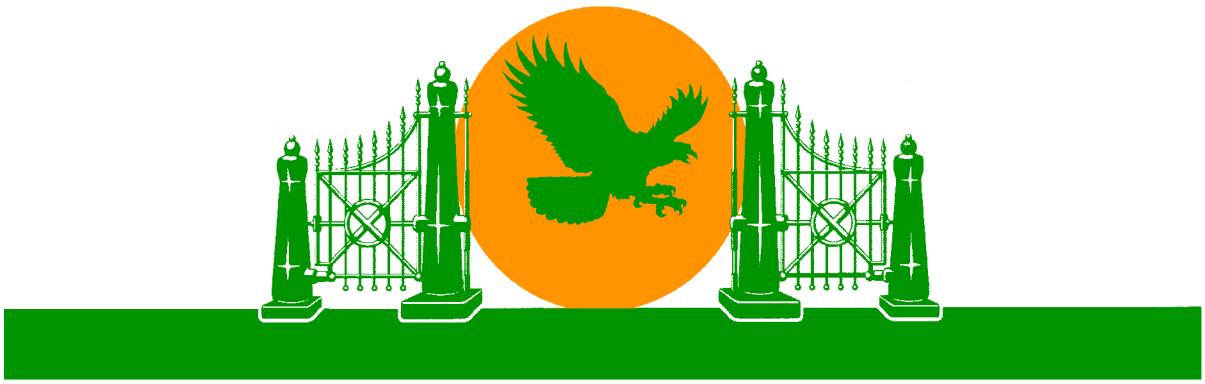

Picatinny is an Official Hawk Watch Site

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

FINAL **DECEMBER 2004**

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

JUL 19 2005

LTC Paul Seitz
Garrison Commander
U.S. Army TACOM-ARDEC
Picatinny, New Jersey 07806-5000

Re: Record of Decision
Green Pond Brook and Bear Swamp Brook

Dear LTC Seitz,

Enclosed is a copy of the Record of Decision (ROD) for Green Pond Brook and Bear Swamp Brook at Picatinny, New Jersey, which, pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act, Section 120(e)(4)(A), I have co-signed to signify Environmental Protection Agency (EPA) concurrence with the selected remedy for the site.

The selected remedy for Green Pond Brook and Bear Swamp Brook is chemical monitoring of surface water and sediment, biological monitoring, and excavation of contaminated sediment from the oil/water separator and hot spot location BSSD-34. Deep sediment samples will be collected to verify the extent of previously identified areas of contamination. If justified, these areas may require a more active remedial measure. Institutional controls will be maintained by the Army to restrict land use. Five-Year Reviews will be required.

This ROD only addresses contamination attributable to Green Pond Brook and Bear Swamp Brook. Other Operable Units at Picatinny will be addressed in separate RODs.

If you have any questions, please contact me or have your staff contact William Roach, EPA Project Manager, at (212) 637-4335.

Sincerely,

William McCabe

William McCabe, Acting Director
Emergency and Remedial Response Division

enclosure

cc: B. Campbell, Commissioner, NJDEP
T. Gabel, Picatinny

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LIST OF ACRONYMS

AR	Army Regulation
AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirement
ARDEC	Armament Research Development and Engineering Center
BERA	Baseline Ecological Risk Assessment
BSB	Bear Swamp Brook
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
COC	Contaminant of Concern
CSM	Conceptual Site Model
CY	Cubic Yard
DGWP	Data Gap Work Plan
DOT	Department of Transportation
EE/CA	Engineering Evaluation/Cost Analysis
ERA	Ecological Risk Assessment
ESD	Explanation of Significant Differences
FS	Feasibility Study
FFS	Focused Feasibility Study
GPB	Green Pond Brook
HDPE	High Density Polyethylene
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
IC	Institutional Control
ICFKE	ICF Kaiser Engineers
IRP	Installation Restoration Program
LOC	Level of Concern
LOEC	Lowest Observable Effect Concentration
LUC	Land Use Control
mg/kg	milligrams per kilogram
msl	mean sea level
NCP	National Contingency Plan
NJDEP	New Jersey Department of Environmental Protection
NJPDES	New Jersey Pollution Discharge Elimination System
NOEC	No Observable Effect Concentration
NPL	National Priorities List
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
RAB	Picatinny Arsenal Environmental Restoration Advisory Board
PAH	Polycyclic Aromatic Hydrocarbon
PCB	polychlorinated biphenyl
pCi/L	Picocuries per liter
PEL	Potential Effect Level
PRG	Practical Remedial Goal
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RG	Remedial Goal
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SI	Site Investigation
SVOC	Semi-volatile organic compound
SW/SD	Surface Water/Sediment
TBC	To-Be-Considered
TCLP	Toxicity Characteristic Leaching Procedure
USACE	United Stated Army Corps of Engineers
USAEHA	U.S. Army Environmental Hygiene Agency
USEPA	United States Environmental Protection Agency
USGS	U.S. Geological Survey
USATHAMA	United States Army Toxic and Hazardous Material Agency
UXO	unexploded ordnance

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1.0 PART 1: DECLARATION

1.1 SITE NAME AND LOCATION

Picatinny is formally designated as Picatinny Garrison under the United States Department of the Army (Army) Installation Management Agency Northeast Regional Office. It is located in North Central New Jersey (NJ) in Morris County near the city of Dover. The facility was included on the National Priorities List (NPL) in March of 1990 and assigned a Comprehensive Environmental Response, Compensation and Liability Identification System (CERCLIS) number of NJ3210020704.

This Record of Decision (ROD) specifically addresses sediment and surface water contamination in the designated sections of Green Pond Brook and Bear Swamp Brook (GPB/BSB) of Picatinny. The remaining areas in Picatinny are being addressed as separate actions.

1.2 STATEMENT OF BASIS AND PURPOSE

This ROD presents the selected remedies for contaminated sediment and surface water at Region 2, Region 3, and Region 4 of GPB/BSB, located in Picatinny in Rockaway Township, NJ. The remedial actions are selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986; and to the greatest extent possible, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The information supporting the decisions on the selected remedial actions is contained in the administrative record file for Picatinny. These decisions have been made by the Army and the United States Environmental Protection Agency (USEPA). The New Jersey Department of Environmental Protection (NJDEP) concurs with the selected remedy.

1.3 ASSESSMENT OF THE SITE

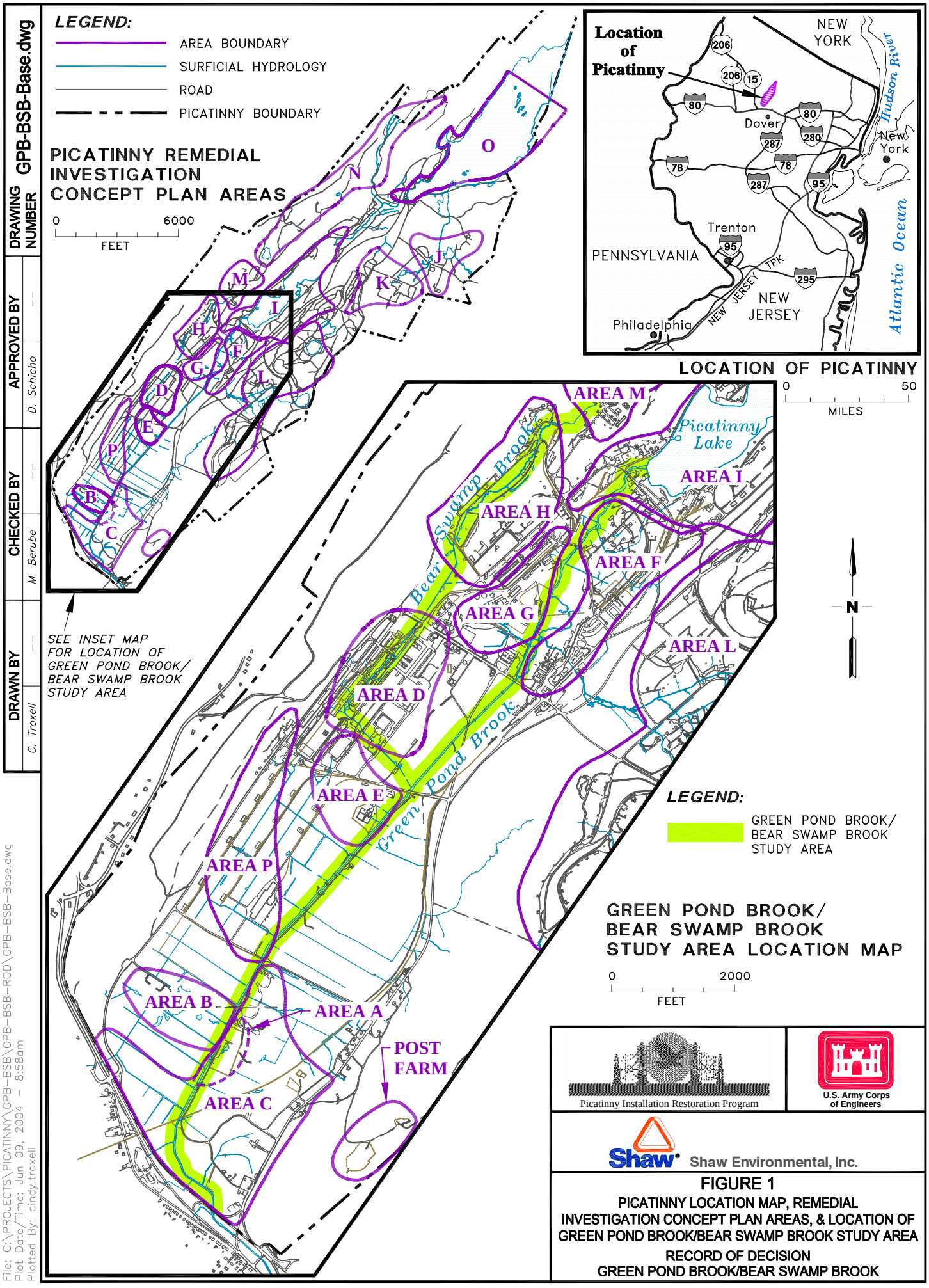
The response action selected in this ROD is necessary to protect human health and the environment from actual or threatened releases of hazardous substances into the environment.

1.4 DESCRIPTION OF THE SELECTED REMEDY

The remediation of contaminated sediment at GPB/BSB 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 the sites into 16 areas based on the potential for environmental contamination, called Area A (greatest potential) through Area P (least potential), to ensure systematic and prioritized investigation and cleanup of the sites. To further expedite the CERCLA investigative processes, the Army further prioritized Areas A through P into three phases: Phase I - Areas A through G, Phase II - Areas H through K, and Phase III – Areas L through P. The stretch of GPB/BSB covered under this ROD is located throughout various areas of Picatinny including Areas A through H and Area P. GPB (including BSB) was designated as Site 192 during the remedial investigation (RI) for Phase I. The GPB/BSB study area is grouped into four individual regions. Based on previous investigations, it does not appear that the storage of explosive materials in Region 1, the area of GPB north of Picatinny Lake, has impacted the quality of surface water or sediment in this area, and is not addressed in this ROD. The ROD includes Region 2, GPB below Picatinny Lake to the confluence with BSB; Region 3, BSB from Area H to the confluence with GPB; and Region 4, GPB from the confluence with BSB to the southern boundary of Picatinny. **Figure 1** presents the location and general site plan of GPB/BSB.

The Feasibility Study (FS) identified metals, polychlorinated biphenyls (PCBs), pesticides, and semi-volatile organic compounds (SVOCs) as the contaminants of concern (COCs) targeted for remediation in the sediment in Region 2, Region 3, and Region 4 of GPB/BSB. None of the contaminated materials within GPB/BSB are considered as principle threat waste because they are non-mobile materials of low toxicity. Therefore, treatment of contaminated media may not be appropriate or necessary to ensure protection of human health and the environment. However, the Army considered and has implemented an active treatment technology (stabilization) in Region 3.

The following six areas of concern (AOCs) have been identified within GPB/BSB as seen on **Figure 2**.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AREA BOUNDARY
SURFICIAL HYDROLOGY
ROAD
PICATINNY BOUNDARY
PICATINNY REMEDIAL INVESTIGATION CONCEPT PLAN AREAS
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SEE INSET MAP FOR LOCATION OF GREEN POND BROOK/ BEAR SWAMP BROOK STUDY AREA
Location of Picatinny
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Hudson River
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New York
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PENNSYLVANIA
NEW JERSEY
Philadelphia
Atlantic Ocean
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AREA I
AREA H
Swamp Brook
Bear
AREA F
AREA G
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Green Pond Brook
AREA E
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LEGEND:
GREEN POND BROOK/ BEAR SWAMP BROOK STUDY AREA
GREEN POND BROOK/ BEAR SWAMP BROOK STUDY AREA LOCATION MAP
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Picatinny Installation Restoration Program
U.S. Army Corps of Engineers
Shaw Environmental, Inc.
FIGURE 1
PICATINNY LOCATION MAP, REMEDIAL INVESTIGATION CONCEPT PLAN AREAS, & LOCATION OF GREEN POND BROOK/BEAR SWAMP BROOK STUDY AREA
RECORD OF DECISION
GREEN POND BROOK/BEAR SWAMP BROOK
DRAWING NUMBER GPB-BSB-Base.dwg
APPROVED BY D. Schicho
CHECKED BY M. Berube
DRAWN BY C. Troxell
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Region 2

1) Sediments in Area G, near the swale that drains Sites 52, 95, and 96 into GPB, and

2) Sediments in GPB near Site 101 in Area G.

Region 3

3) BSB sediments in Area D, including the sediment retention ponds (active treatment completed),

4) BSB sediments in Area H, and,

5) BSB sediments at the oil/water separator pond.

Region 4

6) GPB sediments adjacent to the Burning Ground in Area A.

It should be noted that when this ROD was prepared, all the active engineering measures associated with the third AOC, sediment retention ponds in Region 3, had been completed. These measures included excavation, on-site stabilization, restoration of the sediment retention ponds, and off-site disposal of stabilized sediments. This action was performed under a non-time critical removal action. The decision document to implement the removal action under Army's authority under 40 CFR 300.410 and 300.415 for the removal and the disposal of the sediment from the retention basins was signed on June 7, 2002. The decision document was based on the USEPA approved Engineering Evaluation/Cost Analysis (EE/CA) in consultation with the NJDEP, and public noticed during the spring of 2002. The removal action was completed during the summer of 2003 through spring of 2004.

The scope of this ROD includes remedial actions for the remaining AOCs. This ROD will address the remediation of contaminated sediment at the GPB/BSB AOCs in accordance with the remedial action objectives (RAOs) established in Section 2.7 of the Decision Summary. The remaining areas in Picatinny are being considered separately and remedies for these areas are presented in separate documents. The remedies presented in this document are intended to be the final remedies for the GPB/BSB AOCs. The major components of the selected remedies for these AOCs include the following (full descriptions of these and other alternatives are presented in Sections 2.8 and 2.9 of the Decision Summary):

Region 2: Chemical and Biological Monitoring of AOCs and Land Use Controls (LUCs)

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

Region 3: Excavation, On-site Stabilization, and Off-site Disposal of Contaminated Sediment from the Oil/Water Separator Pond and Hot Spot Location BSSD-34, Environmental Monitoring, and LUCs

- Excavation and on-site stabilization of contaminated sediment from the oil/water separator pond, and the hot spot location BSSD-34
- Chemical monitoring of sediment and surface water for metals, PAHs, pesticides, and PCBs
- Biological monitoring (benthic macroinvertebrate studies and toxicity testing studies)

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

Region 4: Chemical and Biological Monitoring and LUCs

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

The actions described in this ROD are intended to eliminate and monitor the potential unacceptable risk for human and ecological exposure to contaminant concentrations in GPB/BSB surface water and sediment. The remedial action will be considered complete upon agreement with the USEPA Region 2 and Picatinny. Upon agreement that remediation is complete, long-term chemical and biological monitoring will be discontinued per an agreed upon exit strategy and documented in the next 5-year review. LUCs will be continued and 5-year reviews will be performed for GPB/BSB until contaminant levels are shown to allow unrestricted use and exposure.

1.5 STATUTORY DETERMINATIONS

The selected remedies are protective of human health and the environment, comply with Federal and State laws and regulations that are applicable or relevant and appropriate to the remedial actions, and are cost effective.

The Army has considered less emphasis on the statutory preference for treatment as a principal element because none of the COCs in Regions 2 and 3 constitute principal threat wastes. Human exposures would be controlled and limited through the implementation of LUCs. Furthermore, potential unacceptable risks to human and ecological receptors would be monitored through implementation of the long-term chemical and biological monitoring program to ensure that the concentrations or toxicity of COCs meet remediation goals. If the concentrations or toxicity of the COCs are determined to correlate with unacceptable risks, a contingency plan will be implemented.

Even though the COCs in Region 3 do not constitute principal threat wastes, the Selected Remedy for this Region satisfies the preference for treatment as a principal element through the use of on-site stabilization technology. On-site stabilization was selected for Region 3 because it provides the most efficient and cost effective approach.

Five-year reviews will be conducted in compliance with CERCLA and the NCP to ensure that the remedy is and will be protective of human health and the environment.

1.6 RECORD OF DECISION DATA CERTIFICATION CHECK LIST

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

Criterion	Section	Page Number
Chemicals of Concern and Their Respective Concentrations	2.6.5	2-10
Current and Reasonably Anticipated Future Land Use Assumptions Used in Baseline Risk Assessment and ROD	2.7	2-9
Baseline Risk Represented by the Chemicals of Concern	2.8	2-12
Cleanup Levels Established for Chemicals of Concern and the Basis for These Levels	2.8.2	2-14
How Source Materials Constituting Principal Threats will be Addressed	2.12	2-26
Selected Remedy: Description, 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	2.13	2-26
Region 2	2.13.1	2-29
Region 3	2.13.2	2-31
Region 4	2.13.3	2-33
Key Factors Leading to Selection of Selected Remedy	2.15	2-35

1.7 AUTHORIZING SIGNATURE

P T Seitz

Paul T. Seitz
Lieutenant Colonel, U.S. Army
Garrison Commander

4 Jan-05
Date

William McCabe

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

July 18, 2005
Date

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2.0 PART 2: DECISION SUMMARY

2.1 SITE NAME, LOCATION, AND DESCRIPTION

Picatinny, located in Rockaway Township, New Jersey (NJ) is listed on the United States Environmental Protection Agency's (USEPA's) Superfund National Priorities List (NPL). The National Superfund Comprehensive Environmental Response, Compensation and Liability Identification System (CERCLIS) number is NJ3210020704. The United States Department of the Army (Army) is the lead agency for site activities at the Green Pond Brook and Bear Swamp Brook (GPB/BSB) portion of Picatinny and USEPA Region 2 is the support agency with oversight responsibilities. Plans and activities are also being coordinated with the appropriate NJ State agencies, including the NJ Department of Environmental Protection (NJDEP). The funding for this action will be provided from the Environmental Restoration, Army (ER, A) account.

Picatinny is located approximately four miles north of the City of Dover in Rockaway Township, Morris County, NJ. The location of Picatinny is presented on **Figure 1**. Some of the nearby populous areas are Dover, 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. Picatinny 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.

This Record of Decision (ROD) describes the preferred remedies to reduce human health and environmental risks associated with elevated concentrations of metals, polychlorinated biphenyls (PCBs), pesticides, and semivolatile organic compounds (SVOCs) that are present in sediment and surface water in Regions 2, 3, and 4 of GPB/BSB at Picatinny. GPB is approximately 22,440 linear feet and is the primary surface water drainage of Picatinny. BSB is approximately 4,400 linear feet and is a tributary of GPB. The stretch of GPB/BSB covered under this ROD is located throughout various areas of Picatinny including Areas A through H and Area P. **Figure 1** presents the location and site plan of GPB/BSB.

The remedial alternatives presented in this ROD were selected by the Army, in partnership with the USEPA Region 2 and with concurrence by NJDEP. The remedial action is funded by the Army and was selected in accordance with Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and to the greatest extent possible, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and with Army Regulation (AR) 200-1, Environmental Protection and Enhancement, as applicable.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

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

Numerous swampy areas and wetlands exist within the valley and are associated with the poorly drained glacial deposit soils. Some of these wet areas were drained because they were obstructing Picatinny activities. In 1944, dredging increased the hydraulic gradient of GPB. At the same time, field tile drainages were installed in the golf course area and numerous lateral drainage ditches were developed to help drain the wetland areas near the southern installation boundary. The drainage systems, installed as part of the reclamation activities, currently act as tributaries to GPB. These activities resulted in improved drainage and the reclamation of 360 acres of wetlands (U.S. Army Toxic and Hazardous Materials Agency [USATHAMA], 1976). The wetland reclamation activities involved filling in much of the native habitat, resulting in changes to the local ecosystem. GPB below Picatinny Lake flows through the center of the valley in a southwest direction. GPB turns to the southeast just before it exits Picatinny at the southern boundary.

BSB and the upper reaches of GPB in the study area flow through the industrial portion of Picatinny. There are numerous buildings that border both brooks. In the past, many of these buildings had drains that discharged directly to the brooks. Currently, waste discharges to BSB no longer occur.

The primary sources of contamination in GPB/BSB are past industrial activities at adjacent sites and stormwater drainage. Past operational activities include production of explosives, rockets, munitions, propellants, pyrotechnic signals and flares, fuses, and metal components.

Several investigations of GPB/BSB have been performed since 1983. Most of the investigations have focused on determining the impacts of a particular site on the surface water and sediment quality of GPB and BSB, including:

- Ground-Water Contamination in the Area of Building 24, Picatinny Arsenal, New Jersey by the U.S. Geological Survey (USGS) in 1988 (USGS, 1988),
- Hydrogeology and Water Quality in the Open Burning Area and Vicinity, Picatinny Arsenal, New Jersey (USGS, 1990),
- Assessment of Streambed-Material Characteristics and Surface-Water Quality, Green Pond Brook and Tributaries, Picatinny Arsenal, New Jersey (USGS, 1991),
- Letter Report to John Romoe, U.S. Army Corps of Engineers Regarding Stream Sampling Program, Picatinny Arsenal, Green Pond Brook by Metcalf and Eddy in 1991, and
- Receiving Water Biological Study No. 32-24-0949-91, Investigation of Contaminants in Recreational Waters, U.S. Armament, Research, Development, and Engineering Center (ARDEC), Dover, New Jersey, 1-4 May 1989 and 2-5 April 1990 by the U.S. Army Environmental Hygiene Agency (USAEHA) in 1991.

Additionally, the Army has conducted numerous CERCLA-related investigations at GPB/BSB including:

- Site Investigation (SI) in 1989 by Dames & Moore (Dames & Moore, 1989),
- Phase I RI (Dames & Moore, 1995 and 1998),
- Phase II RI Round I in 1997 by ICF Kaiser Engineers (ICFKE, 1997),
- Phase I Additional RI Sites (ICFKE, 1999),
- Green Pond Brook and Bear Swamp Brook, Surface Water/Sediment Feasibility Study Data Gap Work Plan (ICFKE, 1998),
- Focused Feasibility Study (FFS) for GPB/BSB (IT, 2001),
- Engineering Evaluation and Cost Analysis (EE/CA) (Picatinny, 2002),
- Remedial Action Work Plan for Interim Removal Action at BSB Sedimentation Basins in September 2003 (Shaw, 2003a), and
- Proposed Plan in December 2003 (Shaw, 2003b).

Between 1983 and 1992, more than 100 samples were collected from surface water and sediment of GPB/BSB. Since 1993, 136 sediment and 101 surface water samples have been collected in GPB and BSB. Due to the large number of studies completed and the large volume of data compiled, it is difficult to present a complete picture of the data. In addition, the lower region of GPB (below its confluence with BSB) may be receiving chemicals from both BSB and upstream GPB. Furthermore, there are distinct physical differences among the tributaries and between the upper and lower reaches of GPB. Therefore, the FFS grouped GPB/BSB area into four individual Regions (which is consistent with the approach used in the Phase I RI for the Area GPB report). This approach is critical in determining if chemicals are being transported into the lower reaches of GPB from upstream regions.

The FFS area begins at the outfall of Picatinny Lake and extends to where GPB leaves the Picatinny property at the southern boundary of the installation. The study area includes the entire length of BSB, from Area M to the confluence with GPB. The primary tributaries to GPB at Picatinny are Burnt Meadow Brook, BSB, and Robinson Run (ARDEC, 1987). The area of GPB north of Picatinny Lake, referred to as Region 1, is surrounded by undeveloped land and land utilized only for the storage of high explosives, propellants, and ordnance items. These items are stored in magazines throughout the region. This section of GPB has many

undisturbed habitat areas (described in Section 2.5) because it is not easily accessible and has not been impacted by human activity. Samples collected from this area have shown minimal impact from Picatinny activities. It does not appear that the storage of explosive materials in Region 1 of GPB/BSB has impacted the quality of surface water or sediment in this area. Therefore, this section of GPB north of Picatinny Lake was not included as part of the FFS or Proposed Plan, and is not included in this ROD. The ROD includes Region 2, GPB below Picatinny Lake to the confluence with BSB; Region 3, BSB from Area H to the confluence with GPB; and Region 4, GPB from the confluence with BSB to the southern boundary of Picatinny. **Figure 2** presents the study areas addressed in this document. Additional information regarding the background of GPB/BSB can be found in greater detail in the Administrative Record file for Picatinny.

No formalized enforcement activities have occurred at GPB/BSB. 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.

2.3 COMMUNITY PARTICIPATION

GPB/BSB was the topic of a presentation to the Picatinny Arsenal Environmental Restoration Advisory Board (RAB) on September 13, 2000. RAB members have provided comments regarding the proposed remedial alternative. A courtesy copy of the Proposed Plan was given to the RAB's co-chair and a complimentary copy was offered to any RAB member who requested it. A final Proposed Plan for GPB/BSB was completed and released to the public in December 2003 at the information repositories listed below:

Installation Restoration Program Office **Building 319** **Picatinny, NJ 07806**	**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 public meeting. The notification was run in the New Jersey-Star Ledger and the Daily Record on December 5 and 12, 2003. A public comment period was held from December 5, 2003 to January 5, 2004, during which comments from the public were received. A public meeting was held on December 18, 2003 to inform the public about the Selected Remedies for GPB/BSB and to seek public comments. At this meeting, representatives from the Army, NJDEP, USEPA, and the U.S. Army Corps of Engineers (USACE) were present to answer questions about the site and alternatives under consideration. The Army's responses to comments made at the public meeting are included in the Responsiveness Summary section of this document.

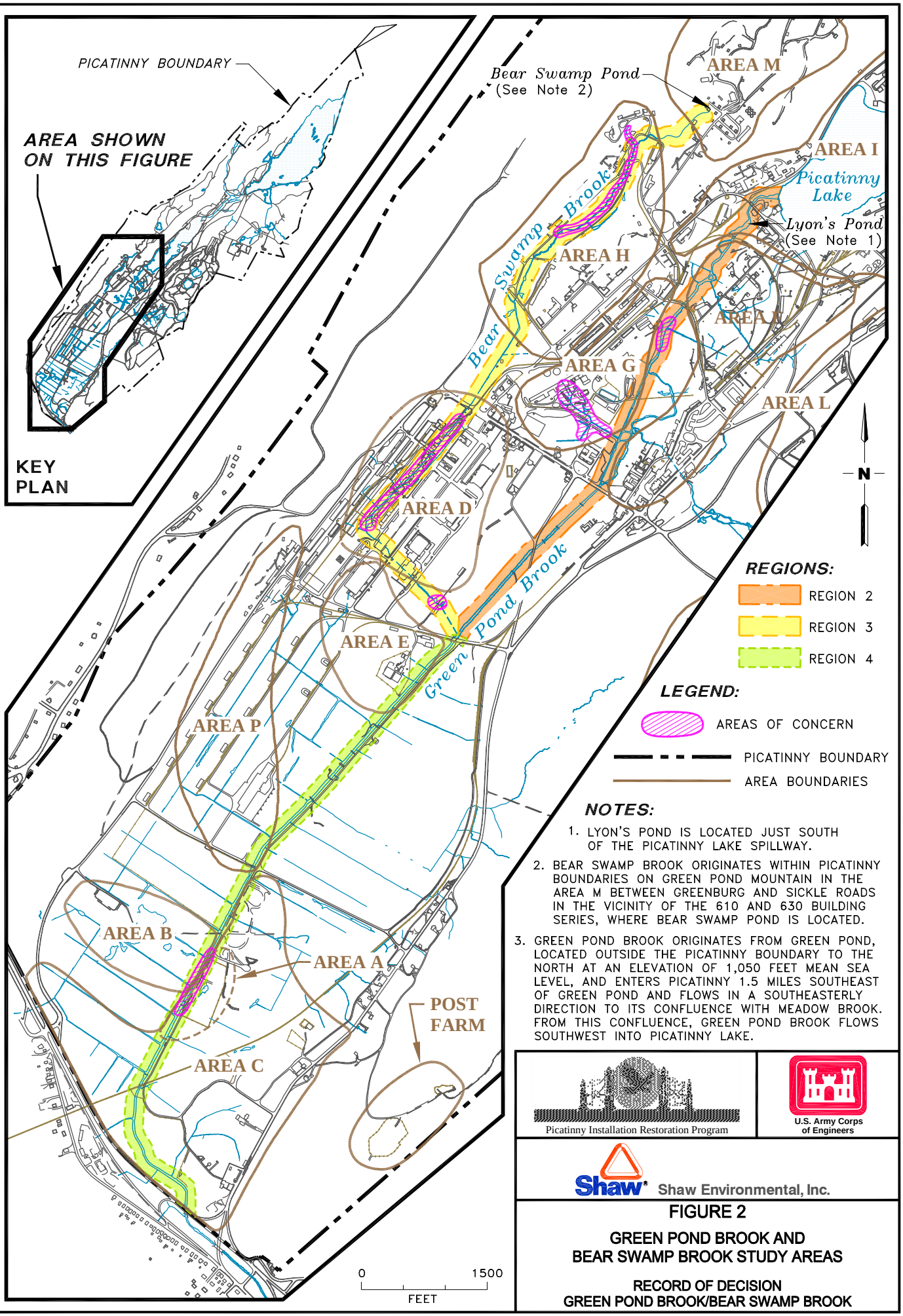
2.4 SCOPE AND ROLE OF RESPONSE ACTION

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 the installation past activities. The remediation of GPB/BSB is part of a comprehensive environmental investigation and remediation process currently underway to meet the IRP goals at Picatinny. Presently, Picatinny has two signed Final RODs. The RODs were signed in 2001 and 2004. The first remedial action was completed in 2003, and planning for the second is underway. The Army has submitted, and is awaiting signature on the third and fourth RODs. The Army intends to submit numerous RODs for other sites at Picatinny in the coming years.

As previously discussed in Section 2.2, the size of the study area and large chemical analytical data set associated with GPB and BSB have made evaluation of the potential remedies complex. As a result, in order to properly define the scope and role of the GPB/BSB remedial action, the area was divided into four study areas or Regions based upon physical stream characteristics, proximity of industrial operations to the streams, and historic waste disposal documentation. Additionally, the lower region of GPB (below its confluence with BSB) may be receiving chemicals from both BSB and upstream GPB. Therefore, the intersection of GPB and BSB is a logical dividing point.

The study area was divided into the following Regions:

- Region 1, GPB and Burnt Meadow Brook above Picatinny Lake;



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C. Troxell --	M. Berube --	D. Schicho --	GPB-BSB-Base.dwg

Picatinny Installation Restoration Program

U.S. Army Corps of Engineers

Shaw Environmental, Inc.

FIGURE 2

GREEN POND BROOK AND BEAR SWAMP BROOK STUDY AREAS

RECORD OF DECISION
GREEN POND BROOK/BEAR SWAMP BROOK

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Plot Date/Time: Jun 08, 2004 - 1:55pm
Plotted By: cindy.troxell

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

This ROD addresses the selection of the remedial actions for Regions 2, 3, and 4 of GPB/BSB. The FFS concluded that past and current activities of Picatinny have not impacted Region 1 of GPB/BSB. The proposed remedial actions primarily target the sediment, which is affected by metals, PCBs, pesticides, and SVOCs. Six AOCs have been identified within GPB/BSB as follows:

Region 2

1) Sediments in Area G, near the swale that drains Sites 52, 95, and 96 into GPB, and

2) Sediments in GPB near Site 101 in Area G.

Region 3

3) BSB sediments in Area D, including the sediment retention ponds,

4) BSB sediments in Area H, and,

5) BSB sediments at the oil/water separator pond.

Region 4

6) GPB sediments adjacent to the Burning Ground in Area A.

Two non time-critical removal actions have been performed that removed contaminated sediment from BSB in Area D. The first action was the removal of PCB-impacted sediments from the streambed and bank adjacent to Site 122 in early 2000. From January to May 2000, 387 cubic yards (CY) (580 tons) of soil and sediment were removed and disposed off-site. This action was performed under a USEPA approved EE/CA.

Remedial action associated with the third AOC – BSB sediments at the sediment retention ponds in Area D in Region 3 – was performed under a non-time critical removal action, which began in March 2003. The remedial action included all the active engineering measures associated with the excavation, on-site stabilization, and characterization of stabilized sediment. Confirmatory sampling was performed as dredging and excavation progressed at frequencies dictated by the State of New Jersey Technical Requirements 7:26E Subchapter 6.4 (NJDEP, 1997a). The disposal of stabilized sediment and site restoration of the retention ponds were completed in early 2004. Approximately 632 tons of stabilized sediment was disposed off-site as hazardous waste, and 386 tons of excavated soil was disposed as solid waste. Further details of activities performed, actual cost, and project milestone for the non-time critical removal action in Region 3 is provided under a separate report.

As previously discussed in Section 1.4 of this document, the decision document to implement a removal action under Army's authority under 40 CFR 300.410 and 300.415 for the removal and the disposal of the sediment from the retention basins was signed on June 7th, 2002. The decision document was based on the USEAPA approved EE/CA in consultation with the NJDEP and public noticed during the spring of 2002.

Remedial actions for the remaining six AOCs described above are the subject of this ROD. The contamination present in the AOCs poses a potential risk human and to ecological receptors. There is no unacceptable risk to human health based on a restricted use scenario. In accordance with CERCLA requirements, implementation of the remedies described in this ROD addresses the remaining sediment and surface water in the GPB/BSB AOCs. Implementation of these remedies will ensure continued protectiveness of human and ecological receptors.

2.5 DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan presents the selected remedial actions as the preferred alternatives. No significant changes have been made. As stated above, when this ROD was prepared, all the active engineering measures associated with the third AOC, sediment retention ponds in Region 3, had been completed under a non-time critical removal action.

2.6 SITE CHARACTERISTICS

2.6.1 Conceptual Site Model

A conceptual site model (CSM) has been developed for surface water and sediment of GPB/BSB in order to convey the salient processes affecting the introduction, movement, and distribution of contaminant mass in these water bodies.

Contaminants, including polycyclic aromatic hydrocarbons (PAHs), metals, pesticides, SVOCs, and PCBs, have been introduced to the surface water through past direct discharges from the various past industrial activities at Picatinny, and surface runoff from contaminated sites at Picatinny. Contaminants were eventually distributed to sediment in these surface water bodies through a continuing adsorption process. This process is the primary mechanisms for contaminants to equilibrate within the surface water and the sediment. Through food chain mechanisms, some contaminants are eventually bioaccumulated in fish and other aquatic invertebrates. Human exposures to the contaminants could potentially occur through consumption of fish, dermal contact and ingestion during swimming activity. **Figure 3** presents the CSM for GPB/BSB. Although these processes are possible, it should be noted that swimming and fishing are unlikely and not allowed in the study area. There are more desirable locations for those activities both on Picatinny and in the surrounding communities.

2.6.2 Physical Characteristics of GPB

GPB is the primary surface water drainage of Picatinny and accounts for approximately 22,440 linear feet of drainage channel within the installation. The Brook drains an area of 8,338 acres from its headwaters in Green Pond Mountain to its exit point at the southern end of the installation (ARDEC, 1987).

GPB originates from Green Pond located north of Picatinny at an elevation of 1,050 feet mean sea level (msl). GPB enters Picatinny 1.5 miles southeast of Green Pond and flows in a southeasterly direction to its confluence with Burnt Meadow Brook. From this confluence, GPB flows southwest into Picatinny Lake. The upper reaches of the Brook (above Picatinny Lake) are characterized by a moderate steep semi-sinuous channel that has an average width of 23 feet, fast flows, and cool waters, and is composed of pool-riffle-run habitats. The channel bed has a coarse sediment composition. The channel travels along a slope ranging from 3.1% (above the confluence with Burnt Meadow Brook) to 1.2% (below the confluence with Burnt Meadow Brook) through mostly forested habitat (ARDEC, 1987).

GPB empties into Picatinny Lake and then emerges from the southern end of the lake. A dam and spillway control the flow of water from Picatinny Lake into GPB. (Lyon's Pond is just south of the Picatinny Lake spillway.) GPB then drops into the relatively broad and flat glacial valley of the study area. The lower reaches (approximately 9,000 feet) of GPB (below Picatinny Lake) have been straightened and/or relocated in many areas. It is characterized as a wide, straight channel (an average width of 30.5 feet), with very slow flows and warm waters. The channel bottom generally consists of a fine sediment composition. The riparian habitat of the glacial valley primarily consists of developed land and maintained fields (e.g., a golf course) (ARDEC, 1987).

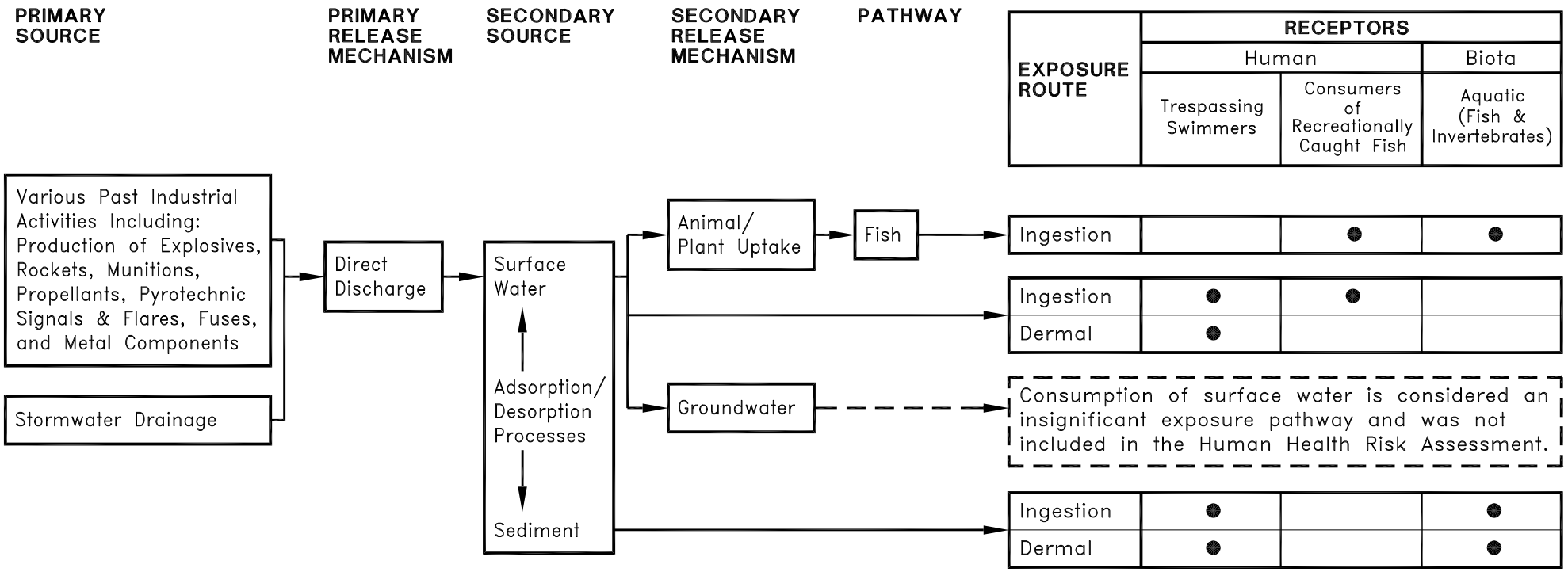
The lower reach of GPB is considered to be a gaining stream system. That is, groundwater discharges into GPB through the bottom of the streambed. The tributaries, drainage systems, and groundwater discharge areas contribute to the overall surface water flow of GPB (USGS, 1991). The principal source of groundwater in the Green Pond Valley is local precipitation.

There is seasonal variation in stream flows based upon precipitation. Thirty-year average monthly precipitation data (1951-1980) compiled from the Boonton ISE, Morris Plains IW, Oak Ridge Reservoir and West Wharton Rain gauging stations indicate that the average annual precipitation in the study area is 49.68 inches.

Most of GPB below Picatinny Lake has been altered through channelization and the placement of weirs and flow gates. The entire reach of GPB from south of Farley Avenue to the point where it exits Picatinny is channelized. This has had an important impact on GPB by eliminating several of the natural features that typically provide productive habitat for aquatic species. Very slow velocities and uniform depths that are conducive to sediment deposition characterize these channelized portions. In general, the bottom substrate is extremely soft and composed primarily of silt and medium to fine-grained sand, in addition to larger organic material. Much of the channelized portions can be characterized as steep-banked and lined with herbaceous and small woody plants that provide little shading. Within the stream channel itself, fairly dense beds of submerged aquatic vegetation are present along various reaches of the brook.

File: C:\PROJECTS\PICATINNY\GPB-BSB\GPB-BSB-ROD\RiskModel.dwg
Plot Date/Time: Nov 12, 2004 - 11:36am
Plotted By: cindy.troxell

DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
C. Troxell	--	M. Berube	--	D. Schicho	--	RiskModel.dwg



Notes:

1. The Human Health Risk Assessment performed for Green Pond Brook (including Bear Swamp Brook) considered risks to trespasser swimmers and consumers of recreationally caught fish.
2. Ecological Risk Assessment was performed from a watershed view point, not site-specific to Green Pond Brook/Bear Swamp Brook.

Picatinny Installation Restoration Program

U.S. Army Corps of Engineers

Shaw Environmental, Inc.

FIGURE 3

CONCEPTUAL SITE MODEL FOR GREEN POND BROOK/BEAR SWAMP BROOK

RECORD OF DECISION GREEN POND BROOK/BEAR SWAMP BROOK

Non-channelized sections of GPB are less disturbed and remain in a more natural state. However, weirs, flow gates, and bridges, located at various points along the stream, act to alter the natural flow of the water and habitat conditions. Much of the reach upstream of the golf course and north of Farley Avenue (Area D) alternates repeatedly, and within very short distances, between man-influenced and a more natural state. In general, there are very few reaches that have homogenous habitat for 200 feet or more in this section. These features have degraded the integrity of the habitat for aquatic species by limiting the viable natural habitat to isolated locations along the stream channel.

2.6.3 Physical Characteristics of BSB

BSB originates within Picatinny boundaries on Green Pond Mountain in Area M between Greenberg and Stickle Roads in the vicinity of the 610 and 630 building series (where Bear Swamp Pond is located). It is a tributary of GPB and accounts for approximately 4,400 linear feet of drainage channel within the installation. BSB drains an area of approximately 384 acres from its headwaters to the confluence with GPB. BSB originates at an elevation of approximately 850 feet msl, and travels on a 6.3% slope through a forested swamp habitat. The upper reaches of BSB are characterized by a moderate steep narrow channel, fast flows, cool waters, and pool-run habitats. The channel bottom has a mixed fine-coarse sediment composition and averages 4 feet in width (ARDEC, 1987).

The lower reach of BSB drops into the northwestern portion of the relatively broad and flat glacial valley of Picatinny. This valley has an average slope of 0.1% and an elevation of approximately 700 feet. A relatively straight channel with an average width of 7 feet, low flows, and warm waters characterize the lower reach of BSB. The channel bottom generally has a fine sediment composition. The riparian habitat is variable with forested wetlands near the upper/lower reach transition zone. The stream becomes channeled underground via a culvert originating near the transportation facility's outdoor storage yard close to the junction of Reilly Road and Farley Avenue. It once again emerges and travels through the industrialized section of Picatinny. Numerous buildings in this section of Picatinny border BSB, and at one time, discharged wastewater directly into BSB. The compositions of the discharges from many of these buildings varied as the operations performed in each building were changed. Direct discharge of untreated effluent from these buildings was discontinued.

The aboveground reaches of BSB meander between buildings and parking lots. BSB continues on a southeastern route to two sediment retention ponds before it is channeled under Dunn Avenue. BSB emerges on Picatinny's golf course and is channeled into a third sediment retention pond and then an oil/water separator pond. It then exits the latter pond and is channeled underground until its confluence with GPB near First Street. BSB is shallow and narrow in this area and has a flow of less than 0.05 cubic feet per second.

The portion of BSB in Area H has the greatest potential for supporting aquatic life, given the size of Bear Swamp, which is approximately 2,500 feet long and 100 feet wide. The portions of BSB below Area H with the greatest potential for supporting aquatic life habitat include an 800-foot aboveground reach south of Sixth Street, and a 500-foot aboveground reach south of Building 60 and parallel to Second Avenue. This latter portion of BSB also contains the two sediment retention ponds.

2.6.4 Sampling Strategy

There have been several thorough environmental investigations of GPB and BSB. A significant amount of GPB/BSB data have been generated as a result of the Phase I RI conducted by Dames & Moore in 1995. Other investigations and pertinent reports include the *Burning Ground Remedial Investigation* (Dames & Moore, 1994), *the Phase II RI Report, Round I* (ICF KE, 1997a), the *Phase I Additional RI Sites* (ICF KE, 1997b), the *Site 20/24 Data Report and Additional Groundwater Investigation Work Plan* (ICF KE, 1998a), and the *Green Pond Brook and Bear Swamp Brook Surface Water/Sediment Data Gap Feasibility Study* (ICF KE, 1998b).

Between 1993 and 1997, 136 sediment and 101 surface water samples were collected from GPB and BSB. In 1999, additional 42 sediment and 13 surface water/sediment (SW/SD) samples were collected as part of the GPB and BSB data gap study. These data were collected to determine the nature and extent of contamination in GPB/BSB. Additionally, these chemical data were used to determine if human or ecological receptors were potentially impacted by contamination.

Bioassay testing and benthic macroinvertebrate and fish community assessments have been previously conducted along both GPB and BSB to determine if contamination was affecting the ecology of the brooks.

2.6.5 Nature and Extent of Contamination

This summary of the nature and extent of sediment and surface water contamination is based on the RI and FFS performed for the Army. The FFS identified metals, PCBs, pesticides, and SVOCs as the COCs in sediment targeted for remediation in the AOCs in Region 2, Region 3, and Region 4 of GPB/BSB. The concentrations that were detected in the surface water were compared to the Region III RBCs for tap water as part of the screening process. The risk assessment did not determine a risk to be present from surface water concentrations to trespasser swimmers; therefore, none were retained as COCs for the purpose of assessing remedial action objectives.. **Table 1** presents a summary of the COCs in sediment. **Figure 2** presents the location of the contaminated sediment in the six AOCs in GPB/BSB.

Region 2 AOCs include the Area G Tributary to GPB which drains Sites 52, 95, and 96, and GPB adjacent to Site 101. Nine COCs were identified for Region 2 AOCs. Contaminated sediment within Region 2 AOCs includes approximately 185 CY of material (2,500 square feet (SF) and 2 feet depth) at the unnamed tributary around SD101-1.

Region 3 AOCs include the Area H tributary to BSB near Site 128, BSB adjacent to Site 55, BSB within Area D, the sediment retention ponds, and the oil/water separator pond. Thirteen (13) COCs were identified for Region 3 AOCs. Contaminated sediment within the AOCs includes approximately 7.5 CY within Area D, and 280 CY (1,875 SF and 4 feet depth) at the oil/water separator pond. As previously discussed in Section 2.4.1, the remedial action for the AOC at the sediment retention ponds at BSB was completed under a non time-critical removal action. From this AOC, approximately 600 tons of stabilized sediment was disposed off-site as hazardous waste, and 300 tons of non-hazardous soil was excavated.

The Region 4 AOC includes GPB adjacent to the Burning Grounds in Area A. The COCs identified in GPB include copper within GPB, and copper, Aroclor-1248 and mercury in the swales that drain Site 34. It has been determined that contaminants detected within Site 34 will be more efficiently and effectively addressed in a Site 34 FS since the samples were collected in discharge ditches at that site and not GPB itself. Therefore, copper is the only COC identified in Region 4 AOCs, which include an area of approximately 4,400 SF.

The principal migration pathways were described under Section 2.5.1 “Conceptual Site Model.” The groundwater pathway is currently being addressed under separate CERCLA actions for various sites at Picatinny. As such, the groundwater pathway is not addressed in this ROD.

2.7 CURRENT AND POTENTIAL FUTURE LAND USES AND DESIGNATION OF GPB/BSB

GPB and BSB currently support fish and wildlife populations throughout Picatinny. GPB and its tributaries are the primary surface water transport bodies within Picatinny. The brooks flow between both the wooded and secluded areas of the installation, as well as the areas associated with industrial activities. Past direct disposal practices into GPB/BSB have ceased, and the industrial operations that once had occurred in buildings along the two brooks have slowed considerably. However, because Picatinny is still an active military installation, the majority of the land on either side of GPB/BSB is earmarked for military and industrial land use. The current discharge to GPB is regulated under the New Jersey Pollution Discharge Elimination System (NJPDES) permit equivalency. Recreational activities that surround GPB/BSB are limited as swimming is not permitted in the study area of either brook, and fishing is not permitted in BSB or the majority of GPB. However, fishing is permitted in Region 1 of GPB (north of Picatinny Lake) and a short section of GPB in Region 2 (Lyon’s Pond, which is just below the outfall of Picatinny Lake). Because GPB joins the Rockaway River approximately 1 mile south of the installation and flows to the Boonton Reservoir (the Reservoir serves as a water supply to Jersey City), at least a portion of Picatinny surface water is used for human consumption. The future use of either brook is not expected to change from current usage.

Table 1 - Summary of COCs

Media	Region	AOC	COC	Maximum Concentration milligrams per kilogram (mg/kg)
Sediment	2	Sediments in Area G, near the swale that drains Sites 52, 95, and 96 into GPB	Benz(a)anthracene	60
			Flouranthene	90
			Phenanthrene	200
			Pyrene	100
			Aroclor 1260	22
			4,4'-DDD	1.6
			4,4'-DDE	0.43
			4,4'-DDT	3.2
		Sediments in GPB near Site 101 in Area G	Copper	5,200
	3	BSB sediments in Area D, including the sediment retention ponds	Cadmium	7,800[1]
			Chromium	860[1]
			Copper	306[1]
			Benz(a)anthracene	7.6
			Flouranthene	8.1
			Phenanthrene	11
			Pyrene	9.3
			Aroclor 1248	95
			Aroclor 1254	21.1
			4,4'-DDE	0.86[1]
			4,4'-DDT	2.9
		BSB sediments in Area H	Mercury	20
			4,4'-DDE	0.86[1]
		BSB sediments at the oil/water separator pond	Cadmium	7,800[1]
			Chromium	860[1]
			Copper	306[1]
			Aroclor 1260	0.727
			4,4'-DDE	0.86[1]
	4	GPB sediments adjacent to the Burning Ground in Area A	Copper	110,000
Surface Water	No COCs were identified for surface water in any Region.			

[1]Analyte identified as COC for other AOCs within Region 3. Denotes maximum concentration in all of Region 3 sediment.

2.8 SUMMARY OF SITE RISKS

Human health and ecological risk assessments (HHRA/ERA) were performed as part of the RI/FS using both chemical and risk-based (effects-related data such as toxicity tests and benthic invertebrate community analysis gathered as part of the ERA) data collected from GPB/BSB. The results of risk assessments may determine the need for a remedial action. As explained further in the human health and ecological risk sections, receptors were selected to evaluate chemical exposure to surface water, sediment, fish, and other aquatic organisms in GPB and BSB. This section summarizes the results of the HHRA/ERA that have been described in detail in the Phase I RI Report (Dames & Moore, 1998) and in the GPB and BSB Surface Water/Sediment (SW/SD) FS Data Gap Work Plan (DGWP) Report (ICFKE, 1998).

The baseline risk assessment estimates what risks and hazards the site may pose if no action were taken. As part of the baseline human health risk assessment, estimates of excess cancer risk and non-carcinogenic hazard are calculated. Risks to potential future trespasser swimmers and consumers of recreationally caught fish were evaluated and are presented in this section.

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

2.8.1 Human Health Risk Assessment

This section describes the results of the HHRA from the 1998 Dames & Moore RI report.

The selected human receptor populations in GPB that were used to evaluate exposures to surface water, sediment, and fish were trespass swimmers and consumers of recreationally caught fish. The GPB study area in the Phase I RI included BSB; therefore the risks discussed herein apply to both GPB and BSB study areas. It should be noted that under current land use, fishing is not permitted in the majority of the study area; however, fishing is permitted both upstream of the sampled area (a short segment of GPB below Picatinny Lake [Lyon's Pond] and north of Picatinny Lake) and downstream of Picatinny. Although swimming is not permitted in any part of GPB under current land use, trespasser swimming could possibly occur in the lower, more remote reaches near the Picatinny boundary. If such swimming actually occurs, it is probably infrequent as the southern brook is not attractive for swimming, and there are more suitable locations for these activities within Picatinny as well as off-site.

For trespass swimmers exposed to GPB surface water and sediment contamination, the estimated carcinogenic risk was $8X10^{-6}$, which was within the NCP target risk range of concern ($1X10^{-4}$ to $1X10^{-6}$). (Specific responses for sites exhibiting elevated cancer risks between $1X10^{-4}$ [1 person in 10,000] and $1X10^{-6}$ [1 person in 1,000,000] are discussed in the NCP). The risk was mainly due to PCBs ($4X10^{-6}$) and 2,3,4,7,8-PECDF, a type of furan, resulting from ingestion of sediment while swimming. New Jersey Public Law (NJSA 58:10B) has set the acceptable cancer risk for human carcinogens at $1X10^{-6}$ and acceptable non-carcinogenic risk for any given effect of a value not to exceed a Hazard Index (HI) of 1. The HI is defined as the sum of Hazard Quotients (HQ) for all contaminants of potential concern within a particular exposure pathway that have a similar mechanism of action or endpoint. An HQ greater than 1 indicates that the exposure level exceeds the protective level for that particular chemical. The non-carcinogenic hazard indices did not exceed the criterion of 1 for trespass swimming. The exposure potential for humans at the GPB and BSB study area is low because Picatinny has developed a series of interlocking institutional controls (ICs) developed to safeguard human health and the environment. Two of these ICs, Picatinny base access restrictions and the base master plan regulations, act to preclude routine contact with the surface water and sediment of GPB/BSB.

The carcinogenic risk to GPB fish consumers was $2X10^{-4}$, which marginally met the upper limit of the NCP target risk range of concern ($1X10^{-4}$ to $1X10^{-6}$). Most of the risk was due to concentrations of arsenic and PCBs, although risk associated with beryllium also exceeded $1X10^{-6}$. The non carcinogenic HI for fish consumers did not exceed the criterion of 1.

The risk to people from consuming fish caught in GPB was estimated using chemical concentrations measured in fish tissue. The fish tissue analyzed in the study was from fish that were caught in the lower reaches of GPB. Using fish caught in this part of GPB will give conservative results because the fish caught in this area are more likely to be impacted by site-related activities. Also, this scenario assumes that the fish consumer would only collect fish from the lower reaches of GPB and from no other location on-site at Picatinny or off-site. This exposure would be greater than the exposure to fish that have migrated off-site. It also is important to note that Picatinny fish tissue samples on which the risk calculations were based were whole body, not strictly the edible portion. Metals such as arsenic are likely to accumulate preferentially in bone and cartilage, rather than muscle tissue. In addition, based on information reported within the scientific literature, arsenic in fish is primarily an organic and non-toxic form. Thus, risk due to the consumption of arsenic in fish is likely to be overestimated. PCBs, which are lipophilic, are more likely to be present in higher concentrations in adipose (fat) tissues than muscle (flesh) tissue. The preparation of fish for consumption often includes the removal of the gut contents, skin, and fat tissues which would result in lower PCB concentrations. In such cases, the ingestion of PCBs in fish could be overestimated by the risk assessment. Current USEPA guidance recommends preparing fish as edible fillets unless information is available that indicates other consumption patterns. It also recommends that analysis for arsenic should only be for inorganic arsenic since this is the toxic form and present at smaller concentrations. The risk assessment used whole body analysis, assumed all arsenic was of the toxic inorganic form, and assumed that all fish consumed were from an area of Picatinny where concentrations were higher. It should also be noted that the sampled fish were native panfish (sunfish), not gamefish, and panfish are less likely to be caught for consumption as compared to other species. However, both the panfish and gamefish will likely bioaccumulate contaminants in a similar manner. In summary, many of the assumptions used to generate an estimate of the risk to people from consuming fish from GPB are conservative. These conservative assumptions provide a safety factor, meaning the estimated risk is most likely greater than the actual potential risk.

The contaminants and scenarios, summarized in **Table 2** were selected from the HHRA conducted as part of the Phase I RI Report (Dames & Moore, 1998). The scenarios are the most likely exposure routes under current and reasonably anticipated future land use. Should land use change significantly, it is possible that other

receptors could be impacted. The contaminants shown in these tables are either COCs for GPB/BSB or those chemicals that are significant contributors to the overall risk (cancer risk higher than $1x10^{-6}$ or HI greater than 1.0). It should also be noted that the COCs absent from these tables were not selected for consideration during the performance of the Phase I RI HHRA due to the lack of detections of these compounds or they did not exceed risk-based criteria (human health) used for screening the media in question. Furthermore, the total risks presented in these tables only represent the total for the contaminants presented in the table and do not represent the total risk for each receptor for each medium of exposure.

Table 2 - GPB/BSB Risk Characterization Summary

Scenario Time Frame: Current/Future

Receptor Population: Trespass Swimmers

Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Contaminant	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Sediment	Total PCBs	$4.0x10^{-6}$	0	$2.0x10^{-7}$	$4.2x10^{-6}$
			23478-PECDF	$1.0x10^{-6}$	0	$5.0x10^{-8}$	$1.0x10^{-6}$
						TOTAL RISK	**$5.2x10^{-6}$**

Scenario Time Frame: Current/Future

Receptor Population: Consumers of Recreationally Caught Fish

Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Contaminant	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish	Fish	Fish	Arsenic	$8.0x10^{-5}$	-	-	$8.0x10^{-5}$
			Beryllium	$1.0x10^{-5}$	-	-	$1.0x10^{-5}$
			Total PCBs	$6.0x10^{-5}$	-	-	$6.0x10^{-5}$
						TOTAL RISK	**$1.5x10^{-4}$**

The estimated human health risk presented in this section was calculated using conservative assumptions and are likely overestimated because Picatinny prohibits swimming activities at GPB and BSB and prohibits fishing in the majority of GPB. As a result, human health risks are not driving the active remedial actions discussed in this document. The basis for the response actions selected in this ROD is the potential for unacceptable risk to ecological receptors, as presented below.

2.8.2 Ecological Risk Assessment

A baseline ecological risk assessment (BERA) of GPB and BSB was conducted from a watershed viewpoint (rather than a site-specific basis) during the Picatinny Phase I RI (Dames & Moore, 1998). Following a review of the report, the Army identified data gaps that prompted collection of additional surface water and sediment samples from GPB and BSB in winter 1999. The additional sampling efforts were detailed in the SW/SD FS DGWP (ICFKE, 1998). The BERA was then revised based on the new surface water and sediment data. The risk assessment was performed to provide an estimate of current and future ecological risk associated with contaminants found in GPB and BSB, and included risk characterization, calculation of Potential Effect Levels (PELs) on aquatic receptors, and exposure modeling to estimate potential risk to terrestrial receptors.

In the risk characterization, constituents measured in surface water and sediment were compared to screening levels to identify constituents that may pose a risk to aquatic life. The ecological receptors selected for the ERA were benthic macroinvertebrates and fish. In the wildlife modeling, potential risks to piscivorous, avian, and mammalian wildlife were evaluated through modeling the exposure of wildlife to contaminants in fish and surface water, and comparing that exposure to exposures that are associated with effects. Part of the data set

collected during the Phase I RI included toxicity data that determined if sediments collected from GPB/BSB were toxic to aquatic species. Using this data in conjunction with chemical data, PELs were established. PELs are estimates of what concentration of a chemical in sediment may cause a toxic effect on aquatic organisms. Additional detail on how the PELs were developed and the potentially impacted receptors for which the PELs were calculated can be found in the final GPB/BSB FFS (IT, 2001).

The results of the BERA revealed a high level of sediment toxicity at three locations in BSB and at two locations in Bear Swamp. Elevated contaminant levels were detected in fish tissues from GPB, while the results of the benthic macroinvertebrate studies indicated moderate impacts at some of the Picatinny sample locations in GPB and BSB (although the brooks had similar biotic integrity to other streams in the area). Fish community assessment findings suggested slight fishery degradation in GPB, with the fishery declining in quality from upstream to downstream. The impaired conditions observed in both the benthic macroinvertebrate and the fish community assessments are believed to be the result of physical alterations in the habitat (e.g., sedimentation, scouring caused by higher runoff peaks associated with urbanization, low summer flows, and elevated summer water temperatures) rather than chemical contamination (Dames & Moore, 1998). Thus, the evidence suggests that there are community structure impacts due to lack of quality habitat. However, because habitat influences may mask influences related to contaminants, the possibility of contaminant effects on the macroinvertebrate and fish communities cannot be ruled out.

The results of the exposure modeling for piscivorous, avian, and mammalian wildlife suggest a potential for contaminant-related impacts in GPB. Arsenic and mercury were found to present a risk potential to mink in all Regions and mercury was found to also present a risk potential to great blue heron in Region 3. Because of the conservative assumptions in the assessment methods (e.g., all mercury is methyl mercury), and a HQ that is between 1 and 9, the risk from mercury may be insignificant. The risk from arsenic is also likely to be overestimated due to natural elevated background levels of the metal and the low frequency of detection in fish. The form of arsenic found in fish is usually found to be of a predominantly non-toxic form, but was considered in the risk characterization to be all in a toxic form. The direct sediment exposure route was considered insignificant and the indirect exposure route was evaluated through the assessment of contaminant intake in great blue heron and mink diets from ingestion of contaminated fish tissue.

Based on the results of the Phase I ERAs, there do not appear to be contaminant-related impacts in GPB despite the presence of elevated levels of contaminants in sediment at certain locations and, occasionally, in surface water, and some observed bioaccumulation of select contaminants in fish tissue. There is potential for adverse effects to mink, great blue heron, and the ecological receptors which they represent in the GPB study area, although the modeling results appear to be conservative.

However, there do exist hot spots of contamination at which localized effects may occur. These AOCs were identified through the selection of COCs that represent contaminants that were frequently detected along with other contaminants and for which the weight-of-evidence strongly supports that they were potentially responsible for effects observed in toxicity tests or in biological field assessments. The toxicity tests were conducted on the amphipod *Hyalella azteca* and the midge *Chironomus reparius.*

To determine the COCs, an evaluation of the benthic toxicity test results and their corresponding contaminant levels was made. From these, lowest observable effect concentrations (LOEC) and no observable effect concentrations (NOEC) were determined. Concentrations of contaminants detected in sediment samples that were toxic and were greater than the concentrations found in samples that were non-toxic were identified as the LOECs. The highest concentrations in the non-toxic samples were identified as the NOECs. Contaminants with concentration in the toxic samples that were below the concentrations found in non-toxic samples do not have evidence suggesting that they are responsible for the observed toxicity, and the highest concentrations of those contaminants were identified as NOECs.

Potential effects could be expected somewhere between the NOEC and LOEC. These PELs were set as the geometric mean of the NOEC and LOEC. For contaminants with NOECs but no LOECs, the PELs were set at twice the NOECs. For other contaminants that were detected in neither the toxic nor non-toxic samples, PELs were established through extrapolation from information on similar contaminants. COCs were selected based on the PELs, frequency of detection above effect levels, occurrence with other contaminants, and location. **Table 3** lists the COCs and their PELs.

The remedial goals (RGs) were set to equal the PELs (IT, 2001). Therefore, the effect level should be met once the remedial alternative is selected and implemented. The basis for the response actions selected in this ROD is the potential for unacceptable risk to ecological receptors due to sediment concentrations in the GPB/BSB AOCs.

Table 3 - Summary of COCs and PELs

COC	LOC (mg/kg)	Number of Samples	Number of LOC Exceedances	Max Detected Concentration (mg/kg)	Location of Max Detection	Region	PEL (mg/kg)
Cadmium	0.596	173	61	7,800	SDBS-22	3	34
Chromium	26	173	68	15,000	SDBS-23B	3	247
Copper	16	173	151	110,000	SD34-6	4	261
Mercury	0.174	173	127	110	SD139-1	2	13.2
Aroclor-1248	0.03	163	28	1690	BSBSD-32	3	2.0
Aroclor-1254	0.06	163	33	587	BSBSD-32	3	2.0
Aroclor-1260	0.005	163	21	22	SD95-1	2	2.0
DDD	0.00354	183	69	1.6	SD138-1	2	0.2
DDE	0.00142	183	63	9.47	BSBSD-32	3	0.2
DDT	0.008	183	52	3.2	SD138-1	2	0.2
Benz(a)anthracene	0.0307	166	48	60	SD52-6	2	2.2
Fluoranthene	0.111	166	75	90	SD52-6	2	4.0
Phenanthrene	0.0419	166	68	200	SD52-6	2	5.4
Pyrene	0.053	166	83	100	SD52-6	2	3.8

Note: LOC = Level of Concern

2.9 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 300.430(e)(2) of the NCP and Section 121 of CERCLA.

The general RAOs for GPB/BSB are to prevent or mitigate further release of hazardous substances to the surrounding environment and to meet the established cleanup criteria and comply with applicable or relevant and appropriate requirements (ARARs). The RAOs for GPB and BSB were developed such that attainment of these goals will result in the protection of human health, ecological receptors, and the environment. The objectives are specific to contaminated surface water and sediment contained in GPB and BSB although the RAOs associated with surface water will be eventually satisfied through remedial alternatives developed for contaminated sediment, and through site-specific FSs and decision documents developed for individual sites at Picatinny.

RAOs have been established for each Region by considering COCs, associated media, potential exposure pathways and receptors, ARARs, and other preliminary RGs. As described in Section 2.6.1 of this document, human health risks to trespasser swimmers and consumers of recreationally caught fish, were found to be acceptable based on a restricted use scenario, or mitigated through implementation of LUCs at Picatinny. Consumption of fish that have migrated off-site would have less exposure to site-related contaminants than the evaluated on-site exposure that is addressed and found to be acceptable given the uncertainty and conservative nature of the risk assessment. Thus, the remedy is protective of this pathway. The transport of chemicals in surface water downgradient to a drinking water source could only be minimal. This is considered an insignificant exposure route. Thus, the remedy is also protective of this pathway.

The RAOs for Region 2 are:

- Implement remedial alternatives that can effectively reduce the risks to potential ecological receptors caused by the COCs present at the AOCs.
- Limit human exposure to elevated levels of contaminants in sediment and surface water. Note: Based on a restricted use scenario, there is no unacceptable risk to human health in Region 2 from levels of contaminants in sediment or surface water.

- Protect areas downstream of Region 2 from migration of COCs at levels that could potentially impact ecological receptors.
- Avoid disturbance of aquatic habitat in Area G where impacts to ecological receptors are uncertain.

The RAOs for Region 3 are:

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

The RAOs for Region 4 are:

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

2.10 DESCRIPTION OF ALTERNATIVES

GPB and BSB have undergone a RI and a FFS according to the CERCLA process. Six alternatives were considered in the FFS and were initially screened based on effectiveness, implementability, and cost. This information is provided in detail in the Green Pond and Bear Swamp Brooks Final Focused Feasibility Study (IT, 2001).

As previously discussed in Section 2.4, Scope and Role of Response Action, mitigation measures for the contaminated sediments in the retention ponds within BSB in Region 3 was performed under a non-time critical removal action. The proposed mitigation measures for the remaining AOCs are the subject of this ROD. **Table 4** presents the three alternatives for each of the three Regions of the study area.

Table 4 - Description of Remedial Alternatives

Region 2	*Remedial Alternative 1*: No Action.
	Remedial Alternative 2: Excavation and Disposal of Sediments from Sampling Location SD101-1; Installation of Sediment Retention Pond Downstream of Sites 52, 95, and 96; and LUCs.
	Remedial Alternative 3: Chemical and Biological Monitoring of AOCs and LUCs.
Region 3	*Remedial Alternative 1*: No Action.
	Remedial Alternative 2: Excavation, On-site Stabilization, and Off-site Disposal of Sediments from the Oil/Water Separator Pond, and Sample Location BSSD-34; Restoration of Excavated Areas; Environmental Monitoring of Selected AOCs in Region 3; and LUCs.
	Remedial Alternative 3: Chemical and Biological Monitoring of AOCs and LUCs.
Region 4	*Remedial Alternative 1*: No Action.
	Remedial Alternative 2: Capping and Chemical Monitoring and LUCs.
	Remedial Alternative 3: Chemical and Biological Monitoring of AOCs and LUCs.

All remedial alternatives listed above for each Region were retained for detailed analysis based on effectiveness, implementability, and cost. Remedial Alternatives 2 and 3 for all Regions include implementation

of land use controls (LUCs) to ensure protectiveness. Because some contamination would remain on-site at levels which would not allow unrestricted use, LUCs would be required as part of these alternatives. The specific provisions and requirements of the LUC portion of this remedy necessary to ensure land use remains safe and appropriate for the level of protection afforded by the remedial action will be detailed as part of the remedial design after the ROD is signed.

The following LUC objectives will be met by implementation of LUCs:

- Prohibit the development and use of property within 25 feet of GPB/BSB for residential housing, elementary and secondary schools, child-care facilities and playgrounds without appropriate engineering controls and additional institutional controls.

- Prohibit or limit fishing, swimming, and other recreational activities in and around GPB/BSB that could lead to unacceptable exposure to environmental contaminants.

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

The following summarizes the alternatives for each Region. Table 5 presents a cost summary for each alternative.

2.10.1 Alternative 1: No Action for Regions 2, 3, and 4

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 containment, removal, treatment, or disposal of contaminated sediment would occur in Regions 2, 3, and 4.

The outcome of No Action alternative would afford no impact mitigation or risk reduction to the potential ecological receptors; no prevention of human exposure to the contaminated sediments and surface water; and, no prevention for current contamination to impact better habitat quality.

2.10.2 Alternative 2: Treatment, Containment, or Removal

Alternative 2 includes active treatment or containment of contaminants in the AOCs. Implementation of Alternative 2 is expected to reduce the risks to potential ecological receptors, prevent unacceptable human exposure to contaminated sediments and surface water, protect downstream areas from COC migration, avoid disturbance of aquatic habitat in Area G, and minimize or eliminate impacts to better quality habitat off-post. These expected outcomes would be realized following completion of the removal or capping of contaminated sediment and site restoration.

Specific components for Alternative 2 in each Region are described below.

2.10.2.1 Region 2: Excavation and Disposal of Sediment; Installation of Sediment Retention Pond; and LUCs

Copper-contaminated sediment would be removed from sample location SD101-1 using a backhoe until confirmatory sampling indicates that the RGs for the COCs are achieved. The spread of COC-contaminated sediments downstream of the dredging site would be controlled by the use of a containment barrier. Sediments removed from GPB would be staged, characterized, and disposed off-site in accordance with the Resource Conservation and Recovery Act (RCRA).

To avoid destruction of the aquatic habitat in Area G and to prevent the potential transport of contaminated sediments to GPB, a sediment retention pond would be constructed on the unnamed tributary draining Sites 52, 95, and 96. The pond would be installed between the mouth of the tributary (before it enters GPB) and sample location SD52-5. The pond would be approximately 100 feet long, 50 feet wide, and 4 feet deep. The sediment retention pond would be earthen-bermed and lined with a layer of geotextile and riprap stone. On the downstream wall of the sediment retention pond, a masonry head wall with an adjustable gate

would be installed. Sediment and soil excavated from the unnamed tributary to construct the sediment retention pond would be staged, sampled, and disposed off-site in accordance with RCRA. Regular maintenance would be performed on the pond, including the removal of sediments and inspection of emplaced pond materials. Annual downstream sediment monitoring would be performed to ensure the effectiveness of the sedimentation pond.

2.10.2.2 Region 3: Excavation, On-site Stabilization, and Off-site Disposal of Sediments from the Oil Water Separator Pond, and Sampling Location BSSD-34; Environmental Monitoring of Selected AOCs; and LUCs

Remedial Alternative 2 for Region 3 includes the excavation of mercury-contaminated sediments detected in an unnamed tributary at sample location BSSD-34, the excavation of sample location BSBSD-45 to remove contaminants from the oil/water separator pond, on-site stabilization of contaminated sediment, and off-site disposal of stabilized sediment.

Chemical and biological monitoring would be performed at Area H sample locations BSSD-1, BSSD-15, BSSD-24, BSSD-29, and BSSD-32 to determine whether Area H benthic organisms are being impacted by contaminants or by naturally occurring conditions. Additionally, deeper sediments would be collected in Bear Swamp from BSSD-24 and BSSD-33 during the remedial design or remedial phase of the project to verify there are no zones of contamination in deeper sediments that could be released in the future to impact aquatic organisms. If sample results indicate deep sediment contamination that could be mobilized in the future, the remedy for this region will be reviewed to determine whether the monitoring program needs to be adjusted or more active remedial measures taken. Chemical monitoring would be performed at Area D sample locations SDBS-23A/B and SDBS-24 to monitor contaminant level trends within this industrialized area.

2.10.2.3 Region 4: In-Situ Capping and Chemical Monitoring and LUCs

An in-situ cap comprised of sand and stone would be installed over the contaminated sediments of GPB to physically isolate the contaminated sediments from aquatic organisms and prevent potential impacts caused by erosion, resuspension, transport, and redeposition of contaminated sediments. The cap would extend from 10 feet upstream of sample location SD34-3 to 10 feet downstream of sample location SD34-4. The cap would extend laterally from stream bank to stream bank and would cap sediment sampling location GPBSD-35. Annual sediment sampling downstream of the cap would be performed to confirm that the cap is effectively preventing the migration of copper-contaminated sediments from Region 4 AOCs to non-impacted areas downstream. Also, visual monitoring of the cap would be performed annually or following major storm events. Excavation/dredging was not proposed as an option for Region 4 because the contamination is spread over a larger area and this segment of GPB has a simple stream structure unlike Regions 2 and 3 of GPB/BSB. As a result, capping was considered more cost-effective and efficient.

2.10.3 Alternative 3: Chemical and Biological Monitoring of Areas of Concern and Land Use Controls

Remedial Alternative 3 for each Region proposes that chemical and biological monitoring be performed in accordance with established protocols to assess the potential for migration of contaminants from AOCs, to monitor biological populations downstream, and to ensure surface water and sediment quality attain RAOs.

The results of the chemical and biological monitoring for each Region would be reviewed and compiled on a yearly basis. After a 5-year period, the results of the monitoring would be assessed. An investigation would be initiated if any two sampling criteria (RG exceedances, sediment toxicity, and benthic community impairment) were triggered within any 2 years. If the results of four of five monitoring periods indicate no toxicity and no benthic community impairment although there are RG exceedances, then monitoring would be discontinued because the evidence indicates that the contaminants are not sufficiently bioavailable to have an ecological effect. If there are no RG exceedances and no sediment toxicity in four of the five monitoring periods, then monitoring would also be discontinued because any benthic impairments without toxicity and RG exceedances is considered to be due to physical conditions. For all other conditions not mentioned above, a decision would be made to continue monitoring, discontinue monitoring, or evaluate the remedial options.

The expected outcomes of this alternative would be continued limitation of human exposure to contaminated sediments and surface water due to implementation of LUCs. Alternative 3 affords a long-term mechanism to monitor the contamination and ensure that the quality of surface water and sediment continue to

attain RAOs. Furthermore, it would also provide a mechanism to assess the health of aquatic habitat through benthic and toxicity studies.

Specific chemical and biological monitoring for each Region is described below.

2.10.3.1 Region 2

Surface water and sediment samples would be collected at sample location SD101-1 and downstream at sample location GPBSD-26 to confirm that areas of contamination at Site 101 are isolated and contaminants are not being transported downstream at concentrations that can impact aquatic organisms. Annual biological monitoring would include both macroinvertebrate studies and toxicity test studies to verify that non-impacted areas downstream of SD101-1 continue to attain RAOs. Additionally, deeper sediment samples would be collected during the remedial design or remedial phase at sample locations SD101-1 and SD141-1 to verify there are no zones of contamination in deeper sediments that could be released in the future and impact aquatic organisms. If sample results indicate deep sediment contamination that could be mobilized in the future, the remedy for this region will be reviewed to determine whether the monitoring program needs to be adjusted or more active remedial measures taken.

Chemical and biological monitoring would be performed at sample location SD52-5, which is within the unnamed tributary draining Sites 52, 95, and 96 (Area G), and upstream and downstream of the confluence of the unnamed tributary with GPB. Surface water and sediment samples would be collected annually and analyzed for metals, SVOCs, pesticides, and PCBs. Annual biological monitoring would include benthic macroinvertebrate studies and toxicity testing studies.

2.10.3.2 Region 3

Samples for both chemical and biological monitoring in Region 3 would be collected at:

- The confluence of BSB and the Area H unnamed tributary to monitor mercury migration from Site 128 and the potential for impacts to benthic populations;
- BSB at sample locations BSSD-1, BSSD-15, BSSD-29, and BSSD-32 to determine whether benthic organisms are being impacted by Area H contaminants or by naturally occurring conditions, and immediately upstream and downstream of the confluence of BSB and GPB (sample location SDGP-14) to monitor potential impacts to GPB.

Samples for chemical monitoring would be collected at:

- BSB between Sites 122 and 123 (sample locations SDBS-23A/B) to monitor trends in the sediment quality in Area D); and
- Downstream of BSB sediment retention ponds (sample locations BSBSD-43) to monitor contaminant transport.

2.10.3.3 Region 4

Chemical monitoring of Region 4 sediment would be performed at sampling locations SD34-3 and SD34-4 in addition to locations immediately upstream and downstream of Region 4 AOCs. No surface water samples will be collected in Region 4. Copper concentrations detected at sample locations GPBSD-35 would be addressed through this chemical monitoring. The purpose of the chemical monitoring is to determine if additional contaminants are being transported into the Region 4 AOCs from Site 34, to evaluate the effectiveness of remedial actions at Site 34, to determine if Region 4 sediment quality is improving over time by the addition of lesser- or non-impacted sediments from upstream; and to determine if contaminant levels are increasing downstream due to transport of contaminants from Region 4 AOCs. Collection and analysis of deep sediment samples adjacent to the burn pan area would be performed to verify there are no zones of contamination in deeper sediments that could be released in the future. If sample results indicate deep sediment contamination that could be mobilized in the future, the remedy for this region will be reviewed to determine whether the monitoring program needs to be adjusted or more active remedial measures taken. It should be noted that groundwater at Site 34 would be periodically monitored as part of the remedial action for the site. Based on the results of the groundwater monitoring, additional analytes may be added to the GPB sediment monitoring. If a chemical not previously characterized in groundwater were detected consistently during the long-term groundwater monitoring, it also would be included in the chemical monitoring of GPB.

Annual macroinvertebrate studies would be performed upstream and downstream of the Region 4 AOCs to determine trends in macroinvertebrate populations and ascertain whether Region 4 AOCs are impacting biological populations downstream. The sample area would be compared to the reference area to determine the degree to which the site has been impacted. A reference sample would be collected upstream of the site being monitored. Unlike the other Regions of GPB and BSB, additional toxicity testing is not deemed necessary, and therefore would not be performed in Region 4.

2.11 COMPARATIVE ANALYSIS OF ALTERNATIVES

The Army and USEPA selected the preferred alternatives by evaluating each of the alternatives against the nine criteria established by USEPA. These criteria are described below.

The advantages and disadvantages of each of the alternatives were compared using the nine CERCLA evaluation criteria established by USEPA in Section 300.430(e) of the NCP. The detailed comparative analysis of all the alternatives is provided in the FFS; a summary of this comparison is provided in the following text.

2.11.1 Threshold Criteria (must be met)

2.11.1.1 Overall Protection of Human Health and the Environment

Addresses whether each alternative provides adequate protection of human health and the environment by eliminating, reducing, or controlling exposure to human or environmental receptors.

2.11.1.1.1 Region 2

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

Remedial Alternative 2 (Installation of Sediment Retention Pond and Removal and Off-site Disposal of SD101-1) would be protective of human health and ecological receptors because: it includes LUCs at Picatinny to ensure fishing and swimming do not occur in most areas of Region 2; includes the removal and off-site secure disposal of contaminated sediments along GPB at sampling locations SD101-1; limits the introduction of contaminated sediments from Sites 52, 95 and 96 into habitat of GPB through the installation of a sediment retention pond; and prevents the disturbance of aquatic habitat in Area G. In Alternative 2, however, impacted sediments would continue to remain in the channels of Area G that drain Sites 52, 95, and 96.

Remedial Alternative 3 (Chemical and Biological Monitoring) would also be protective of the human health and the environment, even though contaminated sediments would remain in-place untreated. As with Alternatives 1 and 2, Alternative 3 includes the LUCs that restrict land use and ensure fishing and swimming does not occur in most areas of GPB. However, long-term chemical and biological monitoring would provide a mechanism by which contaminant levels and biological communities are monitored to confirm that contaminated sediments are not impacting aquatic populations in Area G in GPB.

Remedial Alternatives 2 and 3 are both protective of human health and the environment due to the implementation of LUCs at Picatinny and the management of contaminated sediments either through chemical and biological monitoring, or through excavation and the installation of a sediment retention pond. Based on the information presented above, the risk to human health is acceptable given the current and reasonable anticipated future use of GPB. The risk is marginally within the NCP risk range, but is acceptable based on the sampling location in GPB and the inherent conservative assumptions in the risk assessment.

2.11.1.1.2 Region 3

Remedial Alternative 1 (No Action) does not include any actions that would satisfy the intent of the evaluation criteria. Remedial Alternative 2 (Excavation of Sediment Retention Pond and Oil/Water Separator Pond, and Monitoring) would be protective of human health and ecological receptors because: it includes the LUCs at Picatinny to ensure fishing and swimming do not occur in Region 3; includes the removal and off-site secure disposal of contaminated sediments from the sediment retention ponds, the oil/water separator pond, and Site 128; and provides chemical and biological monitoring of selected AOCs in BSB that would serve as indicators of sediment quality and relative health of the aquatic ecology. Remedial Alternative 3 (Chemical and Biological Monitoring) would also be protective of human health even though contaminated sediments would remain in-place and untreated. Human health would be protected by the ICs at Picatinny that restrict land use

and prohibit fishing and swimming in Region 3. The risk to human health is limited and acceptable given the current and reasonable anticipated future use of GPB and BSB. The risk is marginally within the NCP risk range, but is acceptable based on the sampling location in GPB and the inherent conservative assumptions in the risk assessment.

The ecology would be somewhat protected at most AOCs in Region 3 because long-term chemical and biological monitoring would provide a mechanism by which contaminant levels and biological communities are monitored consistently. However, contaminated sediments within the sediment retention ponds would not be addressed and would continue to pose a significant risk to the *Hyalella azteca* and other aquatic receptors.

Remedial Alternatives 2 and 3 would be protective of human health and the environment due to the implementation of LUCs at Picatinny. However, Remedial Alternative 2, although more costly, would be more protective of the environment because it provides for the removal and off-site disposal of contaminated sediments that have been shown to be toxic to aquatic organisms.

2.11.1.1.3 Region 4

Remedial Alternative 1 (No Action) does not include containment, removal, treatment, or disposal of impacted sediment at AOCs of Region 4.

Remedial Alternative 2 (In-Situ Capping and Chemical Monitoring) meets the intent of the RAOs and is protective of potential human and ecological receptors. The cap would physically isolate the contaminated sediments and would limit potential future impacts downstream of the AOCs by preventing resuspension, transport, and deposition of contaminated sediments caused by erosion. The chemical monitoring component of Alternative 2, which requires sampling downstream of the cap, would also protect the environment by providing a mechanism to monitor the effectiveness of Alternative 2 over the short and long-term. Human health is protected under Alternative 2 by Picatinny LUCs.

Remedial Alternative 3 (Chemical and Biological Monitoring) and LUCs also would be protective of the human health and the environment, even though contaminated sediments would remain in-place and untreated. Long-term chemical and biological monitoring would provide a mechanism by which contaminant levels and biological communities are monitored to confirm that contaminated sediments are not impacting aquatic populations. The environment would also be protected by the implementation of remedial alternatives for Site 34. Human health is protected under Alternative 3 by Picatinny LUCs.

Remedial Alternatives 2 and 3 would also be protective of human health due to the implementation of LUCs at Picatinny. Based on the information presented above, the risk to human health is limited and acceptable given the current and reasonably anticipated future use of GPB. The risk is marginally within the NCP risk range, but is acceptable based on the sampling location in GPB and the inherent conservative assumptions in the risk assessment.

Remedial Alternative 2 is the most protective of the environment because it would physically isolate the contaminated sediments, although as noted above, no impacts to aquatic organisms were identified in Region 4 through chronic bioassay tests, benthic community assessments, and fishery studies.

2.11.1.2 Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Addresses if a remedy would meet all of the ARARs related to the hazardous substances at the site and the circumstances of their release. ARARs are Federal and State environmental laws and promulgated regulations identified for the GPB/BSB remediation at Picatinny.

2.11.1.2.1 Region 2

Remedial Alternative 1, No Action, satisfies the location-specific ARARs. Action-specific ARARs would not apply to this remedial alternative because no additional actions would be taken at the site to address contaminated sediments in Region 2.

Although there are no chemical-specific ARARs for contaminated sediments, Alternatives 2 and 3 satisfy the intent of the RAOs, which include the development of remedial alternatives that reduce the potential risks to humans and ecological communities associated with impacted sediments and surface water. Chemical-specific ARARs for surface water would most likely be met over the long-term through the remediation of contaminated sites at Picatinny, improvement of environmental management techniques at Picatinny, degradation

of contaminants, and desorption and dispersion of contaminants at levels that do not present a risk to ecological communities.

Compliance with the location- and action-specific ARARs would be required and considered during the design phase for Alternative 2. This would include satisfying the stringent stream encroachment requirements in New Jersey's Flood Hazard Control Act (N.J.A.C. 7:13-1 et seq) (NJDEP, 1997b).

2.11.1.2.2 Region 3

Remedial Alternative 1 (No Action) satisfies the location-specific ARARs. Action-specific ARARs would not apply to this remedial alternative because no additional actions would be taken at the site to address contaminated sediments in Region 3.

Although there are no chemical specific ARARs for contaminated sediments, Alternative 2 (Excavation of Sediment Retention Pond and Oil/Water Separator Pond, and Monitoring) satisfies the intent of the RAOs, which include the development of remedial alternatives that reduce the potential risks to humans and ecological communities associated with impacted sediments and surface water. Compliance with the location- and action-specific ARARs would be required and considered during the design phase for Alternative 2. Because the PCB RG is 2 milligrams per kilogram (mg/kg) and the sedimentation ponds would be excavated along with areas approximately 100 feet upstream and downstream of the ponds, the action-specific ARARs would be met. Therefore, Alternative 2 would be compliant with the chemical-specific requirements following its implementation.

Alternative 3 (Chemical and Biological Monitoring) would not meet the intent of the RAOs because sediments, which have been shown to be toxic to aquatic organisms, would remain in-place without treatment. It is not likely that chemical-specific ARARs for surface water would be met since the sediment retention ponds would not be restored and would continue to act as a potential source of surface water and sediment contaminants. Moreover, sediment and surface water quality near the confluence of BSB and GPB would not likely improve since BSB would continue to act as a potential source of contaminants.

2.11.1.2.3 Region 4

Remedial Alternative 1 (No Action) satisfies the location-specific ARARs. Action-specific ARARs would not apply to this remedial alternative because no actions would be taken at the site to address contaminated sediments in Region 4.

Although there are no chemical-specific ARARs for contaminated sediments, Remedial Alternative 2 satisfies the intent of the RAOs, which include the development of remedial alternatives that reduce the potential risks to humans and ecological communities associated with impacted sediments and surface water. Although Remedial Alternative 3 (monitoring and LUCs) may be protective of human health, it would not reduce the potential risk to ecological communities. Chemical-specific ARARs for surface water (except in the instances where background concentrations exceed ARARs) would be achieved more rapidly by implementing Remedial Alternative 2 because contaminated sediments that may be acting as a source to surface water contaminants in Region 4 AOCs would be physically isolated by the cap. However, chemical-specific ARARs for surface water for Alternatives 1 and 3 may be achieved over the long-term through the remediation of contaminated sites (for example Site 34), improvement of environmental management techniques at Picatinny, degradation of contaminants, and the desorption and dispersion of contaminants at levels that do not present a risk to ecological communities.

2.11.2 Primary Balancing Criteria (identifies major trade-offs among alternatives)

2.11.2.1 Long-term Effectiveness and Permanence

Addresses the risk and the ability to protect human health and the environment over time.

2.11.2.1.1 Region 2

Remedial Alternative 1 (No Action) does not satisfy the long-term effectiveness and permanence criteria because contaminants that represent a potential risk to ecological communities would not be addressed by remedial action, monitoring, or evaluation.

Remedial Alternative 2 (Installation of Sediment Retention Pond and Removal and Off-site Disposal of SD101-1) would reduce the long-term risks associated with impacted sediments at Site 101. However, the

effectiveness of the sediment retention pond would be partially dependent upon the proper construction and effective long-term maintenance of it and the proper enforcement of land use and access controls. Remedial Alternative 2 would also be the most permanent remedy since contaminated sediments from Site 101 would be excavated and disposed of at a secure, appropriately permitted landfill. However, impacted sediments would remain untreated in the channels that drain Sites 52, 95, and 96.

Remedial Alternative 3 (Chemical and Biological Monitoring) would meet the intent of the RAOs by providing an effective mechanism for monitoring and addressing potential impacts to ecological communities in Region 2. Alternative 3 does not, however, provide a permanent remedy for the contaminated sediments in Region 2.

2.11.2.1.2 Region 3

Remedial Alternative 1 (No Action) does not satisfy the long-term effectiveness and permanence criteria because contaminants, which represent a potential or real risk to ecological communities, would not be addressed by either remedial action, or monitoring and evaluation.

Remedial Alternative 2 (Excavation of Sediment Retention Pond and Oil/Water Separator Pond, and Monitoring) provides long-term effectiveness and permanence through removal of contaminated sediments from selected AOCs, thereby reducing the long-term risks associated with Region 3 impacted sediments. The restored sediment retention ponds and oil/water separator pond would effectively and permanently prevent contaminated sediments from being transported from Region 3 to Region 4. However, the permanence of Remedial Alternative 2 would be partially dependent upon the proper construction and effective long-term maintenance of the sediment retention pond and the proper enforcement of land use and access controls. In Alternative 2, long-term effectiveness would also be achieved through monitoring of Area H AOCs and assessment of chemical and biological data.

Remedial Alternative 3 (Chemical and Biological Monitoring) would provide an effective mechanism for monitoring potential impacts to ecological communities in Region 3. However, Alternative 3 does not provide a permanent remedy for the contaminated sediments in Region 3, especially at AOCs found to be toxic to aquatic organisms.

Remedial Alternative 2 would be the most permanent remedy since contaminated sediments from the sediment retention ponds, oil/water separator pond, and Site 128 would be excavated and disposed of at a secure landfill.

2.11.2.1.3 Region 4

Remedial Alternative 1 (No Action) indirectly satisfies the long-term effectiveness and permanence criteria because the source of the contaminants that present a potential risk to ecological receptors would be addressed through remedial activities at Site 34. Some copper-impacted sediment would remain in the Region 4 AOCs; however, following remedial activities at Site 34, cleaner sediment would eventually cover the Region 4 AOCs, reducing the risks to ecological receptors.

Remedial Alternative 2 (In-Situ Capping and Chemical Monitoring) would achieve the intent of the RAOs and would be effective in reducing the long-term risks associated with Region 4 impacted sediments. However, the permanence of Remedial Alternative 2 would be partially dependent upon the proper construction and effective long-term maintenance of the cap and the proper enforcement of land use and access controls.

Remedial Alternative 3 (Chemical and Biological Monitoring) would meet the intent of the RAOs and provide an effective mechanism for monitoring and assessing potential impacts to ecological communities in Region 4. While this alternative does not provide a permanent remedy for the contaminated sediments in Region 4, cleaner, non-impacted sediments would likely cap the Region 4 AOCs following remedial activities of Site 34.

Remedial Alternative 2 (In-Situ Capping and Chemical Monitoring) would be the most permanent remedy since contaminated sediments would be physically isolated from potential ecological receptors by the cap, and the potential for downstream migration of contaminants would be greatly reduced.

2.11.2.2 Reduction of Toxicity, Mobility, or Volume through Treatment

Addresses the anticipated performance of treatment that permanently and significantly reduces toxicity, mobility, or volume of hazardous substances as a principal threat at the site.

2.11.2.2.1 Region 2

The Remedial Alternative 1 (No Action) and Remedial Alternative 3 (Chemical and Biological Monitoring) would not actively reduce the toxicity, mobility, or volume of the contaminants detected in the AOCs of Region 2. However, it is possible that some reduction in toxicity may occur over time due to natural attenuation, dispersion, and biodegradation processes.

Remedial Alternative 2 (Installation of Sediment Retention Pond and Removal and Off-site Disposal of SD101-1) would not reduce the toxicity or volume of the contaminants but would effectively reduce their mobility through containment and off-site disposal.

Remedial Alternative 2 best satisfies these criteria because construction of the sediment retention pond would prevent the migration of contaminated sediments from the swales that drain Sites 52, 95, and 96, to GPB. In addition, removal and off-site disposal of contaminated sediments from Site 101 would effectively eliminate the mobility of contaminants at that AOC by placing them in a secure, appropriately-permitted landfill.

2.11.2.2.2 Region 3

Remedial Alternatives 1 (No Action) and 3 (Chemical and Biological Monitoring at Selected AOCs) would not actively reduce the toxicity, mobility, or volume of the contaminants detected in the AOCs of Region 3.

Remedial Alternative 2 (Excavation of Sediment Retention Ponds and Oil/Water Separator Pond, and Monitoring) best satisfies these criteria because removal and off-site disposal of contaminated sediments from selected AOCs would effectively eliminate the mobility of contaminants by placing them in a secure landfill. Moreover, restoration of the sediment retention ponds and oil/water separator pond would prevent the migration of contaminated sediments from Area D to a more ecologically productive habitat in GPB.

2.11.2.2.3 Region 4

Remedial Alternatives 1 (No Action) and 3 (Chemical and Biological Monitoring) would not actively reduce the toxicity, mobility, or volume of the contaminants detected in the AOCs of Region 4. However, it is possible that some reduction in toxicity may occur over time due to natural attenuation, dispersion, and degradation processes. It is also likely that some reduction in contaminant mobility may occur as cleaner sediment begins to cap or cover the Region 4 AOCs following remedial activities at Site 34.

Remedial Alternative 2 (In-Situ Capping and Chemical Monitoring) would not reduce the toxicity or volume of the contaminants but would effectively reduce their mobility through containment. Therefore, Remedial Alternative 2 best satisfies these criteria because construction of the cap will restrict the potential downstream migration of impacted sediments.

2.11.2.3 Short-term Effectiveness

Addresses the impacts to the community and site workers during cleanup including the amount of time it takes to complete the action. Addresses the impacts to the community during off-site disposal, including transportation of the waste and impacts in the area of the disposal facility.

2.11.2.3.1 Region 2

Because Remedial Alternative 1 (No Action) does not include any additional actions that would serve to address contaminated sediments of Region 2, there would be no short-term impacts resulting from implementing it. There would be minimal impacts to worker health and safety and the environment associated with Remedial Alternative 3 due to the limited areas of disturbance resulting from annual sampling events.

Alternative 2 (Installation of Sediment Retention Pond and Removal and Off-site Disposal of SD101-1) would produce some short-term impacts caused by the suspension and transport of contaminated sediments downstream during its implementation. However, these short-term risks could be controlled through the proper installation and maintenance of sediment and erosion control devices during excavation at Site 101 and installation of the sediment retention pond.

Although the short-term risks resulting from the implementation of Alternative 2 would be acceptable, they would be greater than for Alternatives 1 and 3. This is because implementation of Alternative 2 would require the excavation and management of contaminated sediment. Short-term risks to ecological communities inhabiting GPB near the AOCs would be controlled through sediment erosion and control measures. The additional risks associated with the transportation of contaminated sediments and soils on public roadways would include the potential for highway accidents and spills involving hauling vehicles. The risks associated with waste transportation would be minimized by strict adherence to Department of Transportation (DOT) regulations and state and local traffic laws.

2.11.2.3.2 Region 3

Because Remedial Alternative 1 (No Action) does not include any actions that would address contaminated sediments of Region 3, there would be no short-term impacts resulting from implementing it.

Remedial Alternative 2 (Excavation of Sediment Retention Ponds and Oil/Water Separator Pond, and Monitoring) does present some potential for short-term impacts caused by the potential suspension and transport of contaminated sediments downstream during implementation. However, these short-term risks could be controlled through the proper installation and maintenance of sediment and erosion control devices during excavation of the sediment retention ponds, the oil/water separator pond, and sediments at Site 128. Alternative 3 (Chemical and Biological Monitoring) would not produce significant short-term impacts to workers, surrounding communities, or the environment.

Although the short-term risks resulting from the implementation of Alternative 2 would be acceptable, they would be greater than those for Alternatives 1 and 3.

2.11.2.3.3 Region 4

Because Remedial Alternative 1 (No Action) does not include any actions that would serve to address contaminated sediments of Region 4, there would be no short-term impacts resulting from implementing it.

Alternative 2 (In-Situ Capping and Chemical Monitoring) has the potential for some short-term impacts to potential ecological receptors caused by the suspension and potential transport of contaminated sediments downstream during implementation. However, these short-term risks could be controlled through the proper installation and maintenance of sediment and erosion control devices during construction of the cap.

Alternative 3 (Chemical and Biological Monitoring) would not produce significant short-term impacts to workers, surrounding communities, or the environment. Although the short-term risks resulting from the implementation of Alternative 2 (In-Situ Capping and Chemical Monitoring) would be acceptable, they would be greater than for Alternatives 1 and 3. This is because implementation of Alternative 2 would require work in and around the contaminated sediment during placement of the cap. However, risks to site workers would be controlled through the use of suitable protective clothing and good construction practice. Short-term risks to ecological communities associated with suspension of contaminated sediment near the AOCs would be controlled through sediment erosion and control measures.

2.11.2.4 Implementability

Addresses the technical and administrative feasibility of an alternative, including the availability of materials and services required for cleanup.

2.11.2.4.1 Region 2

Since the No Action Alternative does not include any additional activities to address the site contaminants, there are no technical or administrative implementability issues.

Remedial Alternative 2 (Installation of Sediment Retention Pond and Removal and Off-site Disposal of SD101-1) and Alternative 3 (Chemical and Biological Monitoring) are technically implementable. The required equipment, services, and materials are readily available, including the appropriately-permitted disposal facilities required for Alternative 2. The administrative implementability of Remedial Alternative 2 would, however, be dependent upon satisfying the stringent stream encroachment requirements set forth in New Jersey's Flood Hazard Area Control Act (N.J.A.C 7:13-1 *et seq.*). Extensive hydrologic modeling may be required to demonstrate that the sediment retention pond in Alternative 2 does not affect the size of the flood plain or the water levels of GPB.

2.11.2.4.2 Region 3

Since Remedial Alternative 1 (No Action) does not include any activities to address the site contaminants, there are no technical implementability issues.

Remedial Alternative 2 (Excavation of Sediment Retention Ponds and Oil/Water Separator Pond, and Monitoring) and 3 (Chemical and Biological Monitoring) are technically implementable. The required equipment, services, and materials are readily available, including the appropriately-permitted disposal facilities required for Alternative 2. The administrative implementability of Remedial Alternative 2 would be dependent upon satisfying the stringent stream encroachment requirements set forth in New Jersey's Flood Hazard Area Control Act (N.J.A.C. 7:13-1 *et seq.*). Extensive hydrologic modeling may be required to demonstrate that the sediment retention ponds in Alternative 2 do not affect the size of the flood plain or the elevation of water levels of BSB.

2.11.2.4.3 Region 4

Since Remedial Alternative 1 (No Action) does not include any activities to address the site contaminants, there are no technical implementability issues.

Remedial Alternative 2 (In-Situ Capping and Chemical Monitoring) and Alternative 3 (Chemical and Biological Monitoring) are both technically implementable. The required equipment, services, and materials are readily available, including the sources for sand and riprap stone that will comprise the cap in Remedial Alternative 2. The administrative implementability of Remedial Alternative 2 would be dependent upon satisfying the stringent stream encroachment requirements set forth in New Jersey's Flood Hazard Area Control Act (N.J.A.C. 7:13 *et seq.*). Under the Act, extensive hydrologic modeling may be required to demonstrate that the cap in Alternative 2 does not affect the size of the flood plain or the water levels of GPB.

2.11.2.5 Cost

Compares the differences in cost, including capital, operation, and maintenance costs.

Present worth were calculated with a discount rate of 7% for each remedial alternative in each Region. **Table 5** shows the estimated present worth and capital cost for each alternative in all Regions.

Table 5 - Summary of Costs of Remedial Alternatives

	Alternative 1	Alternative 2			Alternative 3		
Cost ($)	**All Regions**	**Region 2**	**Region 3**	**Region 4**	**Region 2**	**Region 3**	**Region 4**
Capital	-	486,600	387,300	99,800	26,000	23,000	27,400
O&M	-	35,800	153,700	56,400	140,850	221,450	72,900
Present Worth	-	**522,400**	**541,000**	**156,200**	**166,850**	**244,450**	**100,300**

2.11.3 Modifying Criteria (formally evaluated after the comment period)

2.11.3.1 State Acceptance for All Regions

Evaluates whether the State agrees with, opposes, or has no comment on the preferred alternatives. This criterion is evaluated formally when comments on the Proposed Plan are reviewed.

State acceptance was evaluated formally after the public comment period on the Proposed Plan. Those documents were prepared in partnership with USEPA and NJDEP representatives. The NJDEP approved the Proposed Plan on March 7, 2002.

Generally, the NJDEP accepts **Alternative 3 (Chemical and Biological Monitoring and LUCs) for Regions 2 and 4,** and **Alternative 2 (Excavation of Sediment Retention Ponds and Oil/Water Separator, Monitoring, and LUCs) for Region 3**.

2.11.3.2 Community Acceptance for All Regions

Addresses the issues and concerns the public may have regarding each of the alternatives. This criterion is evaluated formally when comments on the Proposed Plan are reviewed.

A final Proposed Plan for GPB/BSB was completed and released to the public in December 2003 at the information repositories listed in Section 2.3. The notice of availability of this document was published on December 5 and December 12, 2003 in the New Jersey Star-Ledger and the Daily Record. A public comment period was held from December 5, 2003 to January 5, 2004, during which comments from the public were received. Community acceptance was evaluated formally after the public comment period on the Proposed Plan for GPB/BSB. In general, the community appears to be in support of the Selected Remedies. Responses to written comments received during the public comment period are presented in the Responsiveness Summary (see Section 3.0). A public meeting was held on December 18, 2003 to inform the public about the Selected Remedies for Regions 2, 3, and 4 of GPB/BSB and to seek public comments. A community relations program and community relations plan for Picatinny have been established and are maintained for Picatinny.

2.12 PRINCIPAL THREAT WASTE

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.

COCs in the sediment at GPB/BSB are considered as non-mobile contaminated source material of low to moderate toxicity, and therefore do not constitute principal threats. PCBs and SVOCs in the sediment are relatively immobile. PCBs and SVOCs have high molecular weights and adsorb strongly to the organic fraction of sediment; therefore, leaching from sediment to surface water and groundwater are not considered to be a significant transport mechanism. As for metals, mobilization of these compounds in the aquatic system is greatly dependent upon the changes in pH. Historical measurements of pH at GPB and BSB indicated that the environment is near neutral to neutral. Therefore, mobilization of metals is unlikely.

Since all COCs within the AOCs of GPB/BSB 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 remedies. Alternative 1 does not address COCs. Alternative 2 addresses COCs through removal and containment in Region 2, removal and treatment in Region 3, and containment in Region 4. The long-term monitoring program under Alternative 3 would ensure an early detection of potential contaminant migration from the site or to other media at concentrations that would be harmful to human health and the environment. Additionally, implementation of LUCs would ensure protection of human health.

2.13 SELECTED REMEDIES

This ROD represents the Selected Remedies for contaminated sediment at GPB/BSB at Picatinny, in Rockaway Township, New Jersey, developed in accordance with CERCLA as amended and consistent with the NCP. This decision is based on the administrative record for the site. The Selected Remedies for this site are: **Alternative 3 (Chemical and Biological Monitoring and LUCs) for Regions 2 and 4;** and **Alternative 2 (Excavation of the Oil/Water Separator Pond, On-site Stabilization, Off-site Disposal, Long-Term Monitoring, and LUCs) for Region 3.** This section provides detailed descriptions of the Selected Remedies. These alternatives are selected as the preferred alternatives because they provide the best balance between the assessed criteria while still providing overall protection of human health, ecological receptors, and the environment.

The total project estimated present worth cost, if approved, is **$808,200**, the sum total of which will be paid by the Army. This excludes the costs associated with the excavation, treatment, and off-site disposal of stabilized contaminated sediment and restoration of the retention ponds in Region 3, which have already been paid for and performed.

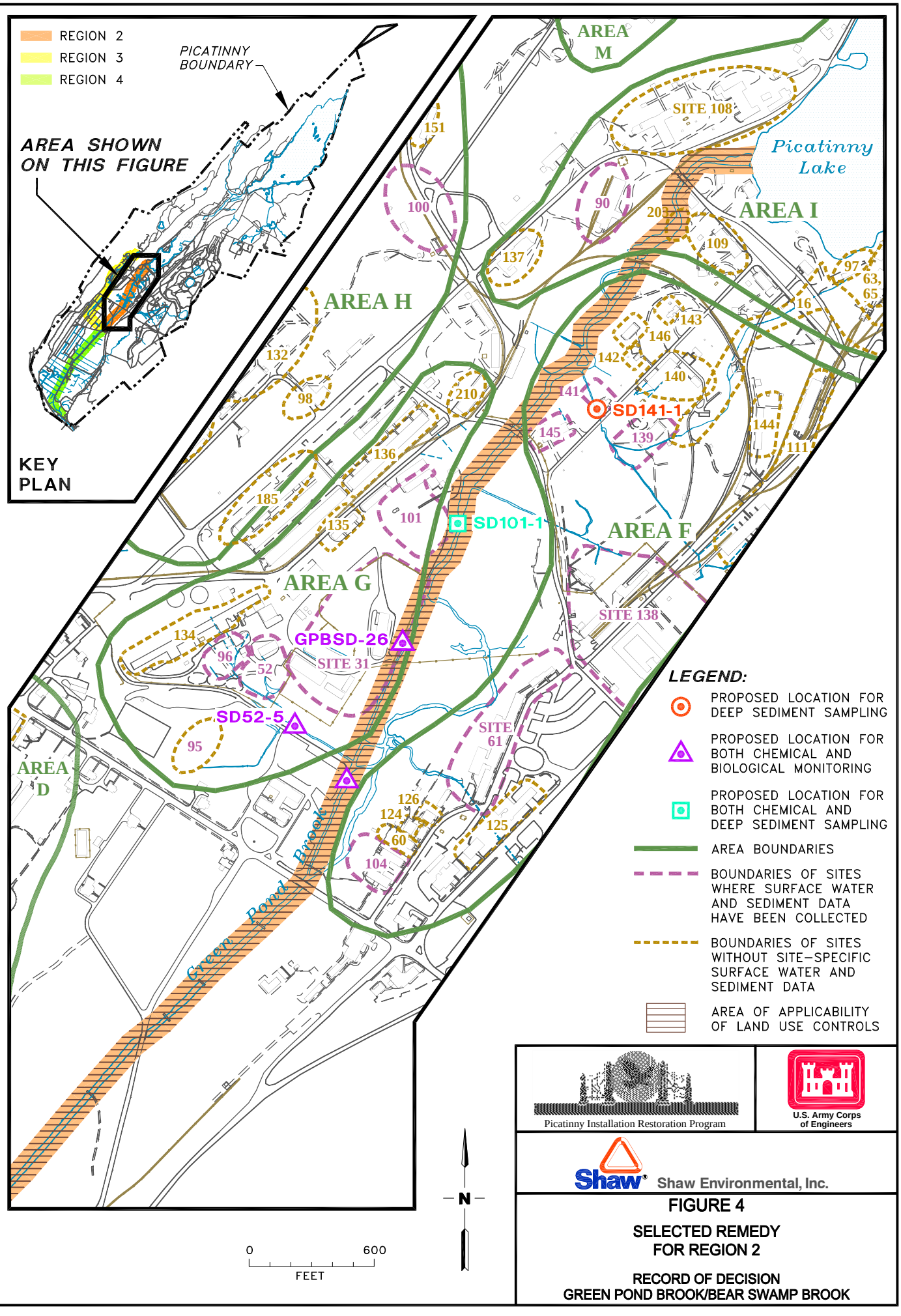
2.13.1 Region 2 – Alternative 3: Chemical and Biological Monitoring and Land Use Controls

Because discharges of contaminants at Picatinny no longer occur, it is very likely that cleaner, non-contaminated sediments will gradually cover, or cap, the impacted sediments identified in Region 2. Additionally, it is anticipated that natural processes, including degradation and dispersion of contaminants at levels non-toxic to aquatic receptors, will continue to reduce existing contaminant levels. To ensure that the improved

environmental quality at Picatinny is having a positive impact on sediments that represent a potential risk to the aquatic ecology, environmental monitoring will be performed to address the AOCs identified in Region 2. Specifically, sediment and surface water samples will be collected at sample location SD101-1 and downstream at sample location GPBSD-26 and analyzed for metals, including copper, lead, and mercury. The sampling will confirm that areas of contamination at Site 101 are isolated. Biological monitoring will be performed annually and will include both macroinvertebrate studies and toxicity test studies. Additionally, deeper sediment samples will be collected at SD101-1 and SD141-1 and analyzed for metals, PAHs, pesticides, PCBs, and explosives to verify there are no zones of contamination in deeper sediments that could be released in the future that can impact aquatic organisms. If sample results indicate deep sediment contamination that could be mobilized in the future, the remedy for this region will be reviewed to determine whether the monitoring program needs to be adjusted or more active remedial measures taken.

Chemical and biological monitoring will be performed at sample location SD52-5, which is within the unnamed tributary draining Sites 52, 95, and 96 (Area G), and upstream and downstream of the confluence of the unnamed tributary with GPB. The upstream sample will be located at GPBSD-26, which also serves as monitoring location for Site 101. This will ensure that the levels of SVOCs, pesticides, and Aroclor-1260 detected in the sediments are not impacting ecological receptors or degrading the aquatic habitat in Area G of GPB. Surface water and sediment samples will be collected annually and analyzed for metals, PAHs, pesticides, and PCBs. Biological monitoring will also be performed annually and will include benthic macroinvertebrate studies and toxicity testing studies.

After a 5-year period, the results of the monitoring will be assessed. If the results from any two of the previous five monitoring periods indicate concurrent practical remedial goal (PRG) exceedances, sediment toxicity, and benthic community impairment, then appropriate remedial actions will be investigated and implemented if applicable. The results will be reviewed annually to determine whether the investigation of remedial alternatives has been triggered. If the results of four of five monitoring periods indicate no toxicity and no benthic community impairment although there are PRG exceedances, then monitoring will be discontinued because the evidence indicates that the contaminants are not sufficiently bioavailable to have an ecological effect. If there are no PRG exceedances and no sediment toxicity in four of the five monitoring periods, then monitoring will also be discontinued because any benthic impairments without toxicity and PRG exceedances is considered to be due to physical conditions. If a pattern of toxicity is observed (i.e., toxicity in 3 of 5 years) even though there are no PRG exceedances, it may indicate increased bioavailability of contaminants. For this condition, and all other conditions not mentioned above, a decision would be made to continue monitoring, discontinue monitoring, or evaluate remedial options. Upon agreement among the Army, Picatinny, USEPA, and NJDEP that remediation is complete, the long-term monitoring program will be discontinued per an agreed upon exit strategy and documented in the next 5-year review. The chart presented in **Table 7** helps illustrate the monitoring review strategy. **Figure 4** shows the approximate locations of monitoring points under this alternative. All environmental monitoring activities performed in Region 2 will be documented in an annual report including sampling methodologies, sample results, and a discussion regarding the findings.



DRAWING NUMBER: GPB-BSB-Remalts.dwg

APPROVED BY	CHECKED BY	DRAWN BY
D. Schicho	M. Berube	C. Troxell
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Picatinny Installation Restoration Program

U.S. Army Corps of Engineers

Shaw Environmental, Inc.

FIGURE 4

SELECTED REMEDY FOR REGION 2

RECORD OF DECISION GREEN POND BROOK/BEAR SWAMP BROOK

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Plot Date/Time: Dec 15, 2004 - 9:33am
Plotted By: cindy.troxell

Table 6 - Monitoring Review Strategy for Region 2

Toxicity	Benthic Impairment	PRG Exceedances	Frequency	Result
X	X	X	Concurrent in any 2 of 5 years	Appropriate remedial actions will be investigated and implemented if applicable.
		X	No benthic impairment or toxicity in at least 4 of 5 years, though there are PRG exceedances	Monitoring discontinued because evidence indicates that the contaminants are not sufficiently bioavailable to have an ecological effect.
	X		No toxicity or PRG exceedances in at least 4 of 5 years, though there is evidence of benthic impairment	Monitoring discontinued because benthic impairments without toxicity and PRG exceedances is considered to be due to physical conditions.
X			Toxicity in no more than 2 of 5 years, with no evidence of benthic impairment or PRG exceedances	Monitoring discontinued.
X			Toxicity exhibited in 3 or more of 5 years, even though no evidence of benthic impairment or PRG exceedances	Management decision will be made, based upon an evaluation of results and trends, to either continue monitoring, discontinue monitoring, or evaluate remedial options
	X	X	Benthic impairment with PRG exceedances in at least 2 of 5 years	
X		X	Toxicity detected with PRG exceedances in at least 2 of 5 years	
X	X		Toxicity with benthic impairment in at least 2 of 5 years	

The costs associated with the preferred alternative for Region 2 are summarized as outlined in **Table 8**. The costing information in this section is based on the best available information regarding the anticipated scope of the remedial alternative. Details on the above cost items are presented in Appendix D of the Final FFS for GPB/BSB. Changes in the cost elements are likely to occur as a result of new information and data collected during the work plan phase and the 5-year review(s). 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 –30 to +50% of the actual project cost.

Table 7 - Summary of Estimated Lifetime Costs of the Selected Remedy for Region 2

CAPITAL COST (TOTAL)	**$26,000**
Permit and Report Writing	$20,000
Nature and Extent Sampling for Deep Sediment	$2,600
Subtotal Capital Costs	***$22,600***
Scope Contingency (15%)	$3,390
O&M AND PERIODIC COSTS (TOTAL – 10 years)	**$140,850**
Annual Sampling Cost	$10,750
Annual Unexploded Ordnance (UXO) Oversight	$4,300
Annual Monitoring Report	$5,000
Total Annual Sampling and Reporting	***$20,050***
TOTAL PRESENT WORTH COST	**$166,900**[1]

[1] Rounded.

2.13.2 Region 3 – Alternative 2: Excavation of Oil/Water Separator, On-site Stabilization, Off-site Disposal, Long-Term Monitoring, and Land Use Controls

Excavation At Sampling Location BSSD-34

The excavation of mercury-contaminated sediment from sample location BSSD-34 will be performed using a backhoe. To ensure complete contaminant removal during the remedial action at sample location BSSD-34 elevated mercury concentrations, if found, will be pursued upstream and downstream of this location. Post excavation samples will be collected from the excavation. The spread of mercury-contaminated sediments downstream of the dredging site will be limited by the use of a silt screen. As part of the remedial activities, additional samples will be collected downstream of the excavation location. Following excavation, the contaminated sediments will be de-watered passively by placing the material in a high density polyethylene (HDPE) lined containment cell constructed adjacent to the dredging location. Mechanical de-watering of sediments at this location is not proposed due to the small quantity of sediment (7.5 CY) that will be removed from this area.

The bermed and HDPE lined cell will contain approximately 4 inches of gravel and will be sloped so decanted water can periodically be pumped to a temporary water storage tank. Water within the tank will be sampled to determine the proper disposal method.

Sediments removed from BSSD-34 will be disposed of in accordance with RCRA. The addition of kiln dust or other water-adsorbing additive may occur should the sediments contain excessive water at the time of transportation and disposal.

Excavation and Restoration of the Oil/Water Separator Pond

Prior to excavation, a heavy equipment and truck decontamination station will be constructed. Liquids used for decontamination will be collected and disposed of. Work zones will be delineated using a hi-visibility fence to control access to the excavation area and minimize the potential for cross contamination. The necessary sediment and erosion control measures will be installed around and downstream of the excavation area as well as any other disturbed locations. A dewatering process area consisting of a trailer mounted recessed chambered filter press, mix tanks, four Baker storage tanks, an air compressor, and an area for process chemical storage will also be constructed.

The oil/water separator pond is approximately 75’ X 25’ X 4’ deep. An estimated 280 CY of material (assuming the entire pond is full of accumulated sediments) will be excavated for its restoration. Confirmatory sampling will be performed to confirm that COCs above the RGs have been removed from the oil/water separator pond. All of the sediment will be stockpiled on-site and disposed off-site in accordance with RCRA. Non-hazardous sediment will either be disposed at an off-site municipal landfill or reused at Picatinny.

The restored oil/water separator pond is earthen-bermed and lined with a layer of non-woven geotextile. A final 9-inch layer of 4-inch riprap will be installed over the geotextile liner. The oil/water separator pond will be restored in accordance with its current as-built condition.

Figure 5 shows the approximate locations of excavation and monitoring points under this alternative.

Chemical and Biological Monitoring

Region 3 Remedial Alternative 2 will also include annual chemical and biological monitoring at Area H sample locations BSSD-1, BSSD-15, BSSD-29, and BSSD-32 to determine whether benthic organisms are being impacted by Area H contaminants or by naturally occurring conditions. The sediment and surface water samples will be analyzed for metals, PAHs, pesticides, and PCBs. It should be noted that additional samples are being collected in the vicinity of Site 64 as part of the Phase II 2A/3A effort. In particular, deeper sediment samples are being collected at BSSD-1, BSSD-15, BSSD-20, BSSD-29, and BSSD-32. During the remedial design or remedial phase of the project, deeper sediment samples will be collected at BSSD-24 and BSSD-33 to verify there are no zones of contamination in deeper sediments that could be released in the future. If sample results indicate deep sediment contamination that could be mobilized in the future, the remedy for this region will be reviewed to determine whether the monitoring program needs to be adjusted or more active remedial measures taken. Resulting data sampling methods and data comparisons will be submitted in an annual report.

Biological monitoring includes benthic macroinvertebrate studies and toxicity testing studies. The same method and monitoring review strategy described for the preferred alternative for Region 2 will be used for the benthic macroinvertebrate and toxicity testing.

Sediment samples will be collected annually at sample locations SDBS-23A/B and analyzed for inorganics, PAHs, pesticides, and PCBs to confirm that this data trend continues. No remediation or biological monitoring will be performed at the remaining AOCs in Area D due to the lack of viable aquatic habitat within this industrialized area. In addition, the restored sediment retention pond and oil/water separator pond will prevent the contaminants in Area D sediment from impacting higher quality aquatic habitat in GPB. However, since the sediment retention pond will act as a trap for contaminants migrating from the industrialized area, it may again accumulate contaminants at high levels. Chemical monitoring will also be performed at sample location SDBS-24 to determine the need for further re-excavation as part of the maintenance of the sediment retention ponds. Upon agreement among the Army, Picatinny, USEPA, and NJDEP that remediation is complete, the long-term monitoring program will be discontinued per an agreed upon exit strategy and documented in the next 5-year review. This alternative includes implementation of LUCs that designate acceptable and unacceptable land uses and ensures swimming and fishing does not occur in BSB.

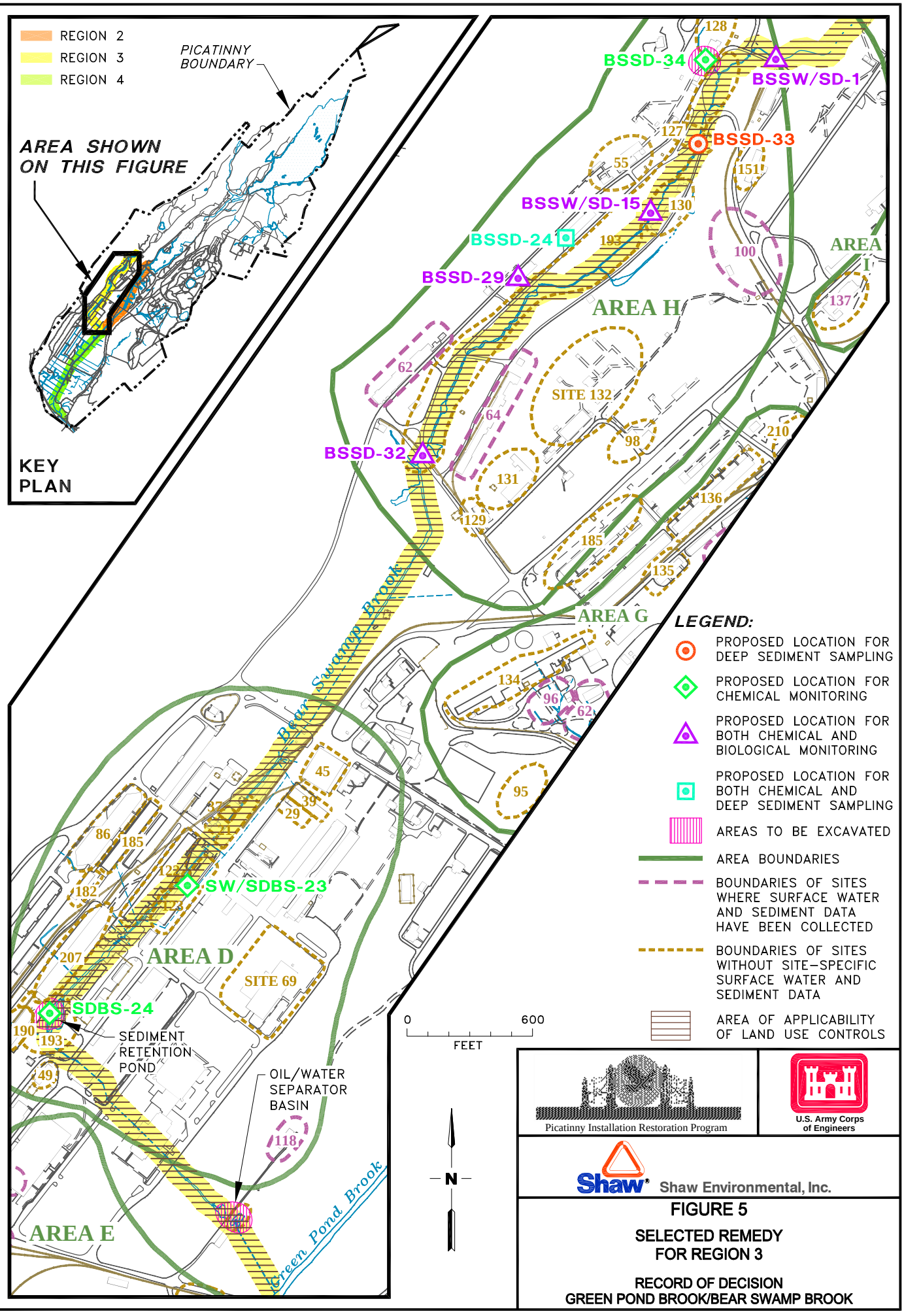
Summary of Cost

The estimated costs associated with the preferred alternative for Region 3 are summarized as outlined in **Table 9**. The costing information in this section is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the work plan phase and the 5-year review(s). Major changes may be documented in the form of a memorandum in the Administrative Record file, an ESD, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within –30 to +50% of the actual project cost.

Table 8 - Summary of Estimated Lifetime Costs of the Selected Remedy for Region 3

CAPITAL COST (TOTAL)	**$387,300**
Permit and Report Writing	$42,000
Characterization Sampling	$12,300
Clearing and Grubbing	$495
Site Preparation	$58,700
Layout and Construction Survey	$8,175
Contaminated Sediment Excavation and Stabilization	
Excavation	$1,100
Stabilization	$7,300
Air Monitoring	$17,400
UXO Oversight	$12,800
Transportation and Disposal	$54,300
Site Restoration	$4,500
Flow Control Gate	$18,500
Construction Oversight	$19,800
Subtotal Capital Costs	***$267,100***
Scope Contingency (15%)	$40,100
Legal Fee (10%)	$26,700
Engineering and Design (20%)	$53,400
O&M AND PERIODIC COSTS	**$153,700**
O&M Costs for 10 years	$153,300
Periodic O&M Costs in Years 10, 20, and 30	$400
TOTAL PRESENT WORTH COST	**$541,000**[1]

[1] Rounded.


REGION 2
REGION 3
REGION 4
PICATINNY BOUNDARY
AREA SHOWN ON THIS FIGURE
KEY PLAN
BSSD-34
BSSW/SD-1
BSSD-33
BSSW/SD-15
BSSD-24
BSSD-29
BSSD-32
SW/SDBS-23
SDBS-24
AREA H
AREA I
AREA G
AREA D
AREA E
SITE 132
SITE 69
SEDIMENT RETENTION POND
OIL/WATER SEPARATOR BASIN
Bear Swamp Brook
Green Pond Brook
128
127
55
151
130
193
100
137
62
64
98
210
131
129
136
185
135
134
96
62
95
45
39
29
86
185
12
182
207
190
193
49
118
0
600
FEET
N
LEGEND:
PROPOSED LOCATION FOR DEEP SEDIMENT SAMPLING
PROPOSED LOCATION FOR CHEMICAL MONITORING
PROPOSED LOCATION FOR BOTH CHEMICAL AND BIOLOGICAL MONITORING
PROPOSED LOCATION FOR BOTH CHEMICAL AND DEEP SEDIMENT SAMPLING
AREAS TO BE EXCAVATED
AREA BOUNDARIES
BOUNDARIES OF SITES WHERE SURFACE WATER AND SEDIMENT DATA HAVE BEEN COLLECTED
BOUNDARIES OF SITES WITHOUT SITE-SPECIFIC SURFACE WATER AND SEDIMENT DATA
AREA OF APPLICABILITY OF LAND USE CONTROLS
Picatinny Installation Restoration Program
U.S. Army Corps of Engineers
Shaw Environmental, Inc.
FIGURE 5
SELECTED REMEDY FOR REGION 3
RECORD OF DECISION
GREEN POND BROOK/BEAR SWAMP BROOK
DRAWING NUMBER GPB-BSB-Remalts.dwg
APPROVED BY D. Schicho --
CHECKED BY M. Berube --
DRAWN BY C. Troxell --
File: C:\PROJECTS\PICATINNY\GPB-BSB\GPB-BSB-ROD\GPB-BSB-Remalts.dwg
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2.13.3 Region 4 – Alternative 3: Chemical and Biological Monitoring of Areas of Concern and Land Use Controls

Chemical monitoring for metals will be performed at Region 4 sampling locations SD34-3 and SD34-4 in addition to locations immediately upstream and downstream of these AOCs. Copper concentrations detected at sample locations GPBSD-35 will be addressed through the chemical monitoring at the aforementioned sample locations. The purpose of the chemical monitoring will be to determine if additional contaminants are being transported into the Region 4 AOCs from Site 34 and to evaluate the effectiveness of remedial actions at Site 34, if Region 4 sediment quality is improving over time by the addition of lesser or non-impacted sediments from upstream, and if contaminant levels are increasing downstream due to transport of contaminants from Region 4 AOCs. Deeper sediment will also be sampled during the remedial design or remedial phase of the project in GPB adjacent to the burn pan area of the burning ground to verify there are no zones of contamination in deeper sediments that could be released in the future. If sample results indicate deep sediment contamination that could be mobilized in the future, the remedy for this region will be reviewed to determine whether the monitoring program needs to be adjusted or more active remedial measures taken.

Annual macroinvertebrate studies will be performed upstream and downstream of the Region 4 AOCs to determine trends in macroinvertebrate populations and ascertain whether Region 4 AOCs are impacting biological populations downstream. Based on the lack of toxicity demonstrated at sample location SDGP-18 (which is downstream of the Region 4 AOCs), during the Phase I RI, no additional toxicity testing is deemed necessary, and therefore, will not be performed in Region 4. Biological population evaluations and chemical data comparisons will be discussed in an annual report. The studies will be conducted using the methods and procedures employed in the Phase II ERA. The same method and monitoring review strategy described for the preferred alternative for Region 2 will be used for the benthic macroinvertebrate analysis. **Figure 6** shows the approximate locations of monitoring points under this alternative.

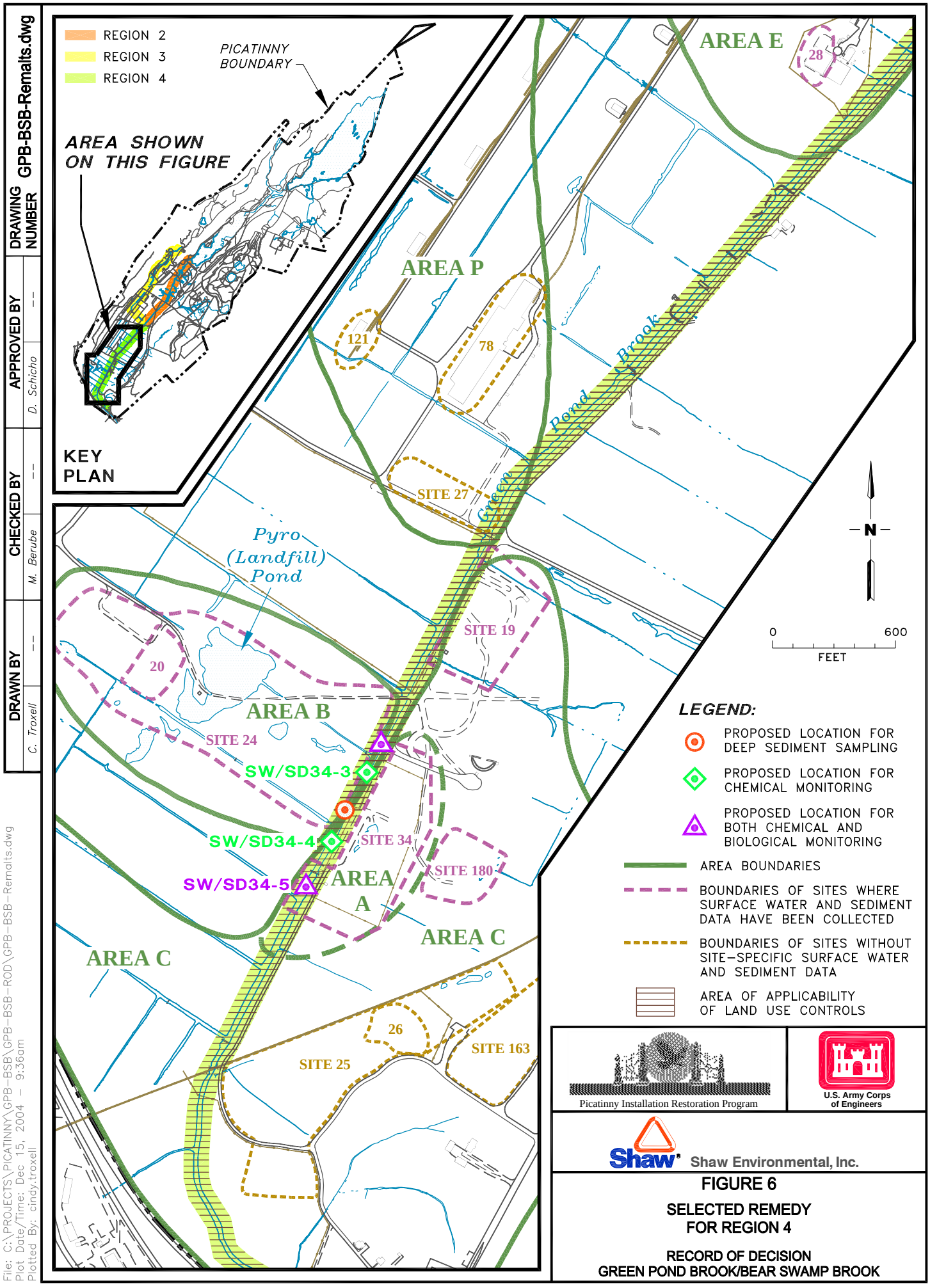
While environmental monitoring will not address potential human exposure, the status of Picatinny as an active military installation will have a continuing effect. The LUCs will protect human health and ensure no unacceptable land use occurs. Upon agreement among the Army, Picatinny, USEPA, and NJDEP that remediation is complete, the long-term monitoring program will be discontinued per an agreed upon exit strategy and documented in the next 5-year review.

The costs associated with the preferred alternative for Region 4 are summarized as outlined in **Table 10**. The costing information in this section is based on the best available information regarding the anticipated scope of the remedial alternative. Details on the above cost items are presented in Appendix D of the Final FFS for GPB/BSB. Changes in the cost elements are likely to occur as a result of new information and data collected during the work plan phase and the 5-year review(s). Major changes may be documented in the form of a memorandum in the Administrative Record file, an ESD, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within –30 to +50% of the actual project cost.

Table 9 - Summary of Estimated Lifetime Costs of the Selected Remedy for Region 4

CAPITAL COST (TOTAL)	**$27,400**
Permit and Report Writing	$20,000
Nature and Extent Sampling for Deep Sediment	$3,800
Subtotal Capital Costs	***$23,800***
Scope Contingency (15%)	$3,570
O&M AND PERIODIC COSTS (TOTAL – 10 years)	**$72,900**
Annual Sampling Cost	$2,280
Annual UXO Oversight	$3,100
Annual Monitoring Report	$5,000
Total Annual Sampling and Reporting	***$10,380***
TOTAL PRESENT WORTH COST	**$100,300[1]**

[1] Rounded.


REGION 2
REGION 3
REGION 4
PICATINNY BOUNDARY
AREA SHOWN ON THIS FIGURE
KEY PLAN
AREA E
28
AREA P
121
78
Green Pond Brook
Road
SITE 27
Pyro (Landfill) Pond
SITE 19
20
AREA B
SITE 24
SW/SD34-3
SW/SD34-4
SITE 34
SW/SD34-5
AREA A
SITE 180
AREA C
AREA C
26
SITE 25
SITE 163
N
0
600
FEET
LEGEND:
PROPOSED LOCATION FOR DEEP SEDIMENT SAMPLING
PROPOSED LOCATION FOR CHEMICAL MONITORING
PROPOSED LOCATION FOR BOTH CHEMICAL AND BIOLOGICAL MONITORING
AREA BOUNDARIES
BOUNDARIES OF SITES WHERE SURFACE WATER AND SEDIMENT DATA HAVE BEEN COLLECTED
BOUNDARIES OF SITES WITHOUT SITE-SPECIFIC SURFACE WATER AND SEDIMENT DATA
AREA OF APPLICABILITY OF LAND USE CONTROLS
Picatinny Installation Restoration Program
U.S. Army Corps of Engineers
Shaw Environmental, Inc.
FIGURE 6
SELECTED REMEDY FOR REGION 4
RECORD OF DECISION
GREEN POND BROOK/BEAR SWAMP BROOK
DRAWING NUMBER GPB-BSB-Remalts.dwg
APPROVED BY D. Schicho --
CHECKED BY M. Berube --
DRAWN BY C. Troxell --
File: C:\PROJECTS\PICATINNY\GPB-BSB\GPB-BSB-ROD\GPB-BSB-Remalts.dwg
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Plotted By: cindy.troxell

2.14 EXPECTED OUTCOMES OF THE SELECTED REMEDIES

Since contaminants will partially remain in surface water and sediment and potential discharge from contaminated groundwater plumes from various sites within Picatinny may occur, completion of these actions does not provide an uncontrolled use of GPB and BSB at Picatinny.

The expected outcomes of the implementation of Alternative 3 for Regions 2 and 4 would be continued limitation of human exposures to contaminated sediments and surface water following the implementation of LUCs. Alternative 3 affords a long-term mechanism to monitor the contamination and ensure that the quality of surface water and sediment continue to attain RAOs. Furthermore, it also provides a mechanism to assess the health of aquatic habitat through benthic studies at Regions 2 and 4 and toxicity studies at Region 2. Additional toxicity testing is not included in the remedial alternative for Region 4.

Implementation of Alternative 2 in Region 3 is expected to reduce the risks to potential ecological receptors, prevent human exposure to contaminated sediments and surface water, protect downstream areas from COC migration, and avoid disturbance of aquatic habitat in Area G. These expected outcomes would be realized following completion of the removal of contaminated sediment and site restoration.

2.15 STATUTORY DETERMINATIONS

Under CERCLA §121 and the NCP, the lead agency must select remedies that are protective of human health and the environment and comply with ARARs (unless a statutory waiver is justified). The following are balancing criteria: long-term effectiveness and permanence; reduction of toxicity, mobility or volume through the use of treatment; short-term effectiveness; implementability and cost effectiveness. The following are modifying criteria: state acceptance and community acceptance.

2.15.1 Protection of Human Health and the Environment

As previously described, the Selected Remedies for contaminated sediment at GPB/BSB are primarily designed to address the ecological risks because the results of HHRA of sediment and surface water at GPB/BSB indicated that the human health risks to trespasser swimmers ($5.2x10^{-6}$) and consumers of recreationally caught fish ($1.5x10^{-4}$) are acceptable.

The Selected Remedies for Region 2 and Region 4 involves no active measures to reduce the ecological risks. However, because the discharges of COCs in these Regions no longer occur, it is very likely that cleaner, non-contaminated sediments will gradually cover the impacted sediments identified in the AOCs. Additionally, it is anticipated that natural processes, including degradation, dispersion, and desorption of COCs at levels non-toxic to aquatic receptors, will continue to reduce existing contaminant levels. Because these Selected Remedies do not remove the source of contamination and only rely on natural attenuation processes to reduce concentrations of contaminants in sediment to ARAR levels, the environment is still being exposed to the COCs. Implementation of long-term sediment and surface water monitoring program under these alternative would ensure an early detection of potential contaminant migration from the site or to other media at concentrations that would be harmful to human health and the environment.

The Selected Remedy for Region 3 would reduce the existing ecological risks through removal and on-site stabilization treatment and containment of contaminated sediment in a restored oil/water separator pond. Similarly, the Implementation of a long-term sediment and surface water monitoring program under this alternative would ensure an early detection of potential contaminant migration from the site or to other media at concentrations that would be harmful to human health and the environment.

2.15.2 Compliance with Applicable or Relevant and Appropriate Requirements

Except for Region 3, the Selected Remedies are not intended to actively reduce COC concentrations in sediment to the chemical-specific ARAR level presented in **Table 11**. The location-specific ARARs presented in **Table 12** would be met by obtaining appropriate permits or permit equivalency and implementing appropriate mitigation measures in the events when the wetlands or stream encroachment areas would be affected. The action-specific ARARs presented in **Table 13** will be met by obtaining appropriate permits for the excavation, on-site stabilization, and their associated activities. All personnel will be properly trained to handle hazardous materials in accordance with Occupational Safety and Health Administration (OSHA) Act 29 C.F.R 1910.

Table 10 - Chemical-Specific ARARs for GPB and BSB

Media	Law/Regulation or Reference	Requirement of Law/Regulation	ARAR Status
Surface Water	Federal Ambient Water Quality Criteria (AWQC) 40 CFR 131.36	Protects aquatic life and human health and developed for 95 carcinogens and non-carcinogens.	Applicable to the cleanup standards and/or effluent limitations on discharges to surface water. (See State Surface Water Quality Criteria for more stringent requirements.)
	Surface Water Quality Criteria (SWQS) N.J.A.C. 7:9B, et. Seq.	Provides policy for the protection and enhancement of surface water resources, class designations, and water quality standards.	Applicable to the cleanup standard, and/or effluent limitations on discharges to surface water.

Table 11 - Location-Specific ARARs for GPB and BSB

Location	Law/Regulation	Requirement of Law/Regulation	ARAR Status
Flood plains	Protection of flood plains 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 flood plains. Federal agencies shall evaluate potential effects of actions in flood plains and ensure consideration of flood hazards and flood plain management. If action is taken in flood plains, federal agencies shall consider alternatives to avoid adverse effects, and potential	Applicable to removal and restoration activities associated with Alternative 2 for Regions 3 since operations will occur within 100-year flood plain.
	Within 100 year flood plain 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.	Applicable to removal and restoration activities associated with Alternative 2 for Region 3 since operations will occur within 100-year flood plain.
Endangered Species Act (Rare, Threatened, or Endangered Species)	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 - 50CFR 17.11-12 - NJSA 23:2A - NJAC 7:25c-4 as being rare, threatened, or endangered species.	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. Agencies should particularly avoid new construction in those areas containing these species unless there are no practicable alternatives. Federal agencies shall incorporate rare, threatened, or endangered species protection consideration into planning, regulating, and decision-making processes.	Applicable to Alternative 2 in Region 3 since capping and/or excavation activities could potentially impact habitat of sensitive species listed within the Endangered Species Act.
U.S. Army Sites	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.	Applicable for sediment removal activities. All hazardous materials will be disposed of through an independent contractor. Picatinny will sign off on all manifests.
	Army Environmental Protection and Enhancement Draft Final Document DA PAM 200-1	This technical document accompanies AR 200-1 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.	Guidance for hazardous materials and removal, storage and disposal activities at the site. Disposal of hazardous material is accomplished through an independent contractor. Picatinny will sign off on all manifests.

Table 12 - Action-Specific ARARs for GPB and BSB

Action	Law/Regulation	Requirement of Law/Regulation	ARAR Status
Generation of Hazardous Wastes and Testing of Excavated Materials	RCRA methods for identification and evaluation of solid and hazardous wastes 40 CFR 261, Subparts A, B, C, D 40 CFR 136, App. A (SW-846 including method 608, 8082 by gas chromatography for PCB wastes). - NJAC 26G-5.1 (Incorporated by reference 40 CFR-26)	Specific requirements for identifying hazardous wastes. Establishes analytical requirements for testing and evaluating solid, hazardous, and water wastes.	Toxicity Characteristic Leaching Procedure (TCLP) analysis and testing results could identify hazardous wastes during implementation of Alternative 2 in Region 3.
Sampling and Analysis	Remediation Technical Requirements NJAC 7:26E-3	Requirements of quality assurance for sampling and analysis at remediation sites.	Applicable to sampling and analytical activities in Alternatives 2 and 3 in Regions 2, 3, and 4.
	Regulations Governing the Certification of Laboratories and Environmental Measurements NJAC 7-18:1-3, 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.	Applicable when selecting a laboratory for sampling activities during removal action. Applicable to Alternatives 2 and 3 in Regions 2, 3, and 4.
Excavation and Capping	40 CFR 264.310(a) New Jersey Soil Erosion and Sediment and Control Act, NJAC 7:16-25A, 13-3 and NJAC 2:90	Requirements for soil erosion and sediment controls.	Applicable to sediment erosion controls during removal and construction activities.
General Remediation	Technical Requirements for Site Remediation NJAC. 7:26E 1, 4-7	Specifies the minimum technical requirements to investigate and remediate contamination on any site.	Relevant and appropriate for on-site sampling and removal activities to be conducted in Alternatives 2 and 3 in Regions 2, 3, and 4.
	New Jersey Soil Erosion and Sediment Control Act 40 CFR 122.26(c) NJAC 7:13-3 and 2:90 40 CFR 122.26 (c)	Requires the implementation of soil and erosion and sediment control measures for activities disturbing over 1 acre of surface area of land.	Applicable for site activities involving excavation, grading, or other soil disturbance activities exceeding 1 acre. May be applicable to Alternative 2 in Region 3.
	USEPA Office of Solid Waste and Emergency Response (OSWER) Publication 9345.3-03FS, January 1992	Investigation-derived wastes generated from remedial activities (e.g., drilling mud, purged water, etc.) are required to be properly stored, managed and disposed. Guidance given in the publication includes waste material containment, collection, labeling, etc.	Applicable for wastes generated during sampling, clearing, grubbing and excavation activities.

Table 12 - Action-Specific ARARs for GPB and BSB

Action	Law/Regulation	Requirement of Law/Regulation	ARAR Status
Discharge of Aqueous Waste to Surface Water	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.	Applicable for discharge of storm water and water from dewatered sediments to surface water bodies that may result from on-site clearing and excavation activities.
	New Jersey Water Pollution Control Act – New Jersey Pollutant Discharge Elimination System (NJPDES) (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.	Applicable to the substantive requirements of the permit program for storm water discharge and water from dewatered sediments to surface water during excavation activities. Would apply to Alternative 2 in Region 3.
Stream/Wetland Encroachment	33 CFR 320.4 Flood Hazard Area Control (NJAC. 7:13-1.1 et seq.) Water Resource Management (NJAC. 7:21) 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 - Surface water diversion - Stream encroachment - Soil erosion and sediment control	Applicable to the substantive requirements of the permit program for removal activities, sediments, dewatering of excavated sediments, and design and installation of sedimentation basin. Would apply to Alternative 2 in Region 3.
On-site Treatment, Storage, and Disposal	RCRA Treatment, Storage and Disposal of Hazardous Waste 40 CFR 264, Subparts A, B, C, D, E, G and I. 265, Subparts A, B, C, D, E, G and I NJAC 26G-8 and 9 (Incorporation by reference)	Standards and requirements for facilities that treat, store, and dispose of hazardous waste. Requirements include: - General Facility Standards - Emergency Preparedness and Prevention - Contingency Plan and Emergency Procedures - Manifest System - Use and Management of Containers - Closure and Post Closure	Applicable to the substantive requirements if hazardous waste is treated or stored on site.

Table 12 - Action-Specific ARARs for GPB and BSB

Action	Law/Regulation	Requirement of Law/Regulation	ARAR Status
On-site Treatment, Storage, and Disposal (continued)	RCRA Treatment, Storage and Disposal of Hazardous Waste 40 CFR and 265 Subparts J and L RCRA – New Jersey Hazardous Waste Regulations Incorporates the above regulation (NJAC 7:26G-8 and 9)	Provides requirements for handling waste at the following facility types: - Tank systems - Waste piles - Chemical, physical and biological treatment	Applicable to the storage and treatment of dewatered liquids from excavated sediments and the storage of sediments in piles. This would be applicable if dewatered liquids and excavated sediments were identified as hazardous waste during implementation of Alternative 2 in Region 3.
	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.	Applicable for on-site activities that would generate particulate matter and fugitive dust emissions from construction vehicles and equipment. Standards have been deferred to the State. See State Air Quality Regulations.
Air Emissions	Air Quality Regulations New Jersey NJAC 7:27-13	Provides requirements applicable to ambient air pollution sources.	Applicable to Alternative 2 in Regions 2, 3, and 4 due to the on-site generation and emission of ambient air pollutants. Air monitoring will be performed and if the following air quality standards are exceeded, then requirements are applicable. Primary air quality standard is 75 $\mu g/m^3$ (not to exceed 260 $\mu g/m^3$ more than once) and secondary standard of 60 $\mu g/m^3$ (not to exceed 150 $\mu g/m^3$ more than once), both for geometric mean value of all 24-hour average concentration standard over 12 consecutive months.
Storage for Disposal	RCRA Land Disposal Restrictions 40 CFR 268, Subparts A, B, C, D, and E NJAC 7:2G-11 *et seq*.	Identifies hazardous wastes that are restricted from land disposal and defines those limited circumstances under which an otherwise restricted waste may continue to be land disposed.	Applicable if hazardous waste (generated by Alternative 2 in Region 3) is transported off-site to a landfill.
Disposal Off Site	TSCA Identification of alternate disposal methods, traditional (performance based) and risk-based methods for disposal. 40 CFR 761.50 (alternate disposal method) 40 CFR 761.75 (chemical waste landfill) 40 CFR 761.61 (self-implementing, traditional and risk based options) 40 CFR 761.77 (approval)	Applicable to disposal of material: 1. containing < 50 ppm PCBs; 2. managed under a 404 CWA or equivalent permit USACE under 33 CFR 320; 3. obtaining prior approval from USEPA based on risk assessment and site specifics.	Applicable to disposal of < 50 ppm PCBs may be sent to a RCRA approved landfill.

Table 12 - Action-Specific ARARs for GPB and BSB

Action	Law/Regulation	Requirement of Law/Regulation	ARAR Status
	RCRA Hazardous Waste Generation 40 CFR 262, Subparts A, B, C, D and E. NJAC 7:26G-6	Specifies requirements for hazardous waste packaging, labeling, manifesting and storage.	Applicable for the off-site transportation of hazardous waste generated by Alternative 2 in Region 3.
Labeling and Transportation	NJDEP – Division of Waste Management: NJAC. 7:26 Subchapter 3; NJAC. 7:26-3.2(c), -3.2(b), -3.2(a), -3.2(a)2, -3.2(a)6; NJAC. 7:26-16.4; and NJAC. 7:26-3.4 and 7:26-3.5	Solid waste (IDW) for off-site transportation must obtain proper written approval from the State prior to transporting the waste. Once approved, the transporting vehicle has to be properly registered to handle the waste with appropriate placard.	Applicable for off-site transportation of waste generated during implementation of Alternative 2 in Region 3.
Transportation	RCRA – Solid/Hazardous Waste Regulations: 40 CFR 262 Subparts A, B, C, and D and 40 C.F.R. 263, Subparts A, B, and C Directive #9330.2-07,49 NJAC 7:26G-7	Hazardous waste containing vehicles must be properly registered to handle and transport the waste to a regulated facility. In addition, waste must be properly packed and accompanied with proper emergency response spill procedures and manifests.	Applicable for the off-site transportation of hazardous waste generated during implementation of Alternative 2 in Region 3.
	USDOT Hazardous Materials Transportation Regulations 49 CFR 171-180	Establishes classification, packaging, and labeling requirements for shipments of hazardous materials.	Applicable for off-site transportation of hazardous materials generated on site.

2.15.3 Cost Effectiveness

In the lead agency's judgment, the Selected Remedies are cost-effective and represent a reasonable value for 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 three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs 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 Remedies are approximately **$166,900** for Region 2, **$541,000** for Region 3, and **$100,300** for Region 4. Although Alternatives 1 (No Action) in all Regions is the least expensive, this alternative affords no mechanisms to reduce the potential human and ecological exposures to the contaminants. The Army believes that the Selected Remedies are cost effective and the additional cost compared to Alternative 1 provides a significant increase in protection to human health and the environment.

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

The Army has determined that the Selected Remedies represent the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the site. The Army has determined that the Selected Remedies provide the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and considering regulatory and community acceptance.

2.15.4.1 Region 2

The Selected Remedy for Region 2 is **Remedial Alternative 3 (Chemical and Biological Monitoring) and LUCs**. Remedial Alternative 3 is protective of human health and ecological receptors, preserves the good-quality aquatic habitat in Area G, and represents the best balance of the seven evaluation criteria considered in the FFS. LUCs are necessary to control land use and will ensure no unacceptable human contact to site contaminants occurs. This remedy prohibits any land use that could result in prolonged exposure to the site.

With the exception of the No Action Alternative, both Remedial Alternatives 2 and 3 were found to be adequately protective of human health, ecological receptors, and the environment. However, both alternatives offer different methodologies for mitigating potential risks to ecological receptors associated with contaminated sediments in Region 2. Alternative 2 provides for immediate action to address potential risks to ecological receptors in GPB associated with Area G contaminated sediments, whereas Alternative 3 provides a means for assessing risks to ecological populations over the short- and long-term. Alternative 3 allows for the reassessment of remedial options should monitoring indicate real, and unacceptable impacts, whereas Alternative 2 is a one-time remedial action. Remedial Alternative 3 (Chemical and Biological Monitoring) was selected as the preferred remedy for Region 2 because this alternative provides protection of human health and ecological receptors through the Picatinny LUCs and the collection of chemical and biological monitoring data. Additionally, Alternative 3 limits short-term impacts to workers, is more administratively implementable, and is substantially less costly to implement than Alternative 2.

2.15.4.2 Region 3

The Selected Remedy for Region 3 is Remedial Alternative 2 (Excavation of Oil/Water Separator, and Monitoring) and LUCs. Remedial Alternative 2 is protective of human health and ecological receptors, preserves the good-quality aquatic habitat in Area G, and represents the best balance of the seven evaluation criteria considered in this study. LUCs are necessary to control land use and will ensure no unacceptable human contact to site contaminants. This remedy ensures any land use that could result in prolonged exposure to the site do not occur.

Alternative 2 (Excavation of Oil/Water Separator, and Monitoring) provides for immediate action to address potential and real risks associated with contaminated sediments of Region 3. Alternative 2 offers advantages over Alternatives 1 and 3 with respect to overall protection to the environment, long-term effectiveness and permanence, and reduction of toxicity, mobility, and volume through the on-site stabilization treatment. The disadvantage of Remedial Alternative 2 is that it has a substantially higher cost than Alternatives 1 and 3. Although Alternative 3 provides a means for assessing risks to ecological populations over the short- and long-term, it does not mitigate the risks to Region 3 ecological populations as demonstrated by sediment toxicity tests. Due to these reasons, Remedial Alternative 2 (Excavation of Oil/Water Separator Pond, and Monitoring) was selected as the preferred remedy for Region 3.

2.15.4.3 Region 4

The preferred remedy for Region 4 is **Remedial Alternative 3 (Chemical and Biological Monitoring) with Institutional Controls**. Remedial Alternative 3 is protective of human health and ecological receptors, preserves the good-quality aquatic habitat, and represents the best balance of the seven evaluation criteria considered in this study. LUCs are necessary to control land use and will preclude unacceptable human contact to site contaminants. This remedy prohibits any land use that could result in prolonged exposure to the site.

Alternative 2 (In-Situ Capping and Chemical Monitoring) and Alternative 3 (Chemical and Biological Monitoring) were found both to be adequately protective of human health and the environment. However, each alternative offers different methodologies for mitigating potential risks to ecological receptors associated with contaminated sediments in Region 4. Alternative 2 provides for immediate action (placement of the cap) to mitigate risks to potential human and ecological receptors, whereas Alternative 3 provides a means for assessing risks to ecological populations through monitoring over the short- and long-term. With Alternative 3, remedial options could be reassessed should monitoring indicate real and unacceptable impacts to ecological communities.

Alternative 2 offers minor advantages over Alternatives 1 and 3 with respect to long-term effectiveness and permanence, and the reduction of toxicity and mobility. The disadvantage of Remedial Alternative 2 is substantially higher cost. Alternative 3 (Chemical and Biological Monitoring) offers minor advantages over Alternative 1 by providing a means for monitoring and assessing potential impacts to ecological receptors at and downstream of Region 4 AOCs and monitoring the effectiveness of remedial actions at Site 34. Because future remedial activities will be conducted at Site 34 (one of the major sources of contaminants to Region 4 AOCs), and the LUCs in place at Picatinny will reduce the potential for human exposure to site contaminants, Alternative 3, Chemical and Biological Monitoring was selected as the preferred remedy for Region 4.

2.15.5 Preference for Treatment as a Principal Element

As discussed previously, the COCs within the scope area of GPB/BSB are considered as Non-Principal Threat Wastes. As a result, the Army considered less emphasis in meeting the statutory preference for treatment as a principal element of the remedies.

Even though no principal threat wastes have been identified in Region 3, the Selected Remedy for this Region, Alternative 2, addresses the principal contamination in this Region through the use of an active treatment technology. Therefore, the statutory preference for remedies that employ treatment as a principal element is satisfied.

The Selected Remedies for Region 2 and Region 4 do not address principal contamination posed by the site through the use of active treatment technologies because there are no principal threat wastes identified in these Regions. Therefore, there is no need to satisfy the statutory preference for remedies that employ treatment as a principal element. However, since the direct discharge of contaminants to GPB and BSB no longer occurs, these remedies would ensure that sediment quality continues to improve. Furthermore, these remedies would also ensure an early detection of potential contaminant migration from the site or to other media at concentrations that would be harmful to human health and the environment. Lastly, these remedies provide an effective use of funding than the technologies that do utilize treatment.

2.15.6 Five-year Review Requirements

Five-year reviews will be conducted in compliance with and CERCLA §121(c) and the NCP §300.430(f)(5)(iii).

3.0 PART 3: 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 Remedies for GPB/BSB and the Army's responses to these concerns.

In general, the community is accepting of the selected alternative. Some community concern has been expressed because contamination will be controlled on-site as opposed to off-site. The Army, USEPA, and NJDEP have considered all comments and concerns summarized below in selecting the final cleanup methods for contaminated sediment of GPB/BSB at Picatinny.

3.1 PUBLIC ISSUES AND LEAD AGENCY RESPONSES

As of the date of this ROD, the Army endorses the preferred alternatives for contaminated sediment of GPB/BSB of Alternative 3 (Chemical and Biological Monitoring and LUCs) for Region 2; Alternative 2 (Excavation, On-site Stabilization, Off-site Disposal of Contaminated Sediment, Monitoring, and LUCs) for Region 3; and, Alternative 3 (Chemical and Biological Monitoring and LUCs) for Region 4. The USEPA and the NJDEP support the Army's plan. Comments received during the GPB/BSB public comment period on the Proposed Plan are summarized below. The comments are categorized by source.

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

The following summarize the agency responses to the comments received during the public meeting on December 18, 2003.

Comment from Mr. Joseph Parrish of Elizabeth, New Jersey

Comment 1: The commenter works for Citizens for Advisory Group for the Cleanup of Newark Bay, a large Superfund site that has sediments contaminated with PCB's, dioxins, and heavy metals. The on-site stabilization of the contaminated sediments at this site has not been successful, and the commenter is concerned with the selection of stabilization as a final remedy for contaminated sediment at GPB due to potential leachability of the matrix.

Response: Stabilization with Portland cement is a long-established and highly utilized technique for stabilization of sediment. In the case of the sediment being removed from Region 3 of the brooks, the stabilization is necessary to make the material solid enough to handle and transport as well as immobilizing contaminants in the sediment. Stabilized sediments will be disposed off-site at a controlled landfill. No stabilized sediment will remain on-site at Picatinny. Stabilized sediments will be tested in accordance to RCRA and TCLP methods to determine the leachability characteristics. These methods have been used widely and accepted among the Regulators. Different methods of on-site treatment were not selected for this action because of the size of the remedial action. On-site treatment by other methods would not be economically feasible to implement on the small volume of sediments to be removed.

Comment 2: The commenter is concerned with the impact to groundwater and downstream migration of contaminants. The commenter also expressed concern for fish and wildlife.

Response: The remedy includes removal of the hot-spots and implementation of a long-term monitoring program that will include ecological receptors. Pursuant to the risk assessments, reviewed and approved by USEPA and NJDEP, there is no unacceptable risk to human health from the surface water or sediment in the brooks. The trigger levels are primarily going to be geared to the ecological effects of the sediment in GPB. As for the potential for impact to groundwater, it is considered very low. The nature of contamination in GPB/BSB consists of predominately immobile compounds. Compounds like PAHs and metals do not move into groundwater readily. Further, the majority of GPB is a gaining stream; meaning that water is entering the brook from the aquifer. So transport of contamination from the stream into the aquifer is unlikely.

Comment 3: The commenter questioned the impacts on growth.

Response: Based on the results of the Phase I ERAs, there do not appear to be contaminant-related impacts in GPB despite the presence of elevated levels of contaminants in sediment at certain locations and, occasionally, in surface water, and some observed bioaccumulation of select contaminants in fish tissue. There is potential for adverse effects to mink, great blue heron, and, more importantly, the ecological receptors which they represent in the GPB study area, although the modeling results appear to be conservative. Based on this conservative modeled risk, the Army has proposed the remedial alternatives in this ROD.

Comment 4: The commenter expressed concern regarding the estimation of potential human toxicological effects using non-human receptors.

Response: The remedy includes land use controls to prohibit human exposure to contaminants in GPB/BSB. Fishing and swimming are both prohibited. There is no swimming allowed in GPB/BSB,. In most cases, the brooks are too shallow for desirable swimming. There is no fishing allowed in any areas except one area up by Picatinny Lake which was north of the study area. So in terms of exposure to humans, those pathways generally aren't complete. The HHRA estimated no unacceptable human health risks to trespasser swimmers and consumers of recreationally caught fish.

Comment from Ms. Courtenay Huff of Rockaway Township, New Jersey

Comment 5: The commenter requested comment on the Portland cement and the longevity with which the Army believes the contaminants will be stabilized in the cement.

Response: PCBs and dioxins are not the primary contaminants in the sedimentation basins, it is metals. So in terms of treatment for metals, you are not going to destroy the metals because they are an element, you cannot destroy them. What you do is you change their state to make them less toxic or make them less mobile and thus controllable.

The longevity of the fixed sediment that is potentially going to a triple-lined landfill in upstate New York, will be permanent. Currently, EPA and the New York State DEP regulate those landfills. Even if contaminants did leach out of the soil, they would soon go into the leachate collection system of the landfill, which will be further treated. Therefore, this part of our remedy is probably the most permanent.

The Army has a preference for on-site treatment of contaminants to a safe level. Off-site removal and disposal is the Army's second choice. In this case, due to the small volume of sediment, it was easier and more cost-effective for the Army to remove it and use a solidification process to transport it to a permanent facility.

Comment from Mr. Milton Zisman of Springfield, New Jersey

Comment 6: The commenter is with the New Jersey Military Toxics Group, and inquired about the presence of radionuclides in the surface runoff water and whether there is any attempt made to remove some heavy metals From the sediment.

Response: I don't believe there were any radionuclides above levels of concern in the surface water. Surface water samples were collected and sent to a laboratory certified to analyze for radiological constituents. The only radionuclide that is regulated is total uranium. Low level concentrations of total uranium were detected at some of the areas within the brook at levels below the federal surface water criterion, which is the USEPA Region 3, Tap Water Risk-Based Criteria of 7.3 ug/L.

Eight radiological constituents were detected in at least one of ten surface water samples analyzed for radionuclides. The concentrations ranged from 0.151 pCi/L of uranium-238 to 44.4 pCi/L of Americium-241. Total uranium was detected at 0.19 ug/L, significantly below the level of concern of 7.3 ug/L. The majority of detections were in samples collected from Region 3. The proposed plan summarized the surface water levels.

Some of the actions, some of the proposed excavations, are based on the removal of the sediment with higher levels of metals. The remedy includes chemical and biological monitoring

of other metals in the GPB/BSB sediment that have not triggered unacceptable health numbers to see if the levels go down, remain the same, and to determine any potential long term ecological or biological effects.

Comment from Mr. Joseph Parrish of Elizabeth, New Jersey

Comment 7: The commenter is concerned with the potential for upstream sources or surface drainage to redeposit contamination after the sediment removal action is complete, and therefore is concerned with the long-term effectiveness of the remedy.

Response: There were 183 sediment samples taken from GPB/BSB. The locations of samples with the highest concentration of contamination, referred to as the hot spots, are the spots that are targeted to be removed. The contamination was introduced by direct discharge from past activities in the industrial section of Picatinny at BSB. Discharges into the brook no longer occur; therefore there is no continuing source of contamination. Additionally, there is no upland source of contamination.

Comment from Dr. Peter Lederman, New Providence, Former Director of the Center for Environmental Engineering and Science at New Jersey Institute of Technology

Comment 8: The commenter addressed the concern raised by the previous commenter. "Reverend Parrish, I am familiar with both this site and Oak Ridge. I was on a national academy committee that studied the Oak Ridge problem. You have got an entirely different level of problem in concentration. The concentrations of the hot spots in Oak Ridge are about orders of magnitude difference than Picatinny. I think we need to keep that in perspective here. That doesn't mean that this does not get remediated. It should get remediated but I don't think you can apply the Oak Ridge model to here, nor would we apply this model to Oak Ridge."

Response: Noted.

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

This section summarizes comments received from Subsurface Solutions LLC on behalf of the Restoration Advisory Board (RAB). These comments were received through a letter dated January 5, 2004 to the Environmental Affairs Office of Picatinny.

Sediment Retention Basin

Comment 1: Alternative 2 for Region 2 was not the preferred remedy. Alternative 2 consists of excavation and disposal of sediments from sampling location SD101-1; installation of a sediment retention pond downstream of the unnamed tributary draining Sites 52, 95, and 96, and implementation of institutional controls (ICs). Despite the added cost of this alternative, this alternative provides for removal of the sediment from a contaminated location plus a means to retain sediment entering the stream from nearby sites and to facilitate future sampling efforts while at the same time potentially providing useful flood control feature. At least one RAB member favors this alternative over other alternatives evaluated.

Response: Both Alternative 2 and Alternative 3 (the preferred remedy) are equally capable in meeting all the RAOs. However, as discussed in this ROD, since none of the COCs within the scope of GPB/BSB are considered as Principal Threat Wastes, the Army has considered less emphasis in meeting the statutory preference for treatment as a principal element of the remedy. Furthermore, because active waste discharges no longer occur at these surface water bodies and the capability of Alternative 3 to provide a mechanism to ensure that the existing concentrations of COCs will not worsen over time, the preferred alternative represents the best balance among the NCP criteria.

Chemical and Biological Monitoring

Comment 2: The chemical and biological monitoring program should also include monitoring the flow characteristics of the streams at the sampling locations. Monitoring of the flow dynamics would

enable an evaluation of changes in flow that might cause mobilization of sediment. For example, increased surface-water runoff to the streams is a concern as more impervious surfaces are added at the base. Such increases in runoff could result in changes in stream velocity and discharge, which might have negative impacts by mobilizing sediment. Furthermore, surface water sampling should be conducted in periods of relatively low flow so that the results reflect base flow conditions. Sampling in periods of high flow such as following a storm event may reflect dilution of contaminants.

Response: Agreed. The monitoring for the flow characteristics of the streams at the sampling locations will be incorporated into the selected remedies.

Timing of Implementation of Remedial Action

Comment 3: Excavation and disposal of sediments was the alternative selected for Region 3. However, such remediation can be ineffective if the source of contaminants is not addressed. Direct discharge to the streams is presumably no longer occurring. However, surface water runoff and groundwater discharge can contribute contaminants. For example, stormwater runoff from Site 34 (Burning Grounds) and through drainage ditches likely carries metals into GPB. The FS concluded that remedial activities at contributing sites should occur prior to remedial activities in GPB and BSB. Chemical and biological monitoring was selected for Regions 2 and 4; therefore, there is no impediment to initiating the planned action in either Region 2 or Region 4. However, the timing of remedial action in Region 3 will need to be coordinated with activities planned for contributing sites.

Response: Agreed and noted. The timing of the remedial action in Region 3 will be coordinated with activities planned for contributing sites.

3.2 TECHNICAL AND LEGAL ISSUES

No technical or legal issues were raised on the Selected Remedy.

4.0 PART 4: REFERENCES

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