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EPA Superfund
Record of Decision:

BURNT FLY BOG
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MARLBORO TOWNSHIP, NJ
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RECORD OF DECISION

Burnt Fly Bog Site

Marlboro Township, Monmouth County, New Jersey

September 1998

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Burnt Fly Bog Site
Marlboro Township, Monmouth County, New Jersey

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Westerly Wetlands, Northerly Wetlands, and Tar Patch Area at the Burnt Fly Bog Superfund Site, which was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA) , and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision document explains the factual and legal basis for selecting the remedy for the third operable unit of the Site.

The New Jersey Department of Environmental Protection concurs with the selected remedy (Appendix V). The information supporting this remedial action is contained in the Administrative Record for the Site, the index of which can be found in Appendix IV to this document.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from the Burnt Fly Bog Site, if not addressed by implementing the response action selected in this Record of Decision, may present an imminent and substantial threat to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy represents the third and final operable unit planned for the Burnt Fly Bog Superfund Site. It addresses contaminated soil present on the three remaining contaminated areas on the site, including the Westerly Wetlands, Northerly Wetlands, and Tar Patch Area.

The major components of the selected remedy include:

1. Excavation and off-site disposal of contaminated soil from the Northerly Wetlands;
2. Excavation and off-site disposal of contaminated soil from the Tar Patch Area;
3. Backfilling the excavated area in the Northerly Wetlands and re-establishing wetlands;
4. Backfilling the excavated area in the Tar Patch Area and creating wetlands;
5. Provision of additional security fencing around the Westerly Wetlands, and the recording of a Deed Notice for the Westerly Wetlands, Northerly Wetlands, and Tar Patch Area;
6. Monitoring of surface water and sediment in the Westerly Wetlands, surface water and sediment in the existing sedimentation basin located in the Downstream Area, and surface water, sediment and, if necessary, biota in Burnt Fly Brook; and
7. Biological sampling in the Westerly Wetlands.

DECLARATION OF STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. The remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable for this Site. However, because treatment of the principal threats of the Site was not found to be practicable, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy.

Because this remedy will result in hazardous substances remaining on the Site above health-based levels, a review will be conducted within five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. This review will include an evaluation of the data and information obtained in connection with remedial components 6 and 7 above, as well as other appropriate components of the selected remedy.

<IMG SRC 98143A>

RECORD OF DECISION

DECISION SUMMARY

Burnt Fly Bog Superfund Site
Marlboro Township, Monmouth County
New Jersey

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SITE NAME, LOCATION AND DESCRIPTION

The Burnt Fly Bog (BFB) Superfund Site is located near the intersection of Texas and Spring Valley Roads in Marlboro Township, Monmouth County, New Jersey. It is situated approximately thirty miles northeast of Trenton, and about five miles from the Atlantic Ocean (Figures 1 and 2). While the entire Burnt Fly Bog encompasses about 1700 acres, the Site is limited to the approximately sixty acres of the study area affected by contamination. The Site is identified on the Marlboro Township Tax Map as Block 146, lot 47, and parts of lot 2, lot 3, lot 4, lot 5, lot 7, lot 8, and lot 49, and on the Old Bridge Township Tax Map as Block 13003, lot 23.11, and parts of lot 24.11 and lot 31. The majority of the waste was originally deposited in lot 47, a ten acre parcel located in the southeastern area (Uplands Area) of the Site. Much of the waste then migrated to other parts of the Site.

The BFB Site consists of the following sub-sites: Uplands Area, Tar Patch Area, Northerly Wetlands, Westerly Wetlands, and Downstream Area Figure 3). The Uplands Area had several abandoned oil storage and treatment lagoons containing residual oil sludges and aqueous wastes, contaminated waste piles, and buried or exposed drummed wastes. The Westerly Wetlands, Northerly Wetlands, and the Downstream Area had contamination in the surface water, surface soil, and the shallow subsurface soil. It is believed that this contamination was the result of uncontrolled discharges and runoff from the Uplands Area waste sources. The Tar Patch Area comprises two areas that were previously referred to as the Tar Patch and the Contaminated Soils Area, and which are located adjacent to each other. The core of the combined Tar Patch Area, which is approximately 4 acres in extent, is devoid of any vegetation. The material is more sandy, and this area is contaminated to a maximum depth of approximately 6 feet. The total area of Tar Patch Area contamination is nearly 5.5 acres. The Westerly Wetlands is the largest of the sub-sites covering an area of approximately 21 acres. The area of the contaminated Northerly Wetlands is approximately 2.5 acres while the Downstream Area contamination, prior to remediation, covered an area of 3 acres.

Two auto salvage yards and a few residences are found near the Site. The predominant land use within the township includes residential development, agricultural land, open spaces and wooded lands.

The Site is located in a fringe area of the New Jersey Pine Barrens. The New Jersey Pine Barrens is an environmentally sensitive area in the State. The interior of Burnt Fly Bog is considered an undisturbed wilderness area with documented reports of wildlife including red and gray fox, several species of squirrel, rabbits, white-tailed deer, opossum, raccoon, skunk, and seasonal birds. Other wildlife that makes this area its habitat includes various reptiles and amphibians. The Westerly Wetlands and Northerly Wetlands are rated moderate to high in value as wetland systems. No federally listed threatened or endangered plant species are present on the Site. The Westerly Wetlands provides habitat to a greater diversity of wildlife than the other habitats on the Site, and certain species occurring on the Site are likely to be found only in the Westerly Wetlands. The Westerly Wetlands had significant loss of plant cover as the result of a past oil fire and/or potentially toxic effects on plants from excessive levels of contaminants. Most of the affected area has experienced good progress toward re-establishing indigenous plant life.

The entire Site is located in the outcrop area of the Englishtown Formation. In the Westerly Wetlands, a relatively impermeable clay layer is at or near the ground surface. Ground water flowing through the overlying upper sand layer discharges to the surface of the Westerly Wetlands which is inundated most of the year. The Westerly Wetlands receives drainage from the Uplands Area, Northerly Wetlands, Tar Patch Area, and parts of the surrounding 1,700 acres of bog and pine barrens. Surface water flows in a south-westerly direction through the Westerly Wetlands, into the Downstream Area, through the sedimentation basin, and eventually into Burnt Fly Brook. The combined flow in Burnt Fly Brook flows into Deep Run at a distance of approximately one mile from the Site. Deep Run is a groundwater recharge source for the potable wells in the City of Perth Amboy.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

In or about 1952, activities that were responsible for the initial contamination at the Site began. During this period, different portions of the Site were used for reprocessed oil storage or settling lagoons, oil reprocessing filter cake storage, sanitary landfill activities, and sand and gravel pit operations.

Before 1950, the BFB Site was still an undeveloped area. In about 1950, Champion Chemical Company established

an oil reprocessing facility located on Orchard Place in Morganville, New Jersey, approximately two miles east of the Site. About the same time, Eagle Asphalt Company purchased that portion of the present BFB Superfund Site comprising the area around the four lagoons in the Uplands Area. These lagoons were developed for use as oil storage facilities and as settling ponds to handle the reprocessed oil. These facilities were operated until the property was sold in November 1964 to a Mr. Eckel.

In 1960, sanitary landfill operations began at another portion of the future Burnt Fly Bog Site, reportedly receiving local trash. The owner/operator, Mr. Towler died in 1961, and the landfill discontinued operations. Subsequently, Mr. Dominick Manzo purchased the property in December 1963, reopening the landfill and operating it with the approval of the municipality until 1967. In July 1965, Mr. Manzo acquired the former Eagle Asphalt Company property from Mr. Eckel. This purchase, coupled with the purchase of an adjoining plot in July 1968, brought under one ownership adjoining plots of land that together would eventually become known as the Burnt Fly Bog Superfund Site.

In 1969, the Middlesex County Court ordered the closure of the landfill. Aside from the deposition of excavated fill from a sewer construction project in Hazlet, New Jersey in July 1979, there have been no operations at the Site since 1969. On October 26, 1973, a fire started and burned at the Site for 16 hours before it was finally extinguished.

The New Jersey Department of Environmental Protection (NJDEP) is the lead agency for this Site. An Environmental Information Document pertaining to the Site was prepared by Dames and Moore for NJDEP in 1982. Contamination of soil, ground water and surface water was found to exist from the improper disposal of hazardous substances at the Site. The Site was then included on the National Priorities List in 1983. Based on the findings in the report, a Record of Decision (ROD) was issued in November 1983. The ROD called for off-site removal of contaminated soil and waste from the Uplands Area, and for a supplemental Remedial Investigation and Feasibility Study (RI/FS) to further investigate the wetland areas. The Uplands Area remediation was performed under Operable Unit One (OU-1).

Ebasco Services Inc. was engaged by NJDEP to provide design engineering services for the removal from the Uplands Area of contaminated soil and waste, which included drummed wastes, aqueous wastes and sludges from lagoons, and wastes from an Asphalt Pile. Between 1985 and 1990, NJDEP conducted several remedial actions in this area in accordance with the requirements of the ROD. These remedial actions included the removal of the Asphalt Pile, removal of lagoon liquids, excavation and off-site disposal of approximately 85,000 tons of contaminated soil, and installation of a clay cap over the area. In addition, about 600 cubic yards of PCB-contaminated soil was removed in 1992 for incineration off-site.

Ebasco also performed an RI/FS for the Westerly Wetlands and the Downstream Area between 1984 and 1987. As part of the investigations, sampling and analysis of soil, surface water, and ground water were performed. The results of the RI/FS are summarized in the January 1988 Westerly Wetland Remedial Investigation Final Report and the January 1988 Westerly Wetland Ultimate Remedy Feasibility Study Final Report which are included in the Administrative Record for this Site, and are summarized in this document. Following the RI/FS, lead mobility studies and a water budget analysis were also performed by Ebasco. Based on the findings of these investigations and studies, another ROD was issued in September 1988. This ROD called for the excavation and off-site disposal of contaminated soil from the Downstream Area, containment of the contaminated soil in the Westerly Wetlands through the installation of a sedimentation basin and appropriate diversion controls, construction of a security fence, and treatability studies on the most promising treatment technologies for the contaminated materials in the Westerly Wetlands, Northerly Wetlands and Tar Patch Area. Investigation of the Westerly Wetlands and remediation of the Downstream Area, including construction of the sedimentation basin, constituted Operable Unit Two (OU-2).

In August 1992, Frederic R. Harris, Inc. was contracted by NJDEP to perform the remedial design for the removal of the contaminated soil in the Downstream Area and for the construction of the sedimentation basin. As part of the design investigations, Harris also delineated the Tar Patch Area. The results of these investigations are summarized in the May 1994 Final Field Sampling and Testing Results Report - Tar Patch Area. Removal of the contaminated soil in the Downstream Area and sedimentation basin construction commenced in September 1995 and the work was completed by the end of 1996. A security fence along Spring Valley Road was also constructed.

Remedial activities pertaining to the remaining contaminated areas, namely, Westerly Wetlands, Northerly Wetlands, and Tar Patch Area are being done under Operable Unit Three (OU-3). In June 1993, BCM Engineers was contracted by NJDEP to perform a supplemental feasibility study of these three areas. Treatability studies on soil washing and chemical dechlorination were performed as part of this feasibility study. The results of the study are summarized in the October 1997 Final Supplemental Feasibility Study Report for Burnt Fly Bog Site which is included in the Administrative Record for this Site.

The United States Environmental Protection Agency (EPA) performed an ecological assessment of the Westerly Wetlands based on the results of a field study conducted in 1991. The results of this assessment are summarized in the June 1992 Ecological Assessment Final Report.

Soil sampling in the Northerly Wetlands was performed by NJDEP in 1995 in order to fully delineate the contamination in this portion of the Site. The results of this sampling are shown in the January 1997 Northerly Wetlands Field Sampling Report. Surface soil sampling was also performed in the Westerly Wetlands in 1996 to confirm the established levels of contamination in this area. The results of this sampling are summarized in the September 1997 Westerly Wetlands Field Sampling Report. In addition, surface water and sediment in Burnt Fly Brook have been sampled since 1992, at quarterly intervals.

EPA initiated a cost recovery action under the Comprehensive Environmental Response, Compensation, and Liability Act, as amended (CERCLA), in January 1997 against several parties to recover monies expended at the Site. This action is ongoing.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

In 1981, concerned residents organized the Burnt Fly Bog Citizens' Advisory Committee (BFBCAC). BFBCAC, which originally was composed of residents from Marlboro and Old Bridge Townships, now includes citizen representatives from Marlboro and Old Bridge Townships, Marlboro Township officials, as well as officials from Monmouth County and Middlesex County. The Committee functions as the liaison between NJDEP and the local community.

Since the establishment of NJDEP's Community Relations Program in 1982, representatives of NJDEP have met with BFBCAC on a regular basis. All pertinent Site data, reports, and events have been shared and discussed with BFBCAC to enable its input to be incorporated into the decision-making process involving Site activities. In 1998, a group known as the Monmouth County Environmental Coalition (MCEC) received a Technical Assistance Grant from EPA to hire technical advisors to review technical reports pertaining to this Site on behalf of the residents.

Community concerns have focused primarily on the potential environmental and human health risks posed by the Site. The ingestion of contaminated ground or surface water has been of major concern to the community because of the high lead concentrations at the Site.

Moreover, residents and officials of neighboring communities have expressed concern about contaminant migration to Deep Run which receives drainage from the Site.

Several public meetings have been held to present the findings of various studies conducted for the Site. In August 1983, a public meeting was held to discuss the remedial alternatives that were evaluated for the Uplands Area and to receive public comments before the issuance of the 1983 ROD. Similarly, a public meeting was also held on March 29, 1988 before the 1988 ROD was issued.

Additional RI reports, the Supplemental FS report, and the Proposed Plan dated February 1998 for the third operable unit (OU-3) were released to the public for comment on February 4, 1998. The public comment period was originally scheduled for a duration of 30 days. Based on requests for a time extension by the MCEC and potentially responsible parties (PRPS), the public comment period was extended by 6o days and ended on May 4, 1998. These documents were made available to the public in the Administrative Record file at the NJDEP file room at 401, East State Street, Trenton, New Jersey, and the information repositories at:

Monmouth County Library
Building

Marlboro Township Municipal
1979 Township Drive

1 Library Court Marlboro, New Jersey 07746
Marlboro, New Jersey 07746

On February 19, 1998, NJDEP conducted a public meeting at the Marlboro Township Municipal Building to inform local officials and interested citizens about the Superfund process, to discuss the findings of the remedial investigations, the supplemental feasibility study, and the proposed remedial activities at the Site, and to respond to any questions from the area residents and others who attended.

NJDEP's responses to the comments received at the public meeting, and in writing during the 90-day public comment period, are included in the Responsiveness Summary (see Appendix VI).

SCOPE AND ROLE OF RESPONSE ACTION

As a result of the BFB Site complexities and as is discussed above, the work has been divided into three operable units. A ROD was issued in 1983 for OU-1 for the remediation of the Uplands Area, and for conducting investigations in the wetland areas. A second ROD was issued in 1988 for OU-2 which provided for an interim remedy for the Westerly Wetlands portion of the Site. It called for the removal of contaminated materials from the Downstream Area, construction of a sedimentation basin, and the performance of treatability studies on the most promising treatment technologies for the remediation of Site soil. These treatability studies were performed as part of a supplemental feasibility study. Remedial Actions have already been completed for OU-1 and OU-2.

Uplands Area (OU-1)

Several remedial actions were conducted in the Uplands Area between 1985 and 1990. The activities included the removal of a pile of oily material mixed with soil called the Asphalt Pile, removal of lagoon liquids and sludge material, excavation and off-site disposal of approximately 85,000 tons of soil contaminated with PCBs and lead, and installation of a clay cap over the area and re-vegetation of the surface. Approximately 600 cubic yards of PCB-contaminated soil was also removed for incineration off-site. The clay cap is being inspected and maintained at regular intervals in order to preserve its structural integrity.

Downstream Area Remedial Action and Sedimentation Basin Construction (OU-2)

Approximately 6300 cubic yards of soil contaminated with PCBs and lead were removed off-site for disposal from the Downstream Area in 1996. A sedimentation basin was constructed in the Downstream Area after removing the contaminated soil. The capacity of the basin is such that it can fully contain storm flow resulting from a hundred year storm event within the catchment area. Accumulation of sediment in the basin is being monitored at regular intervals. The collected sediment will be sampled and analyzed before disposal. A security fence along Spring Valley Road was also constructed to prevent trespassers from entering the Site.

The third operable unit authorized by this ROD is based on remedial investigations performed to date and a determination that further remedial action is required for unremediated areas of the Site. Therefore, as further explained in this ROD, EPA and NJDEP have identified Excavation and Off-site Removal of Contaminated Soil, and Wetland Restoration for the Tar Patch Area and Northerly Wetlands, and Limited Action for the Westerly Wetlands portion of the BFB Site.

OU-3 is the final response action for this Site.

SUMMARY OF SITE CHARACTERISTICS

Remedial Investigation

The RI for the Westerly Wetlands was performed in three stages between 1984 and 1987 and consisted of sampling and analyses of soil/sediment, surface water and groundwater. Chemical analysis of all samples was performed for PCBs, lead, and other chemical compounds. Chemical analysis of the wetlands soil indicated a large extent and high degree of PCB and lead contamination. The maximum concentration of PCB contamination detected in soil was 254 milligrams/kilogram (mg/kg). PCBs were not present in surface water. Lead contamination was found

in the soil within the delineated boundaries of PCB contamination and outside. The maximum concentration of lead contamination detected in soil was 31,000 mg/kg. Lead was also found in surface water samples. The maximum concentration of total lead detected in surface water was 1,900 micrograms/liter (Ig/L); the maximum concentration of dissolved lead was 1,600 Ig/L.

NJDEP soil cleanup criteria established as the action levels for the Site at that time were 5 mg/kg for PCBs and 250 mg/kg for lead. Utilizing a remediation level of 5 mg/kg for PCBs, the results of the Stage I investigation identified an approximate volume of 58,000 cubic yards of PCB-contaminated soil in the Westerly Wetlands. The results of the Stage II investigation refined this estimate to 62,600 cubic yards of PCB-contaminated soil. The results of the Supplemental Stage II investigation increased the volume of contaminated soil within the Westerly Wetlands to 76,400 cubic yards after including lead-contaminated soils, using a threshold level of 250 mg/kg for lead. In addition, the Supplemental Stage II investigation evaluated soils in an area immediately down-gradient of the Westerly Wetlands, which was designated as the Downstream Area. The Downstream Area was remediated in 1996 with the removal off-site of approximately 6300 cubic yards of contaminated soil.

Water Budget

A water budget for the Site was prepared utilizing data gathered during the Supplemental Stage II investigation. The study was intended to obtain surface water, ground water, and site-specific meteorologic data and to discuss and develop a water budget for the Westerly Wetlands. Data were collected through the installation of hydrologic monitoring equipment including stream gauges and a small number of geohydrologic cluster well point systems as well as meteorologic monitoring equipment.

Data compiled by the investigation included the following: a rainfall database, hydrographs, ground water flow rates, hydraulic conductivity of the ground water, and permeability of the Woodbury Clay layer. The significant components of the water budget of the Westerly Wetlands identified by the investigation include: precipitation, direct runoff, delayed runoff, ground water discharge, and evapotranspiration.

The results of the study indicated that the primary hydrologic pathway of contaminant transport is through surface water runoff. Surface water runoff (direct runoff plus delayed runoff) accounts for between 44.2 and 48.5 percent of the precipitation that falls on the drainage basin.

Laboratory Lead Mobility Study

The purpose of the lead mobility study was to determine the mobility of lead in the soil and the potential for off-site migration of lead through either surface water or ground water. The study was also intended to focus the direction of Site remediation efforts toward the contaminant transport pathways of greatest environmental concern.

The results of the investigations indicated the following:

- Lead concentrations in fine particle soil fractions (<74 microns) were 3 to 10 times higher than in overall bulk soil samples.
- A large fraction of the lead bound to contaminated soils was potentially available for leaching to surface waters.
- The source of lead in surface waters may be lead mobilized from surface soils.
- Specification studies suggested that up to 20 percent or more of the total lead concentration may be available for release to surface waters under appropriate mixing conditions.
- The reservoir of lead remaining in Site soils may be sufficient to maintain surface water lead concentrations in the range of 0.1 mg/L to 1.0 mg/L for more than 10 years.
- Lead in the soil did not appear to be undergoing rapid downward migration into or through the ground water aquifer.
- Lead concentrations in soil leachate were attenuated by subsurface soils.
- Lead concentrations in ground water were less than 0.04 mg/L even at relatively shallow depths (10 to 15 feet).

Feasibility Study (1988)

The Feasibility Study that was performed following the RI identified fourteen different alternatives for detailed evaluation. These alternatives included seven innovative/alternative remedial treatment technologies. However, because treatability data were not available for the innovative/alternative treatment technologies, these alternatives could not be fully evaluated. Therefore, a final remedial action could not be selected for the Westerly Wetlands without a complete evaluation of the innovative/alternative technologies.

Since the results of previous studies had identified potential risks to human health and the environment, it was decided that an interim remedial action for the Westerly Wetlands was necessary to prevent off-site migration of contaminants. Several remedial alternatives were evaluated before selecting the interim remedy in the OU-2 ROD issued on September 29, 1988.

The interim action selected in the OU-2 ROD was containment without capping of the Westerly Wetlands. This action consisted of construction of a drainage system and a sedimentation basin to prevent off-site migration of contaminants, and the installation of a security fence around the perimeter of the Westerly Wetlands to prevent human access to the area. In addition, excavation and off-site disposal of contaminated soil present in the Downstream Area was identified as a final remedy for that portion of the Site. The ROD also recommended that treatability studies be performed on the most promising innovative/alternative remedial technologies for the remaining areas of concern, namely, the Westerly Wetlands, Northerly Wetlands, and Tar Patch Area.

Ecological Assessment

In 1991, EPA conducted sampling of biota within the Westerly Wetlands with the purpose of performing an ecological assessment for this Site. In addition to biota sampling, EPA also conducted limited soil sampling.

Results of the ecological assessment indicated the following:

- Plants on Site are accumulating low levels of lead.
- Worms are accumulating lead.
- Lead and PCBs pose a risk to avian predators (e.g. woodcock) of soil invertebrates such as earthworms.
- PCBs pose a risk to predatory mammals (e.g. red fox and mink) but not to herbivorous mammals such as deer.
- PCBs do not pose a risk to avian predators at higher trophic levels (e.g. red-tailed hawk).

Functional Assessment of the Wetlands

Five separate ecological investigations were performed as part of the functional assessment study covering the Westerly Wetlands, Northerly Wetlands and Tar Patch Area. The purpose of the investigations was to assess the functions and values of the biological communities on the Site. The investigations, which were conducted during the autumn of 1993, included survey and mapping of major plant communities, a wildlife survey, a survey for threatened and endangered species, an assessment of habitat quality using Habitat Evaluation Procedures (HEP), and an assessment of the functions and values of wetlands using the Wetland Evaluation Technique (WET).

Six plant communities, including three wetland and three upland plant communities, were identified on the Site. Burnt Fly Bog provides habitat for a moderate diversity of wildlife species, particularly birds. Reptiles and amphibians are also likely to be present. The Westerly Wetlands provides habitat to a greater diversity of wildlife than the other habitats on the Site and certain species occurring on the Site are likely to be found only in the Westerly Wetlands. This is due primarily to the larger size and more diverse habitat structure of the Westerly Wetlands.

The results of the field survey for threatened and endangered plant species indicated that no individual specimens of the five species of concern identified by NJDEP, namely, Barrett's sedge, swamp pink, yellow-fringed orchid, Knieskern's beaked rush, and coastal oceanorous were present. However, based on the habitat requirements of each species of concern, potential habitat for four of the species occurs in the study area.

Habitat Evaluation Procedures (HEP) were used to identify the quality of habitat that could be impacted by the proposed remedial activities for the BFB Site. The results of the HEP analysis indicate that Burnt Fly Bog

provides moderate to optimal habitat for a number of species that are likely to occur on the Site. Due to the presence of older and larger trees in the Northerly Wetlands than in the Westerly Wetlands, the Northerly Wetlands provides moderate to optimal habitat for canopy dwelling birds and small mammals as well as cavity nesting birds. The Westerly Wetlands, with more areas of open water interspersions and vegetation than the Northerly Wetlands, provides moderate to optimal habitat for amphibian species and birds that utilize this type of habitat. In addition, due to the larger area of the Westerly Wetlands compared to the Northerly Wetlands, the Westerly Wetlands provides habitat for larger numbers of individual species as well as species that require a larger home range.

Wetland Evaluation Techniques were used to assess the water quality functions provided by the wetlands on the Site. An evaluation of the entire wetlands system (BFB Wetlands System) as well as separate analyses for the Northerly Wetlands and Westerly Wetlands were conducted. Results were generated for four categories: social significance, effectiveness, opportunity, and habitat suitability.

For social significance, the BFB Wetlands System was rated generally higher than either the Westerly Wetlands or Northerly Wetlands, because the BFB Wetlands System is the most diverse of the wetland areas. For effectiveness, the BFB Wetlands System, the Northerly Wetlands, and the Westerly Wetlands all rated moderate to high for the evaluated functions and values. For opportunity, WET rated the BFB Wetlands System, the Northerly Wetlands, and the Westerly Wetlands generally high. For habitat suitability evaluation, all three wetland assessment areas received similar ratings. The majority of ratings received by each wetland assessment area for habitat suitability evaluation were low to moderate.

Tar Patch Area Delineation

A phased sampling of the Tar Patch Area was conducted by Frederic R. Harris, Inc. in 1993 in order to fully delineate the contamination present in the soil in this area. The sampling consisted of collection and analysis of surface and subsurface soil samples for PCBs and lead.

Using the most stringent NJDEP Soil Cleanup Criteria at that time for lead and PCBs as reference levels, the total volume of contaminated soil above 0.49 mg/kg for PCBs and 400 mg/kg for lead was determined to be 29,600 cubic yards, spread over an area of approximately 5.5 acres. The maximum depth of contamination is 6 feet. The maximum contaminant concentrations detected in the soil in the Tar Patch Area were 1060 mg/kg for PCBs and 53,000 mg/kg for lead. However, a lead concentration of 70,000 mg/kg was detected in a sample taken from tarry material found in this area.

Northerly Wetlands Sampling

The Northerly Wetlands was sampled in two phases in 1995 in order to complete the delineation of contamination extent and determine the volume of contaminated soil present in this part of the Site. Surface and subsurface soil samples were collected, and were analyzed for PCBs and lead. The volume of contaminated soil above 0.49 mg/kg for PCBs and 400 mg/kg for lead was determined to be 4000 cubic yards, the maximum depth being 2 feet. The maximum contaminant concentrations detected in the Northerly Wetlands were 150 mg/kg for PCBs and 34,800 mg/kg for lead. The contamination was found to be spread over approximately 2.5 acres.

Westerly Wetlands Sampling

Surface soil samples were taken in 1996 to determine the levels of PCB and lead contamination in the soil, as well as to confirm the lateral extent of contamination within the Westerly Wetlands. The results indicated that the area of contamination remained largely unaltered (during this sampling phase, the maximum lead concentration was 11,000 mg/kg and the maximum PCB concentration was 129 mg/kg). It was also noted that surface PCB contaminant levels established during the 1996 sample event within the Westerly Wetlands were demonstrated to be generally less than the contaminant concentrations measured during the previous investigations in the 1980's.

The total volume of contaminated soil in the Westerly Wetlands is estimated at 73,300 cubic yards based on the cleanup criteria of 0.49 mg/kg for PCBs and 400 mg/kg for lead. The area covered by contamination is approximately 21 acres, the maximum depth of contamination being 4 feet.

Quarterly Monitoring of Surface Water and Sediment in Burnt Fly Brook

Surface water and sediment in Burnt Fly Brook have been sampled and analyzed for PCBs and lead at four locations in Burnt Fly Brook since March 1992, at approximately three-month intervals. The sampling points are located at the point where surface water from the Site discharges into Burnt Fly Brook, 200 feet upstream and downstream of this point, and approximately a half-mile downstream of the point at which surface water flows from the Site into Burnt Fly Brook.

PCBs have not been detected in water samples collected during the quarterly monitoring. Lead contaminant levels have not been found to be consistent, and are likely subject to seasonal variations in the rate of flow in Burnt Fly Brook. Recent surface water samples indicated that lead levels were below the human health criteria and acute aquatic Freshwater criteria, which are 5 micrograms per liter and 65 micrograms per liter, respectively. However, they were found to be slightly above the aquatic chronic freshwater criteria of 2.5 micrograms per liter. Lead has also been consistently detected at the upstream background sample location in Burnt Fly Brook, which indicates potential sources other than the BFB Site.

The most recent sediment sample data indicated no detectable PCBs in Burnt Fly Brook. Lead levels in sediment were found to be below thesediment screening criteria described in the Ontario Ministry of the Environment and Energy publication entitled, "Guidelines for the Protection and Management of Aquatic Sediment quality in Ontario, August 1993".

Treatability Study

A treatability study was conducted in 1996 and early 1997 to evaluate the effectiveness of treatment technologies on Site soils in remediating lead and PCB contamination, as specified in the 1988 ROD. Before the studies were performed, several innovative technologies were evaluated, including KPEG, B.E.S.T., Bio-Clean, and incineration, the four technologies identified in the 1988 ROD for further evaluation. Soil Washing and Chemical Dechlorination technologies were finally chosen for the treatability study.

The treatment program consisted of testing the effectiveness of these two technologies, alone and in combination, on soil specimens obtained from the Site. Over 180 different combinations of soil, reagents, temperature, and concentrations were performed and analyzed to evaluate the two technologies. Based on the results of the different treatment sample combinations, optimum soil washing processes and optimum chemical dechlorination processes were developed. Results of the study indicated that remediation of Site soil to ecology based cleanup levels could be achieved by using these two technologies in succession. However, owing to limitations in the soil characteristics and laboratory detection levels, it was not possible to achieve reduction in concentrations to human health based levels which are more stringent. The residual soil after treatment was tested and found to be deficient in properties to support re-establishment of wetlands. Further modification of the treated soil would be necessary to neutralize acidity and to minimize microbial toxicity in order to make it suitable for the re-establishment of wetlands.

SUMMARY OF SITE RISKS

Based upon the results of all RI efforts, a baseline risk assessment was conducted to estimate the risks associated with current and future conditions at the three remaining contaminated areas. The baseline risk assessment estimates the human health and ecological risk which could result from the contamination at the Site if no further remedial action was taken. Details of this risk assessment are summarized in the May 1994 report entitled Public Health Evaluation.

Human Health Risk Assessment

The reasonable maximum human exposure is evaluated. A four-step process is used for assessing Site-related human health risks for a reasonable maximum exposure scenario: Hazard Identification - identifies the contaminants of concern at the Site based on several factors such as toxicity, frequency of occurrence, and concentration. Exposure Assessment - estimates the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways (e.g. ingesting contaminated water) by which human beings are potentially exposed. Toxicity Assessment - determines the types of adverse health effects associated with

chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response). Risk Characterization - summarizes and combines outputs of the exposure and toxicity measurements to provide a quantitative (e.g. one-in-a-million excess cancer risk) assessment of Site-related risks.

The Baseline Risk Assessment that was conducted for the BFB Site evaluated the potential human health risks associated with three distinct areas of the Site, namely, Westerly Wetlands, Northerly Wetlands, and Tar Patch Area. In addition, it also evaluated Burnt Fly Brook which is found downstream of the BFB Site.

The initial step in the risk assessment process was the selection of contaminants of concern which would be representative of Site risks. Lead and PCBs are the predominant contaminants of concern (COC). However, several inorganic analytes, and volatile and semi-volatile organic compounds were also included as COCs. Those chemicals which were thought to contribute most to the Site risk, based on factors such as frequency of detection and concentration, were retained as COCs. The full list of the COCs can be found in the Public Health Evaluation report.

An important factor that impacts the risk assessment is the assumed future use of the Site. Since the Westerly Wetlands is unlikely to be developed due to the restrictions placed on protected wetlands, current and future use will remain as undeveloped wetland. As such, an exposure scenario for this area included an adult and child trespasser only. For the Westerly Wetlands, exposure of a Site trespasser to soil, sediment, surface water, and blueberries was evaluated. Potential exposure to the Northerly Wetlands and Tar Patch Area soil and sediment was evaluated for the current trespasser and the hypothetical future resident of this area. Exposure of area residents to Burnt Fly Brook sediment and surface water, and ingestion by residents of edible biota such as deer and waterfowl which may forage on the Site were also investigated as potential exposure pathways of concern for the Site.

EPA has determined that an acceptable cancer risk range is 10 -4 to 10 -6, which can be interpreted to mean that an individual may have a 1 in 10,000 to a 1 in 1,000,000 increased chance of developing cancer as a result of Site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at the Site. EPA toxicity values were used to quantify risk based on the exposure scenarios described for the Site. Lead, one of the predominant COCs at the Site, does not have an assigned EPA toxicity value. Therefore, the risk from lead exposure could not be quantified using standard risk assessment methodologies.

PCBs, benzo(a)pyrene, and benzo(b)fluoranthene are the main compounds associated with carcinogenic risk. The total risk for the Westerly Wetlands trespasser was estimated to be 1.49 x 10 -3. The dermal and ingestion pathways for soil and sediment containing PCB compounds are the primary contributors to carcinogenic risk. Ingestion of on-site blueberries was not shown to contribute significantly to elevated carcinogenic or non-carcinogenic risk.

The total risk for the combined Northerly Wetlands/Tar Patch Area trespasser scenario was estimated to be 1.07 X 10 -3. The dermal and ingestion pathways for soil and sediment containing PCB compounds are the primary contributors to carcinogenic risk. The total carcinogenic risk for a future resident living on the Northerly Wetlands/Tar Patch Area of the Site was estimated at 7.5 X 10 -3. Here too, the dermal and ingestion pathways for soil and sediment are the primary contributors to carcinogenic risk.

To assess the overall potential for non-carcinogenic effects posed by more than one contaminant, a hazard index (HI) was developed. This index measures the assumed exposures to several chemicals at low concentrations simultaneously, which could result in adverse health effects. In accordance with this approach, a hazard quotient (i.e., the ratio of the level of exposure to an acceptable level) greater than 1.0 indicates a potential for adverse non-carcinogenic health effects. The HI is summed for all media common to a particular receptor.

With regard to non-carcinogenic effects, based on the calculated His, the trespasser scenario for the Westerly Wetlands, Northerly Wetlands and Tar Patch Area, and the future residential scenario for the Northerly Wetlands/Tar Patch Area do not contribute to an unacceptable non-carcinogenic risk.

Risk associated with ingestion and dermal contact of contaminated soil, ingestion of brook sediment, dermal

contact with brook surface water, and ingestion of brook surface water could not be quantified based on exposure to lead, since no EPA verified toxicity values are available for lead. Although risk to lead was not quantified, concentrations of lead in Tar Patch Area and wetland soils (see Table 1 in Appendix II) may be considered a risk with respect to ingestion and dermal contact based on comparison to EPA Screening Levels (400 mg/kg lead) and NJDEP Soil Cleanup Criteria for lead (also 400 mg/kg lead). A qualitative evaluation for exposure to brook sediment and surface water determined that lead exposure associated with ingestion of brook sediment and dermal contact with brook surface water did not exceed a level calculated to be an acceptable intake of lead in soils and drinking water. The intake of lead associated with ingestion of venison and waterfowl was shown to be insignificant, when modeled to an acceptable lead intake associated with exposure to contaminated soils.

Ecological Risk Assessment

Ecological Risk Assessment involves a qualitative and/or semi-quantitative appraisal of the actual or potential effects of a hazardous waste site on plants and animals. A four-step process is used for assessing Site-related ecological risks for a reasonable maximum exposure scenario: Problem Formulation - a qualitative evaluation of contaminant release, migration, and fate; identification of contaminants of concern, receptors, exposure pathways, and known ecological effects of the contaminants; and selection of endpoints for further study. Exposure Assessment - a quantitative evaluation of contaminant release, migration, and fate; characterization of exposure pathways and receptors; and measurement or estimation of exposure point concentrations. Ecological Effects Assessment - literature reviews, field studies and/or tests linking contaminant concentrations to effects on ecological receptors. Risk Characterization - measurement or estimation of both current and future adverse effects.

The ecological evaluation of the BFB Site included an Ecological Risk Assessment conducted by EPA in 1992, as well as a follow-up Environmental Risk Assessment performed in 1994 by BCM Engineers Inc. for NJDEP.

The EPA Ecological Risk Assessment consisted of a comprehensive sampling and analysis program of abiotic and biota media, laboratory bioassays, and calculated risk for selected species of wildlife representing several trophic levels. The scope of the assessment was limited to the Westerly Wetlands. On the basis of standard risk assessment modeling methods utilized by EPA, no organisms, except woodcock under a high exposure scenario, were found to be at risk for lead. Mammalian predators, including red fox, and mink, and avian predators of soil invertebrates, such as woodcock, were found to be at risk because of the presence of PCBs. Based on the applied EPA reference dose, red-tailed hawk, an avian predator, was determined not to be at risk from PCBs. Herbivorous or primarily herbivorous wildlife (e.g., white tailed deer, voles, and mice) were also determined not to be at risk. Based on EPA tissue bioassays, shrews are very likely to be adversely affected by PCB levels in their tissues. Comparison of Burnt Fly Bog forage species tissue levels to the Great Lakes International Joint Commission Predator Protection Levels for PCBs indicates that woodcock, red-tailed hawk, red fox and mink may all be at risk from feeding at the Site.

The follow-up Environmental Risk Assessment performed in 1994 focused on those species that were determined not to be at risk in the EPA study. The Environmental Risk Assessment evaluated the effects of Site-related contaminants of concern, namely PCBs and lead, on the Site's natural resources in the Westerly Wetlands, Northerly Wetlands, and Tar Patch Area. Natural resources include existing flora and fauna, wetland communities, and sensitive species or habitats. A wetlands delineation performed at the Site identified approximately 25 acres of wetland areas within the three contaminated areas. No federally listed or proposed threatened or endangered flora or fauna are known to occur at or near the Site. The Environmental Risk Assessment considered the effects of lead on red-tailed hawk, fox, and deer, and PCBs on red-tailed hawk.

The Environmental Risk Assessment did not arrive at conclusions that were different from those presented in the 1992 EPA Ecological Risk Assessment. It confirmed that lead posed a risk only to avian predators (e.g. woodcock) of soil invertebrates (e.g. earthworms).PCBs pose a risk to predatory mammals such as red fox and mink, butnot to herbivorous mammals such as deer. PCBs do not pose a risk to avian predators at the higher trophic levels (e.g. red-tailed hawk), except when evaluated against the Great Lakes International Joint Commission Predator Protection Levels for PCBs.

The Environmental Risk Assessment suggests that concentrations of lead in soil may cause phytotoxicity in some species of plants, including threatened and endangered plant species that could potentially occur at the Site.

Significant uptake of PCBs into plant tissue was not measured.

REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives are specific goals to protect human health and the environment. These objectives are based on available information, applicable or relevant and appropriate requirements (ARARs), and risk-based levels established in the risk assessment.

The following remedial action objectives were established for cleanup activities for the remaining unremediated portions of the BFB Site:

- Minimize exposures to PCBs and lead in soil at levels exceeding State and Federal soil cleanup criteria, while minimizing the extent of wetlands to be excavated;
- Minimize/control releases of contaminants in sediment into surface waters during storm events;
- Minimize/control exposures to PCBs and lead in soil to ecological receptors; and
- Restore the wetlands to a productive ecosystem.

DESCRIPTION OF REMEDIAL ALTERNATIVES

CERCLA requires that the selected Site remedy be protective of human health and the environment be cost effective, comply with other applicable or relevant and appropriate requirements, and utilize permanent solutions, alternative treatment technologies, and resource recovery alternatives to the maximum extent practicable. In addition, the statute includes a preference for the use of treatment as a principal element for the reduction of toxicity, mobility, or volume of the hazardous substances.

Three different soil cleanup criteria for lead and PCBs were used during the evaluation of alternatives in the Supplemental Feasibility Study. The soil cleanup criteria were established based on the most current NJDEP soil cleanup criteria, EPA screening levels, and values derived from the ecological risk assessment. They are as follows:

- NJDEP Soil Cleanup Criteria (residential) of 0.49 mg/kg for PCBs and 400 mg/kg for lead.
- EPA Screening Levels of 1 mg/kg for PCBs and 400 mg/kg for lead.
- Ecological risk assessment based numbers of 5 mg/kg for PCBs and 8,950 mg/kg for lead.

Volumes of contaminated soil present in the three areas of concern above the three sets of cleanup criteria are shown in the Supplemental Feasibility Study Report. The estimated costs of remediation using the three sets of cleanup criteria for the different remedial alternatives considered are also shown in the report.

The remedy selection process described herein is based on the most stringent human health based cleanup criteria of 0.49 mg/kg for PCBs and 400 mg/kg for lead (note: these levels are also more stringent than the ecological risk assessment based numbers described above).

Use of these criteria will allow for unrestricted use of portions of the Site in the future.

The Supplemental FS report evaluates in detail six remedial alternatives for addressing the contamination associated with the Westerly Wetlands and Northerly Wetlands, and seven alternatives for addressing the contamination associated with the Tar Patch Area. The Westerly Wetlands and Northerly Wetlands were evaluated separately from the Tar Patch Area because the natural characteristics of the wetland areas and the Tar Patch area are distinctly different, and the contaminant distributions are also different, hence, warranting different considerations in the remedy selection process. For ease of identification in this ROD, the remedial alternatives for the wetland areas (Westerly Wetlands and Northerly Wetlands) are listed as Alternative W-1 through Alternative W-6, while those for the Tar Patch Area are listed as Alternative TP-1 through Alternative TP-7.

The remedial alternatives are described in detail below. Implementation times given include the time necessary to construct and implement the remedy but do not include the time required for design or award of a contract for

the performance of the work.

Westerly Wetlands and Northerly Wetlands

Alternative W-1 - No Action

Westerly Wetlands	Northerly Wetlands
Capital Cost: $0	Capital Cost: $0
O&M Cost: $0	O&M Cost: $0
Present Worth Cost: $0	Present Worth Cost: $0
Construction Time: Not Applicable	Construction Time: Not Applicable

The Superfund program requires that the "No Action" alternative be considered as a baseline for comparison of other alternatives. The no action alternative involves no remedial action to reduce the toxicity, mobility or volume of contamination in the Westerly Wetlands and Northerly Wetlands. These portions of the Site will remain in theirpresent condition. The wetland system can continue to function as a valuable hydrologic resource and continue to provide habitat for a wide variety of flora and fauna. The contaminated sediment left behind will present a risk to some species (small mammal and avian) for an undetermined period of time. However, the natural processes of the wetland ecosystem including vegetation growth, decay, and sediment build-up are expected to gradually cover the contaminated areas over time, thus reducing the risk of exposure to the ecological receptors. The effectiveness of this cover process would require careful monitoring. Over the past ten years, obvious visible changes have been observed in the wetland areas with a steady improvement in the vegetation.

Before surface water leaves the Site, the sedimentation basin that has already been constructed in the Downstream Area will collect any contaminated sediment that may migrate in storm flows originating from the rest of the Site. Although the presence of lead was detected in surface water within the Westerly Wetlands in the past, the on-going monitoring of surface water and sediment in Burnt Fly Brook immediately downstream of the Site has not shown appreciable levels of lead in the water (refer to the section on Quarterly Monitoring of Surface Water and Sediment on page 13). Because this alternative would result in contaminants remaining on Site, CERCLA requires that the Site be reviewed every five years. If justified by the review, further remedial action may be implemented to address the contaminated soil.

Alternative W-2 - Limited Action and Institutional Controls

Westerly Wetlands	Northerly Wetlands
Capital Cost: $76,400	Capital Cost: $41,600
Annual O&M Cost: $3,850 (for 30 years)	Annual O&M Cost: $1,950 (for 30 years)
Present Worth Cost: $136,000	Present Worth Cost: $71,000
Construction Time: 6 months	Construction Time: 6 months

Alternative W-2 consists of the installation of additional security fencing in areas where fencing has not already been provided, and the recording of a Deed Notice for the contaminated areas of the Site to restrict future use of the Site. Protection of human health will be achieved by constructing the fence which will prevent potential exposure to contaminants through direct contact. The wetland system can continue to function as a valuable hydrologic resource and continue to provide habitat for a wide variety of flora and fauna. The contaminated sediment left behind will present a risk to some species (small mammals and avian species) for an undetermined period of time. However, the natural processes of the wetland ecosystem including vegetation growth, decay, and sediment build-up are expected to gradually cover the contaminated areas over time, thus reducing the risk of exposure to ecological receptors. The effectiveness of this cover process would require careful monitoring over the past ten years, obvious visible changes have been observed in the wetland areas with a steady improvement in the vegetation.

Before surface water leaves the Site, the existing sedimentation basin in the Downstream Area will collect any

contaminated sediment that may migrate in storm flows originating from the rest of the Site. Although lead was detected in surface water within the Westerly Wetlands in the past, the on-going monitoring of surface water and sediment in Burnt Fly Brook immediately downstream of the Site has not shown appreciable levels of lead in the water (refer to section on Quarterly Monitoring of Surface Water and Sediment on page 13). Because this alternative would result in contaminants remaining on Site, the Site will be reviewed every five years in accordance with the requirements of CERCLA.

Alternative W-3 - Excavation, Off-site Disposal, and Wetland Restoration

Westerly Wetlands	Northerly Wetlands
Capital Cost: $28,202,000	Capital Cost: $2,583,000
Annual O&M Cost: $4,250 (for 7 years)	Annual O&M Cost: $4,250 (for 7 years)
Present Worth Cost: $28,227,000	Present Worth Cost: $2,608,000
Construction Time: 1 year 6 months	Construction Time: 6 months

Alternative W-3 consists of the excavation and off-site disposal of contaminated soil present in the Westerly Wetlands and Northerly Wetlands. The excavated areas will be backfilled with clean loamy soil that is capable of sustaining wetland vegetation. Wetlands will be restored in the areas affected by excavation. The newly created wetlands will be monitored for at least seven years to ensure proper restoration of wetlands.

Alternative W-4 - Consolidation, and Wetland Restoration

Capital Cost: $7,660,000
Annual O&M Cost: $10,200 (for 30 years)
Present Worth Cost: $7,835,000
Construction Time: 2 years

(Costs associated with this alternative are not shown separately for the two wetland areas as the remedial activities will be focused on the combined area.).

Alternative W-4 consists of partial relocation of contaminated soil into areas within the impacted areas of the Westerly Wetlands and Northerly Wetlands for consolidation. The consolidation areas will be chosen so as not to impede drainage within the Site. The soil will be allowed to remain in place for a year in order for it to consolidate by its own weight. An impermeable soil cap will be constructed on top of the consolidated soil to limit exposure to contamination. The excavated areas will be backfilled with clean loamy soil that is capable of sustaining wetland vegetation. Wetlands will be restored in the backfilled areas. The newly created wetlands will be monitored for at least seven years to ensure proper restoration of wetlands. The consolidated areas will be maintained for 30 years with periodic inspection of the cap to ensure that its structural integrity is maintained. Because this alternative would result in contaminants remaining on Site, CERCLA requires that the Site be reviewed every five years. If justified by the review, further remedial action may be implemented to address the contaminated soil.

Alternative W-5 - Pyrokiln Thermal Treatment, and Wetland Restoration

Westerly Wetlands	Northerly Wetlands
Capital Cost: $67,920,000	Capital Cost: $4,090,000
Annual O&M Cost: $4,250 (for 7 years)	Annual O&M Cost: $4,250 (for 7 years)
Present Worth Cost: $67,945,000	Present Worth Cost: $4,115,000
Construction Time: 6 years 4 months	Construction Time: 2 years 3 months

Alternative W-5 involves the incineration of the contaminated soil in a rotary kiln while adding inorganic additives to promote thermal volatilization and/or encapsulation. The resultant ash is a mass of stabilized slag

of insoluble, inert particles. Fluxing compounds are required to be added to promote the formation of nodules of the required size. A pilot study would be required to determine the required fluxing compounds, before full scale implementation. The residual material after treatment will not be suitable for the establishment of wetlands and hence will be disposed of off-site. The excavated areas will be backfilled with clean loamy soil that is capable of sustaining wetland vegetation. Wetlands will be restored in the backfilled areas. The newly created wetlands will be monitored for at least seven years to ensure proper restoration of wetlands.

Alternative W-6 - Soil Washing, Chemical Dechlorination, and Wetland Restoration

Westerly Wetlands

Capital Cost: $104,695,000
Annual O&M Cost: $3,550
(for 7 years)
Present Worth Cost: $104,720,000
Construction Time:
6 years 4 months

Northerly Wetlands

Capital Cost: $7,790,000
Annual O&M Cost: $3,550
(For 7 years)
Present Worth Cost: $7,815,000
Construction Time:
2 years 6 months

Alternative W-6 involves high-energy contacting and mixing of contaminated soil with an aqueous solution in a series of mobile washing units for soil washing treatment. After soil washing is completed, the material will undergo chemical dechlorination treatment. The soil washing/chemical dechlorination technologies will only remediate the soil to the higher remediation goals of 5 mg/kg for PCBs and 8950 mg/kg for lead. Treated soil will be disposed of off- Site, because it will not be suitable for establishing wetlands. The excavated areas will be backfilled with clean loamy soil that is capable of sustaining wetland vegetation. Wetlands will be restored in the backfilled areas. The newly created wetlands will be monitored for at least seven years to ensure proper restoration.

Tar Patch Area

Alternative TP-1 - No Action

Capital Cost: $0
O&M Cost: $0
Present Worth Cost: $0
Construction Time: Not applicable

The Superfund program requires that the "No Action" alternative be considered as a baseline for comparison of other alternatives. The no action alternative involves no remedial actions to reduce the toxicity, mobility or volume of contamination in the Tar Patch Area. This part of the Site will continue to remain in its present unvegetated condition, thus remaining vulnerable to more severe erosion and transport of contaminants downstream. Before surface water leaves the Site, the sedimentation basin that has already been constructed in the Downstream Area will collect sediment that may migrate in storm flows originating from the rest of the Site. Because this alternative would result in contaminants remaining on Site, CERCLA requires that the Site be reviewed every five years. If justified by the review, further remedial action may be implemented to remove or treat the contaminated soil.

Alternative TP-2 - Limited Action and Institutional Controls

Capital Cost: $60,000
Annual O&M Cost: $3,600 (for 30 years)
Present Worth Cost: $114,700
Construction Time: 2 months

Alternative TP-2 consists of the installation of security fencing around the Tar Patch Area, and the recording of a Deed Notice for the contaminated area to limit future use of the area. Protection of human health will be achieved by constructing the fence which will prevent potential exposure to contaminants through direct contact. Before surface water leaves the Site, the sedimentation basin that has already been constructed in the Downstream

Area will collect sediment in storm flows originating from the rest of the Site, including the Tar Patch Area. Because this alternative would result in contaminants remaining on Site, the Site will be reviewed every five years in accordance with the requirements of CERCLA.

Alternative TP-3 - Excavation, Off-site Disposal, and Wetland Establishment

Capital Cost: $13,965,000
Annual O&M Cost:: $1,100 (for 7 years)
Present Worth Cost: $13,975,000
Construction Time: 1 year

Alternative TP-3 consists of the excavation and off-site disposal of contaminated soil present in the Tar Patch Area. The excavated areas will be backfilled with clean loamy soil that is capable of sustaining wetland vegetation. Wetlands will be created in the area affected by excavation. The newly created wetlands will be monitored for at least seven years to ensure proper establishment of wetlands.

Alternative TP-4 - Consolidation, and Wetland Establishment

Capital Cost: $2,670,000
Annual O&M Cost: $6,200 (for 7 years)
Present Worth Cost: $2,765,000
Construction Time: 1 year 6 months

Alternative TP-4 consists of partial relocation of contaminated soil into areas within the impacted Tar Patch Area for consolidation. The consolidation areas will be chosen so as not to impede drainage within the Site. The soil will be allowed to remain in place for a year to allow it to consolidate by its own weight before constructing the cap. An impermeable soil cap will be constructed on top of the consolidated soil to limit exposure to the contaminated soil. The excavated areas will be backfilled with clean loamy soil capable of sustaining wetland vegetation. Wetlands will be created in the backfilled areas. The newly created wetlands will be monitored for at least seven years to ensure proper establishment of wetlands. The consolidated areas will be maintained for 30 years with periodic inspection of the cap to ensure that its structural integrity is maintained. Because this alternative would result in contaminants remaining on Site, CERCLA requires that the Site be reviewed every five years. If justified by the review, further remedial action may be implemented to address the contaminated soil.

Alternative TP-5 - Pyrokiln Thermal Treatment, and Wetland Establishment

Capital Cost: $29,045,000
Annual O&M Cost: $1,100 (for 7 years),
Present Worth Cost: $29,050,000
Construction Time: 3 years 1 month

Alternative TP-5 involves the incineration of the contaminated soil in a rotary kiln and adding inorganic additives to promote thermal volatilization and/or encapsulation. The resultant ash is a mass of stabilized slag of insoluble, inert particles. Fluxing compounds are required to be added to promote the formation of nodules of the required size. A pilot study to determine the required fluxing compounds would be required before full scale implementation. The residual material after treatment will not be suitable for the establishment of wetlands and hence will be disposed of off-site. The excavated areas will be backfilled with clean loamy soil. Wetlands will be created in the backfilled areas. The newly created wetlands will be monitored for at least seven years to ensure proper establishment of wetlands.

Alternative TP-6 - Soil Washing, Chemical Dechlorination, and Wetland Establishment

Capital Cost: $34,525,000
Annual O&M Cost: $1,100 (for 7 years)
Present Worth Cost: $34,530,000
Construction Time: 3 years 1 month

Alternative TP-6 involves high-energy contacting and mixing of contaminated soil with an aqueous solution in a series of mobile washing units, to perform soil washing. After soil washing is completed, the material will undergo chemical dechlorination treatment. The soil washing and chemical dechlorination technologies will only remediate the soil to the higher remediation goals of 5 mg/kg for PCBs and 8950 mg/kg for lead. Treated soil will be disposed of off-site as it will not be suitable for establishing wetlands. The excavated areas will be backfilled with clean loamy soil. Wetlands will be created in the backfilled areas. The newly created wetlands will be monitored for at least seven years to ensure proper establishment of wetlands.

Alternative TP-7 - Capping-and Engineering Controls

Capital Cost: $2,485,000
Annual O&M Cost: $6,200 (for 30 years)
Present Worth Cost: $2,580,000
Construction Time: 4 months

Alternative TP-7 involves the construction of an impermeable soil cap over the contaminated area. The cap will limit exposure to the contaminated soil and prevent erosion of contaminated soil during storm flows. Engineering controls will be provided to facilitate the movement of storm water originating in upstream areas, around the capped area. The capped area will be maintained for 30 years with periodic inspection of the cap to ensure that its structural integrity is preserved. Because this alternative would result in contaminants remaining on Site, CERCLA requires that the Site be reviewed every five years. If justified by the review, further remedial action may be implemented to address the contaminated soil.

SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

In accordance with the NCP, a detailed analysis of each remedial alternative was conducted with respect to each of the nine criteria described below. This section discusses and compares the performance of the remedial alternatives when considered against these criteria. All selected alternatives must at least attain the Threshold Criteria. The selected alternative should provide the best balance among the nine criteria. The Modifying Criteria were evaluated following the public comment period.

The evaluation criteria are described below:

Threshold Criteria

1. Overall protection of human health and the environment addresses whether or not an alternative provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2. Compliance with applicable or relevant and appropriate requirements (ARARs) addresses whether or not an alternative will meet all of the ARARs of the Federal and State environmental statutes or provide a basis for invoking a waiver.

Primary Balancing Criteria

3. Long-term effectiveness and permanence refers to the magnitude of residual risk and the ability of an alternative to maintain reliable protection of human health and the environment over time, once remedial objectives have been met.

4. Reduction of toxicity. mobility, or volume through treatment addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce toxicity, mobility, or volume of the hazardous substances as a principal element.

5. Short-term effectiveness refers to the period of time that is needed to achieve protection, as well as the alternative's potential to create adverse impacts on human health and the environment during the construction and implementation period.

6. Implementability is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular alternative.

7. Cost includes estimated capital, and operation and maintenance costs, and net present worth costs.

Modifying Criteria

8. Support Agency acceptance indicates whether, based on its review of the RI and FS reports and the ROD, the support agency opposes, and/or has identified any reservations with the preferred alternative.

9. Community acceptance refers to the public's general response to the alternatives described in the Proposed Plan and the RI/FS reports. Responses to public comments are addressed in the Responsiveness Summary (see Appendix VI).

Westerly Wetlands and Northerly Wetlands

The following presents a comparative analysis of the alternatives for the Westerly Wetlands and Northerly Wetlands based upon the evaluation criteria noted above.

Overall Protection of Human Health and the Environment

Alternatives W-3 and W-5 provide for the maximum protection of human health and the environment on-site, since under each of these alternatives, all contaminated soil would be excavated and treated on site or managed off-site in some manner. Alternative W-6 will be less protective of human health, because contaminated soil will be remediated to ecological risk-based cleanup levels. However, each of these three alternatives results in significantly increased impact to the environment during implementation, because large portions of moderate and optimal wetland habitat would be destroyed to gain access, and to excavate contaminated media. The Westerly Wetlands would be impacted to a greater extent as the excavation alternative would destroy a larger area of more valuable wetlands. These three alternatives will also significantly extend the period of time needed for the whole Site ecosystem to be fully restored. There is also a level of uncertainty associated with the capabilities and effectiveness of Alternative W-5. In addition, Alternative W-5 will result in air emissions that will require collection and treatment. Alternative W-4 provides a lesser degree of protection of human health, because contaminated soil will remain on Site consolidated under an impermeable soil cap. Due to excavation, however, the impacts to the wetland ecosystem will be the same as for Alternatives W-3, W-5, and W-6. Alternative W-2 provides even lesser degree of protection of human health since all contaminated material will be allowed to remain within the wetlands, and this alternative will rely on engineering and institutional controls to prevent contaminants from migrating off-site, and to control human exposure to on-site contaminated media left in the wetlands. However, this alternative will not require destruction of any moderate and optimal wetland habitat in the Westerly Wetlands, thus allowing for continued occurrence of natural processes (i.e., sedimentation) which are expected to reduce exposure to soil contaminants over time. The Northerly Wetlands would not have the same degree of natural sedimentation and humification, because of the local hydrology and the type of vegetation. The ecosystem will be hydrologically functional and continue to support species diversity. The existing sedimentation basin within the Downstream Area will continue to prevent any off-site migration of contaminated sediment. Alternative W-1 provides the least protection of human health since all contaminated material will be allowed to remain within the wetlands without any engineering and institutional controls to limit exposures. Similar to Alternative W-2, Alternative W-1 will provide some environmental benefit by leaving moderate and optimal wetland habitat undisturbed, thereby allowing for natural processes to continue.

Compliance with ARARs

Alternatives W-3, W-5 and W-6 are expected to provide similar degrees of compliance with ARARs. Off-site disposal of treated material in Alternative W-5 and Alternative W-6 will be performed in accordance with Resource Conservation and Recovery Act (RCRA) Land Disposal Restrictions. In Alternative W-3, contaminated soil will be disposed of off-site in accordance with RCRA land disposal requirements and Toxic Substances Control Act (TSCA) regulations. Transport of materials will be done in compliance with United States Department of Transportation (USDOT) regulations for hazardous materials transportation. Air emissions during field operations will be

monitored and controlled to satisfy the requirements of the Clean Air Act. Fresh water wetlands will be restored in areas impacted by remedial activities, thereby meeting the requirements of the Fresh Water Wetlands Protection Act, and the Endangered Species Act.

Action-specific and location-specific ARARs will be met during the implementation of Alternative W-4. Wetlands will be created in the excavated areas, except in capped areas. The loss of any wetlands will be mitigated.

Alternatives W-1 and W-2 will not attain chemical-specific to-be considered (TBC) criteria for surface soils as site soil will be allowed to remain in place, untreated. Although there are current exceedances of New Jersey Surface Water Quality Standards, Alternatives W-1 and W-2, in conjunction with the sedimentation basin, are also expected to meet chemical-specific ARARs for surface water. Alternatives W-1 and W-2 will meet action-specific ARARs.

Long-Term Effectiveness and Permanence

Alternatives W-3 and W-5 are expected to be the most effective remedies in the long-term with respect to on-site protection of human health and the environment. Alternative W-6 is slightly less effective than Alternatives W-3 and W-5 since it reduces contamination to ecological risk-based cleanup levels only. Alternatives W-5 and W 6 are expected to treat the contaminated soil and, thereby, would result in less residual, untreated wastes than in the case of the other alternatives. Alternative W-3 will provide long-term effectiveness through the removal of contaminated soil from the Site for disposal off-site. Except for monitoring of wetland restoration, no other controls will be required with Alternatives W-3, W-5 and W-6. There will be uncertainty associated with the duration and the effectiveness of wetland restoration.. There is no certainty that all of the natural services and biological diversity currently provided by the existing ecosystem can ever be suitably restored, or if so, how long full restoration will take.

Alternatives W-2 and W-4 are expected to be less effective in the long-term because contaminated soil will remain on Site without treatment. Exposure to contamination will be prevented through the construction of an impermeable soil cap on consolidated soil in the case of Alternative W-4. In Alternative W-2, human exposure to contaminated soil will be prevented by constructing a security fence, and by imposing use restrictions by filing a Deed Notice on the property. The existing sedimentation basin will collect sediment in storm flows before surface water leaves the Site. The wetland system will remain unaffected by Alternative W-2, and sediment build-up from seasonal wetland processes are expected to gradually create a natural protective barrier on top of the contaminated soil. Careful monitoring of these natural processes will be needed to insure reduction in ecological exposure risks over time. Five year reviews of these alternatives will be required due to the continued presence of contamination.

Alternative W-1 is the least effective in the long-term because the contaminated soil will remain within the wetlands without any engineering and institutional controls to limit exposure. Five year reviews will be required due to the continued presence of contamination. The wetland system will remain unaffected and natural sedimentation from seasonal wetland processes is expected to create a protective cover over time. The existing sedimentation basin will collect sediment in storm flows before surface water leaves the Site.

Reduction in Toxicity, Mobility, or Volume

Alternatives W-5 and W-6 provide the greatest potential reduction of toxicity, mobility, or volume through treatment of the contaminated soil. Alternative W-5 will remediate the soil by thermal treatment.

Alternative W-6 will reduce toxicity of the soil by soil washing and chemical dechlorination.

Alternative W-4 provides a limited reduction in contaminant mobility by placing an impermeable soil cap over consolidated areas of contaminated soil. Toxicity and volume will not be reduced.

Alternative W-3 provides reduction in mobility of the contaminants by excavation and off-site disposal in a landfill. Toxicity and volume will not be reduced by this alternative.

Alternatives W-1 and W-2 provide no reduction in toxicity, mobility or volume of the contaminated soil.

Short-term Effectiveness

Alternative W-1 presents the least short-term risk to human health and the environment, because it involves no remediation and no disturbance of existing contamination within the wetlands. While the wetland areas remain contaminated, the risk of exposure to the contaminants is expected to be significantly mitigated by natural re-vegetation and sedimentation processes over time. However, while no increases in risk result in the short-term, remedial response objectives are not achieved.

Alternative W-2 can be considered to pose slightly greater short-term risk than Alternative W-1, because it involves the construction of a perimeter fence around portions of the Site where a fence has not already been constructed. However, the environmental impacts of constructing the fence at the periphery of the Site is minimal.

The remaining alternatives, all of which involve Site remediation, present greater short-term risks to human health and the environment. There will be short-term health risks associated with large scale movement of contaminated soil. Exposure controls such as the use of personal protective equipment and implementation of dust control measures will minimize short-term risks. The existing sedimentation basin in the Downstream Area will be used to capture sediment released downstream during construction operations. Off-site transportation of contaminated soil in Alternative W-3 will slightly increase potential short-term exposure risks to the adjacent community and the environment. The longer time required to implement Alternatives W-5 and W-6 will also increase the short-term risk. The impacts caused to the existing ecosystem as a result of W-3, W-4, W-5, and W-6 will be immense. There will be short-term risks to the ecosystem, biodiversity and habitat, because of such large scale disruption to the environment.

Implementability

Alternative W-1 is the most implementable of the alternatives because it requires that no action be taken.

Alternative W-2 can be implemented easily because it involves only the construction of a perimeter fence and the implementation of institutional controls (i.e., Deed Notice) by the State of New Jersey.

Among alternatives that involve Site remediation, Alternative W-3 is easier to implement than the others. Excavation of contaminated soil, off-site disposal, and backfilling with clean fill material to restore wetlands can be done using common earthmoving machinery and equipment. The existing sedimentation basin can be used for capturing any sediment migration during field operations.

Alternative W-4 will be slightly more difficult to implement because of the longer time required to complete the work. The consolidated soil will be allowed to settle for a year before the impermeable soil cap is constructed. Alternative W-4 also can be implemented using conventional earthmoving machinery and equipment.

Alternatives W-5 and W-6 are the alternatives that are most difficult to implement, because they involve the on-site setup and operation of the treatment processes. These alternatives also take the longest time to implement.

Cost

Total present worth cost estimates for implementing the alternatives range from $0 to $112,535,000. Alternative W-1 does not entail any cost because it requires that no action be taken. The next least costly alternative is Alternative W-2 with a present worth of $207,000. Alternative W-4 costs the least among alternatives that involve active Site remediation. The present worth cost for alternative W-4 is $7,835,000. Alternatives W-3 and W-5 cost $30,835,000 and $72,060,000 to implement, respectively. Alternative W-6 at a cost of $112,535,000 is the alternative with the highest cost to implement.

When only capital costs for alternatives are compared, they follow the same trend as for present worth costs.

Tar Patch Area

The following presents a comparative analysis of the alternatives for the Tar Patch Area based upon the evaluation criteria.

Overall Protection of Human Health and the Environment

Alternatives TP-3 and TP-5 provide for the maximum protection of human health and the environment on-site, because all contaminated soil would be excavated and treated on-site or managed off-site in some manner. Alternative TP-6 will be less protective of human health, because contaminated soil will be remediated to ecological risk based numbers. There is a level of uncertainty associated with the capabilities and effectiveness of Alternative TP-5. In addition, Alternative TP-5 will result in air emissions that will require collection and treatment. Alternative TP-4 and TP-7 provide a lesser degree of protection of human health, because contaminated soil will be allowed to remain on Site under an impermeable soil cap. There will be some impact to the ecosystem that exists within the Site, during remedial operations under Alternatives TP-3, TP-4, TP-5, TP-6 and TP-7. Alternative TP-2 provides even a lesser degree of protection of human health and the environment since all contaminated material will be allowed to remain on the Site. This alternative will rely on engineering and institutional controls to prevent contaminants from migrating off-site, and to control human exposure to on-site contaminated media but will continue to allow exposure to the biological receptors. The existing sedimentation basin within the Downstream Area will continue to prevent any off-site migration of contaminated sediment. Alternative TP-1 provides the least protection of human health since all contaminated material will be allowed to remain within the Site without any engineering and institutional
controls to limit exposures.

Compliance with ARARs

Alternatives TP-3, TP-5 and TP-6 are expected to provide similar degrees of compliance with ARARs. Off-site disposal of treated material in Alternative TP-5 and Alternative TP-6 will be performed in accordance with RCRA Land Disposal Restrictions. In Alternative TP-3, off-site disposal of contaminated soil will be disposed of off-site in accordance with RCRA land disposal requirements and TSCA regulations. Transport of materials will be done complying with USDOT regulations for hazardous materials transportation. Air emissions during field operations will be monitored and controlled to satisfy the requirements of the Clean Air Act. Fresh water wetlands will be restored in areas impacted by remedial activities, thereby meeting the requirements of the Fresh Water Wetlands Protection Act, and the Endangered Species Act.

Action-specific and location-specific ARARs will be met during the implementation of Alternative TP-4 and Alternative TP-7. In the case of Alternative TP-4, wetlands will be created in the excavated areas, except in capped areas. The loss of any wetlands will be mitigated.

Alternatives TP-1 and TP-2 will not attain chemical-specific TBC criteria for surface soils as site soil will be allowed to remain in place, untreated. Alternatives TP-1 and TP-2 will meet action specific ARARs.

Long-Term Effectiveness and Permanence

Alternatives TP-3 and TP-5 are expected to be the most effective in the long-term, as fair as on-site protection of human health and the environment is concerned. Alternative TP-6 is slightly less effective than Alternatives TP-3 and TP-5 since it reduces contamination to ecological risk-based cleanup levels only. This will result in lessresidual, untreated wastes than in the case of the other alternatives. Alternative TP-3 will provide long-term effectiveness through the removal of contaminated soil from the Site for disposal Off-site. Except for monitoring of wetland establishment, no other controls will be required for Alternatives TP-3, TP-5 and TP-6. For each of these alternatives, there will be uncertainty associated with the effectiveness of wetland establishment after the area is remediated.

Alternatives TP-2, TP-4 and TP-7 are expected to be less effective in the long-term because contaminated soil will remain on Site without treatment. Exposure to contamination will be prevented by constructing an impermeable cap in Alternatives TP-4 and TP-7. In Alternative TP-2, human exposure to contaminated soil will be prevented by constructing a security fence, and by imposing restrictions such as institutional controls. The existing sedimentation basin will collect any contaminated sediment that may migrate in storm flows before surface water leaves the Site. Five year reviews will be required due to the continued presence of contamination on Site.

Alternative TP-1 is the least effective in the long-term because contaminated soil will be allowed to remain on Site without any engineering and institutional controls to limit exposure. Five year reviews will be required due to the continued presence of contamination. The existing sedimentation basin will collect sediment in storm flows before surface water leaves the Site.

Reduction in Toxicity, Mobility, or Volume

Alternatives TP-5 and TP-6 provide the greatest potential reduction of toxicity, mobility, or volume through the treatment of the contaminated soil. Alternative TP-5 will remediate the soil by thermal treatment. Aiternative TP-6 will reduce toxicity of the soil by soil washing and chemical dechlorination.

Alternatives TP-4 and TP-7 provide a limited reduction in contaminant mobility by placing an impermeable soil cap over the contaminated soil. Toxicity and volume will not be reduced.

Alternative TP-3 provides reduction in mobility of the contaminants by excavation and off-site disposal in a landfill. Toxicity and volume will not be reduced by this alternative.

Alternatives TP-1 and TP-2 provide no reduction in toxicity, mobility or volume of the contaminated soil.

Short-term Effectiveness

Alternative TP-1 presents the least short-term risk to human health and the environment, because it involves no remediation and no disturbance of existing contamination within the Tar Patch Area. However, while no increases in risk result in the short-term, remedial response objectives are not achieved.

Alternative TP-2 can be considered to pose slightly greater short-term risk than Alternative TP-1 because it involves the construction of a perimeter fence around the contaminated area. However, the environmental impacts of constructing the fence at the periphery of the Tar Patch Area is minimal.

The remaining alternatives, all of which involve Site remediation, present greater short-term risks to human health and the environment. There will be short-term health risks associated with large scale movement of contaminated soil, except in the case of Alternative TP-7 where there will be less disturbance. Exposure controls such as the use of personal protective equipment and implementation of dust control measures will minimize any short-term risks. The existing sedimentation basin in the Downstream Area will be used to capture sediment released downstream during construction operations. Off-site transportation of contaminated soil in Alternative TP-3 will slightly increase potential short-term exposure risks to the adjacent community and the environment. The longer time required to implement Alternatives TP-5 and TP-6 will also increase the short-term risk. There will also be some short-term impact caused to the existing ecosystem surrounding the Tar Patch Area, because of remedial operations in this area.

Implementability

Alternative TP-1 is the most easily implementable of the alternatives because it requires that no action be taken.

Alternative TP-2 can also be implemented easily because it involves the construction of a perimeter fence, and the implementation of a declaration of environmental restriction by the State of New Jersey.

Among the alternatives that involve Site remediation, Alternative TP-7 is easier to implement than the others. The impermeable soil cap will be placed directly on top of the contaminated soil with minimal movement of the soil.

Alternative TP-3 is easier to implement than the remaining alternatives. Excavation of contaminated soil, off-site disposal, and backfilling with clean fill material to establish wetlands can be done using common earthmoving machinery and equipment. The existing sedimentation basin can be used for capturing any sediment migration field operations.

Alternative TP-4 will be slightly more difficult to implement because of the longer time required to complete the work. The consolidated soil will be allowed to settle for a year before the cap is constructed.

Alternatives TP-5 and TP-6 are the most difficult to implement because they involve the on-site setup and operation of the treatment processes. These alternatives also take the longest time to implement.

Cost

Total present worth cost estimates for implementing the alternatives range from $0 to $34,530,000. Alternative TP-1 does not entail any cost because it requires that no action be taken. The next least costly alternative is Alternative TP-2 with a present worth of $114,700. Alternatives TP-4 and TP-7 with comparable costs are the least costly among alternatives that involve active Site remediation. The present worth cost for Alternative TP-4 is $2,765,000 and the cost for TP-7 is $2,580,000. Alternatives TP-3 and TP-5 cost $13,975,000 and $29,050,000, respectively, to implement. Alternative TP-6 at a cost of $34,530,000 is the alternative with the highest cost to implement.

When capital costs for alternatives are considered, they follow the same trend as for present worth costs.

SELECTED REMEDY

NJDEP and EPA have determined after reviewing the alternatives and public comments, that the appropriate remedy for the three areas is as follows:

(a) limited Action with Institutional Controls (Alternative W-2) for the Westerly Wetlands;
(b) Excavation, Off-site Disposal, and Wetland Restoration (Alternative W-3) for the Northerly Wetlands; and
(c) Excavation, Off-site Disposal, and Wetland Establishment (Alternative TP-3) for the Tar Patch Area.

Westerly Wetlands

The selected remedy for the Westerly Wetlands is Limited Action with Institutional Controls. NJDEP and EPA believe that this alternative is protective of human health by controlling potential exposure to contamination through the installation of a security fence and, from a long-term perspective, as a result of the anticipated sediment build up from vegetative humification, which is expected to form an increasing protective barrier over the contaminated soil. Since the extent of vegetative humification would be considerably much less in the Northerly Wetlands, the Northerly Wetlands and the Tar Patch Area would continue to be active contamination sources for the Westerly Wetlands, unless remediated. Although the selected remedy does not fully mitigate the ecological risks posed by the Westerly Wetlands contamination, remediation of the Westerly Wetlands would cause significant ecological impacts to this area and it is uncertain if these wetlands could be effectively restored. As a result, the selected remedy will preserve the existing wetland system and require monitoring of the area to confirm that conditions do not deteriorate and the above-described natural protective barrier continues to develop. Additional security fencing will be installed around the Westerly Wetlands where fencing has not already been provided.

The capital cost for the selected remedy for the Westerly Wetlands has been estimated at $76,400. The annual operation and maintenance cost will be approximately $3,850. The total net present value of the cost of the selected remedy is $136,000.

The existing wetland system, which has been rated moderate to high in value, will remain hydrologically functional and continue to provide habitat, because no intrusive remedial measures will be undertaken within this portion of the Site. The natural processes of the wetland ecosystem, including continued vegetation growth and sediment build up, is expected to gradually mitigate the potential for contaminant migration and the potential for exposure to the contaminated areas for both ecological and human receptors. In addition, removal of contaminated soil from Northerly Wetlands and Tar Patch Area, which are located upstream of the Westerly Wetlands, will also eliminate the potential for migration of contaminated sediment through surface water runoff into the Westerly Wetlands.

A sedimentation basin has already been constructed at the most downstream location within the BFB Site. This basin will collect any contaminated sediment that may migrate in the near term during storm flows. Thus, most of the particulate matter in the surface water will be captured in the sedimentation basin before surface water leaves the Site. Dissolved contaminants in surface water will be monitored at the single discharge point beyond the sedimentation basin.
Accumulation of sediment in the sedimentation basin will be monitored on a regular basis and sediment will be excavated and removed for off site disposal at appropriate intervals. Natural sedimentation within the wetlands over time will also be monitored regularly through the implementation of a monitoring plan to ensure that the anticipated natural covering and containment of contamination is occurring. Monitoring will include biological, surface water and sediment sampling in the Westerly Wetlands, surface water, sediment and, if necessary, biological sampling in Burnt Fly Brook, and surface water and sediment sampling in the sedimentation basin. The monitoring plan will be developed in consultation with the Biological Technical Assistance Group (B-TAG) and will be implemented to monitor the effectiveness of this remedy selected for the Westerly Wetlands.

A Deed Notice will be prepared for filing with the appropriate authorities to control future use of the Westerly Wetlands area. Because this remedy will result in contaminants remaining on Site, the Site will be reviewed every five years in accordance with the requirements of CERCLA.

Northerly Wetlands

The selected remedy for the Northerly Wetlands is Excavation, Off-site Disposal and Wetland Restoration, which involves the excavation and off-site disposal of all contaminated soil present in the Northerly Wetlands, and the re-establishment of wetlands in the disturbed areas. Since this area is located immediately upgradient of the Tar Patch Area and surface water runoff flows from the Northerly Wetlands into the Tar Patch Area., this remedy will complement the remedy selected for the Tar Patch Area and prevent any recontamination of the Tar Patch Area after its remediation. The contamination in the Northerly Wetlands is spread over a smaller area, approximately 2.5 acres in extent, within mature forest habitat. When compared to the Westerly Wetlands, it contains a smaller volume of contaminated soil that is easily accessible.

The excavation alternative provides for the maximum protection of human health and the environment on-site as all contaminated soil will be excavated and removed off-site. Though the existing wetland areas will be destroyed during excavation, the extent of the contaminated Northerly Wetlands is small when compared to the contaminated Westerly Wetlands, and the wetland can be restored in the disturbed areas after backfilling with clean loamy soil. Off-site disposal of the contaminated soil will be done in accordance with RCRA land disposal requirements, and TSCA and USDOT regulations. Excavating and removing the contaminated soil off-site will result in a remedy that is effective in the long-term, and permanent. Mobility of the contaminants will be reduced by removing the contaminated soil to a landfill, although toxicity and volume will not be reduced. There will be minimal short-term risk to the adjacent community and the environment during the remedial action. The remedial activities are easily implementable using commonly available earthmoving machinery. A residential soil cleanup level of 0.49 mg/kg for PCBs and 400 mg/kg for lead will be used, because the Northerly Wetlands is more easily accessible to trespassers. In addition, it will allow most of the contamination to be excavated, thus preventing the further spreading of PCBs and lead into the Tar Patch Area and the Westerly Wetlands. Approximately 4,000 cubic yards of contaminated soil will be excavated and removed, and approximately 2.5 acres of wetlands will be re-established. The capital cost of the remedial activities in the Northerly Wetlands has been estimated at $2,583,000. The annual operation and maintenance cost will be approximately $4,250. The total net present value of the cost of the selected remedy is $2,608,000. EPA uses a PCB residential soil cleanup number of 1.0 mg/kg instead of the NJDEP number of 0.49 mg/kg. The difference between the two volumes generated from these cleanup levels is estimated to be 50 cubic yards, resulting in an implementation cost difference of $21,100 for the Northerly Wetlands which will be borne by NJDEP.

The newly created wetlands will be monitored for at least seven years to ensure proper restoration of wetlands. The Deed Notice will be extended to cover this area in order to preserve the wetland ecosystem that will be restored.

Tar Patch Area

The selected remedy for the Tar Patch Area is Excavation, Off-site Disposal, and Wetland Establishment, which

involves the excavation and off-site disposal of contaminated soil present in the Tar Patch Area, and the establishment of wetlands in this area. For the Tar Patch Area, the cleanup goal is based on visual contamination instead of an actual cleanup level. However, the excavation in this area should also meet the residential soil cleanup goal as described for the Northerly Wetlands. The visual goal was chosen because the contaminated area is clearly defined due to its lack of vegetation. If an exact number was specified for the Tar Patch Area, it would include vegetated portions of the Westerly Wetlands Area. By removing this area, a continuing source of contamination to the Westerly Wetlands can be removed without destroying heavily vegetated wetland areas. In addition, excavation of the Tar Patch Area would also mitigate the migration of contaminants into the Westerly Wetlands due to ground-water movement and surface water runoff.

Approximately 29,000 cubic yards of visibly contaminated soil from the unvegetated portion of the Tar Patch Area, which is approximately 4 acres in extent, will be excavated. Excavated soil will be disposed of off-site in accordance with TSCA, RCRA and USDOT regulations. Excavated areas will be backfilled with clean loamy soil that is capable of sustaining wetland vegetation. Wetlands will be created in the area, which is now devoid of any vegetation, and in any wetland areas affected by the remedial activities. The newly created wetlands will be monitored for at least seven years to ensure proper restoration of wetlands. The Deed Notice will be extended to cover this area in order to preserve the wetland ecosystem that will be restored.

The capital cost for the selected remedy for the Tar Patch Area has been estimated at $13,965,000. The annual operation and maintenance cost will be approximately $1,100. The total net present value of the cost of the selected remedy is $13,975,000. Because the cleanup goal is based on visual contamination in the Tar Patch Area instead of actual cleanup numbers, a cost differential was not determined.

Excavation and removal of the contaminated soil is preferred over capping in place, because of the unstable nature of the contaminated material present in the Tar Patch Area under extreme temperature conditions, and consideration for long-term maintenance costs.

Summary

The selected remedy for the remaining areas of concern at the BFB Site is consistent with the remedy that was chosen in the past for the Uplands Area, and the more recent provision of the sedimentation basin as an interim remedy. Access controls that are already in place for the Uplands Area and the Downstream Area will be extended to cover the Westerly Wetlands, the Tar Patch Area, and the Northerly Wetlands. The overall remedy provides the most cost-effective approach to restore a contiguous wetland ecosystem with only limited, low cost, long-term maintenance requirements. The selected remedial action is protective of human health and the environment to the extent practicable, limits disturbance and destruction of large areas of valuable wetland habitat, and, hence, minimizes the potential for migration of contaminants downstream. No additional response actions are contemplated at the Burnt Fly Bog Site at this time.

STATE ACCEPTANCE

The New Jersey Department of Environmental Protection supports the selected remedy presented in this Record of Decision for the Westerly Wetlands, Northerly Wetlands, and Tar Patch Area. The State agrees to fund all additional costs incurred during remedial action due to the application of NJDEP's more stringent PCB residential cleanup criteria. The State does not waive its rights to challenge this later.

COMMUNITY ACCEPTANCE

Community acceptance was evaluated after the close of the public comment period. Written comments received during the public comment period, as well as verbal comments during the public meeting were evaluated.

The majority of comments received during the public comment period originated from the MCEC and PRPS. While supporting the selected remedy for the Northerly Wetlands and the Tar Patch Area, the Coalition has urged that removal of contaminated sediment from any "Hot Spots" within the Westerly Wetlands be considered, particularly adjoining the Tar Patch Area. The PRPs, while being supportive of the remedy for the Westerly Wetlands, are opposed to the remedy chosen for the Northerly Wetlands and the Tar Patch Area. They recommend that a limited action alternative similar to the one proposed for the Westerly Wetlands be considered for the Northerly Wetlands

and the Tar Patch Area.

The county health officers and many others present at the public meeting were supportive of the selected remedy.

STATUTORY DETERMINATIONS

The selected remedy satisfies the statutory requirements of section 121 of CERCLA, which mandates that a remedial action be protective of human health and the environment, cost effective, and utilize permanent solutions and alternative treatment technologies to themaximum extent practicable. Section 121 also establishes a preference for remedial actions which employ treatment to permanently and significantly reduce the volume, toxicity, and mobility of the hazardous substances, pollutants, or contaminants at a Site. CERCLA
further specifies that a remedial action must attain a degree of cleanup that satisfies ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA section 121(d)(4).

For the reasons discussed below, NJDEP and EPA have determined that the selected remedy meets the requirements of Section 121 of CERCLA.

Protection of Human Health and the Environment

The selected remedy for Site soils is protective of human health and the environment, since it involves the excavation and off-site disposal of contaminated soils from the Tar Patch Area and the Northerly Wetlands and, due to conditions which are favorable for vegetative humification and sediment build-up, allows for the development and monitoring of a natural protective cover for the contamination in the Westerly Wetlands while preserving the ecological integrity of the wetland system. Once the contaminated soil is removed from the Northerly Wetlands and Tar Patch Area, wetlands will be established in the excavated areas which will result in the formation of contiguous wetlands from the Westerly Wetlands through the Northerly Wetlands. Institutional controls such as Deed Notices and engineering controls such as a perimeter fence and the sedimentation basin will also contribute to the mitigation of human risk related to any exposure to remaining contaminants.

With the appropriate engineering controls, the excavation and removal of soil from the Tar Patch Area and Northerly Wetlands will not create unacceptable short-term risks or cross-media impacts.

Compliance with ARARs

Since most of the Site is classified as wetlands, the selected remedy must comply with the NJ Freshwater Wetlands Protection Act Rules, Section 404 of the Federal Clean Water Act and Executive Order 11990 which require that actions be taken to minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. Any actions which disturb or impact wetlands would additionally require development of a wetlands mitigation plan. Since the contaminated soils in the Northerly
Wetlands and Tar Patch Area will be excavated and disposed of off site, the selected soil remedy would meet chemical-specific, location specific and action-specific Federal and State ARARs and TBCs for the contaminated soils. Although the remedial alternative for the Westerly Wetlands will not meet chemical-specific ARARs and TBCs, it does provide adequate level of protection of human health and the environment while limiting the disturbance and destruction of large areas of valuable wetland habitat.

Cost-effectiveness

Of the alternatives which most effectively address the threats posed by Site contamination, the selected remedy is cost-effective as it has been determined to provide the greatest overall effectiveness in proportion to its cost. The selected remedy results in a net present value of the estimated total project cost for all three areas of $16,719,000.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The selected remedy represents the maximum extent to which permanent solutions and alternative treatment technologies can be utilized in a cost-effective manner for the BFB Site. Excavation and Removal of contaminated soil, from the Northerly Wetlands and Tar Patch Area will offer a permanent solution to the risks posed

contaminated soils in these two areas. The sedimentation basin that has already been constructed upstream of Burnt Fly Brook will collect sediment leaving the Westerly Wetlands during runoff and storm flows, thus reducing potential migration of contaminants into downstream surface water bodies. As a result of the implementation of the monitoring program to be developed in accordance with this ROD, monitoring data will be obtained to determine the effectiveness of the remedy selected for the Westerly Wetlands. The sediment collected in the basin will be removed off-site for disposal at regular intervals. In summary, the selected remedy provides the best balance of tradeoffs with respect to the nine evaluation criteria.

Preference for Treatment as a Principal Element

The selected remedy will not satisfy the statutory preference for treatment as a principal element because treatment of the principal threats of the Site was not practicable.

Treatability studies performed on contaminated soil from the Site using soil washing and chemical dechlorination technologies showed that contaminant levels could not be reduced to human health based cleanup levels. It was also found that the treated material was unsuitable for creating wetlands on Site.

The remedy provides for excavation and off-site disposal of contaminated soil from the Northerly Wetlands and Tar Patch Area, in accordance with RCRA and TSCA regulations. Based on the available data, EPA and NJDEP do not anticipate treatment of the contaminatedsoil prior to off-site landfill disposal. However, if the need for treatment arises during the remedial action, based on the nature and PCB-concentration of the material generated, such treatment will be performed prior to landfill disposal.

DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for the Site was released to the public on February 2, 1998. The Proposed Plan identified the preferred alternatives for the Westerly Wetlands, Northerly wetlands, and the Tar Patch Area. NJDEP and EPA reviewed all written and verbal comments received during the 90-day public comment period. Upon review of these comments, NJDEP and EPA determined that no significant changes to the selected remedy, as originally identified in the Proposed Plan, were necessary.

APPENDIX I

FIGURES

Figure No.	Title
1	Regional Site Location Map
2	Site Location Map
3.	Site Map

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APPENDIX II

Tables

Table No.	Title
1.	Maximum and Average Lead and PCB Concentrations in Soil
2.	Areas and Volumes of Contaminated Soil
3.	Estimate of Costs for Selected Remedy

TABLE 1

MAXIMUM AND AVERAGE LEAD AND PCB CONCENTRATIONS IN SOIL

AT BURNT FLY BOG

	Lead (mg/kg)		PCB (mg/kg)	
AREA	Maximum	Average	Maximum	Average
Tar Patch Area	53,000	2,203	1,060	8.6
Northerly Wetlands	34,800	8,168	150	78.4
Westerly Wetlands	31,000	11,575	254	51.9

Note:
mg/kg - milligrams per kilograms
(From Ecological Risk Assessment BCM 1993)
Source BCM Engineers Inc. (BCM Project No. 00-516-094)

Table 2

Areas and Volumes of Contaminated Soil

Burnt fly Bog Site

Item	Westerly Wetlands	Northerly Wetlands	Tar Patch Area
Area	21 acres	2.5 acres	5.5 acres
Volume	73,300 cu yd	4,000 cu yd	29,600 cu yd

Note

Source Burnt Fly Bog Site Supplemental Feasibility Study Report - October 1997

These volumes are approximated based on a soil cleanup level of 0.49 mg/kg for PCBs.

Table 3

Estimated Costs for Selected Remedy

Burnt fly Bog Site

Sub-site	Capital Cost	Annual O&M Cost	Present Worth cost
Westerly Wetlands	$76,400	$3,850	$136,000
Norherly Wetlands	$2,583,000	$4,250	$2,608,000
Tar Patch Area	$13,965,000	$1,100	$13,975,000,

Note:

Source Burnt Fly Bog Site Supplemental Feasibility Study Report - October 1997

APPENDIX III

Total Risk Summary Tables

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Table 1

TOTAL RISK SUMMARY
FROM THE WESTERLY WETLANDS
USE: CURRENT/FUTURE TRESPASSER

BURNT FLY BOG
MONMOUTH AND MIDDLESEX COUNTIES, NEW JERSEY

CARCINOGENIC RISK

	RME	AVERAGE
SURFACE SOIL AND SEDIMENT - INGESTION	4.37E-04	8.01E-05
SURFACE SOIL AND SEDIMENT - DERMAL	1.04E-03	1.90E-04
SURFACE SOIL - INHALATION	1.52E-06	3.61E-07
SURFACE WATER - DERMAL	*	*
BLUEBERRIES - INGESTION	1.21E-05	8.55E-06
TOTAL:	1.49E-03	2.79E-04

NONCARCLNOGENIC RISK - ADULT

	RME	AVERAGE
SURFACE SOIL AND SEDIMENT-INGESTION	7.85E-04	1.02E-04
SURFACE SOIL - INHALATION	*	*
SURFACE WATER - DERMAL	2.70E-04	1.01E-04
BLUEBERRIES - INGESTION	2.49E-02	1.41E-02
TOTAL:	2.59E-02	1.43E-02

NONCARCINOGENIC RISK - CHILD

	RME	AVERAGE
SURFACE SOIL AND SEDIMENT-INGESTION	7.33E-03	9.52E-04
SURFACE SOIL - INHALATION	*	*
SURFACE WATER - DERMAL	9.62E-04	2.14E.04
BLUEBERRIES - INGESTION	1.16E-01	6.56E-02
TOTAL:	1.24E-01	6.68E-02

Notes:
*=The only COPC for the specified route of exposure is lead for which toxicity values are not available.
RME = Reasonable Maximum Exposure.
BCM Project No: 00-0516-0902

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Table 2

TOTAL RISK SUMMARY
FROM THE NORTHERN AREA
USE . CURRENT TRESPASSER

BURNT FLY BOG
MONMOUTH AND MIDDLESEX COUNTIES, NEW JERSEY

CARCINOGENTIC RISK

		RME	AVERAGE
CURRENT TRESPASSER			
SURFACE SOIL AND SEDIMENT - INGESTION		3.32E-04	4.53E-05
SURFACE SOIL AND SEDIMENT - DERMAL		7.40E-04	6.23E-05
SURFACE SOIL - INHALATION		1.15E-06	1.46E-07
	TOTAL:	1.07E-03	1.08E-04

NONCARCINOGENIC RISK

		RME	AVERAGE
SURFACE SOIL AND SEDIMENT - INGESTION		3.88E-03	1.89E-03
SURFACE SOIL AND SEDIMENT - DERMAL		9.78E-04	2.48E-04
SURFACE SOIL - INHALATION		1.17E-05	8.40E-06
	TOTAL:	4.87E-03	2.13E-03

NONCARCINOGENIC RISK - CHILD

		REM	AVERAGE
SURFACE SOIL AND SEDIMENT - INGESTION		3.62E-02	1.77E-02
SURFACE SOIL AND SEDIMENT - DERMAL		2.07E-03	5.25E-04
SURFACE SOIL - INHALATION		4.81E-05	3.42E-05
	TOTAL:	3.83E-02	1.82E-02

Notes:
*=The only COPC for the specified route of exposure is lead for which toxicity values are not available.
RME = Reasonable Maximum Exposure.
BCM Project No.: 00-0516-0902

<IMG SRC 98143G>

Table 3

TOTAL RISK SUMMARY
FROM THE NORTHERN AREA
USE: FUTURE RESIDENT

BURNT FLY BOG
MONMOUTH AND MIDDLESEX COUNTIES, NEW JERSEY

CARCINOGENTIC RISK

	RME	AVERAGE
FUTURE RESIDENT		
SURFACE SOIL AND SEDIMENT - INGESTION	2.32E-03	3.17E-04
SURFACE SOIL AND SEDIMENT - DERMAL	5.18E-03	2.87E-04
GROUNDWATER - INGESTION	*	*
GROUNDWATER - DERMAL	*	*
TOTAL:	7.50E-03	6.04E-04

NONCARCINOGENIC RISK - ADULT

	RME	AVERAGE
SURFACE SOIL AND SEDIMENT - INGESTION	2.71E-02	1.32E-02
SURFACE SOIL AND SEDIMENT - DERMAL	6.85E-03	1.74E-03
GROUNDWATER - INGESTION	*	*
GROUNDWATER - DERMAL	*	*
TOTAL:	3.40E-02	1.50E-02

NONCARCINOGENIC RISK - CHILD

	RME	AVERAGE
SURFACE SOIL AND SEDIMENT - INGESTION	2.53E-01	1.24E-01
SURFACE SOIL AND SEDIMENT - DERMAL	1.45E-02	3.67E-03
GROUNDWATER - INGESTION	*	*
GROUNDWATER - DERMAL	*	*
TOTAL:	2.68E-01	1.27E-01

Notes:
*=The only COPC for the specified route of exposure is lead for which toxicity values are not available.
RME = Reasonable Maximum Exposure.

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TABLE 4

Compounds of Potential Concern

Westerly Wetlands Soil/Sediment	Westerly Wetlands Surface Water	Westerly Wetlands Blueberries	Westerly Wetlands Groundwater	Northern Area Soil/Sediment	Burnt Fly Brook Sediment	Burnt Fly Brook Surface Water
lead	lead	aluminum	lead	cadmium	lead	lead
copper	mercury	arsenic		copper		
zinc	zinc	barium		lead		
PCBs		beryllum		zinc		
elthybenzenene		chromium		PCB		
toluene		lead		ethylbenzene		
xylene		silver		methylene chloride		
2,4-dimethyl phenol		vanadium		toluene		
4-methyl phenol		zinc		2-methylnaphylene		
phenol		aldrin		benzo(a)anthracene		
		methoxychlor		benzo(a)pyrene		
				benzo(b)fluoranthene		
				benzo(g,h,l)perylene		
				benzo(k)fluoranthene		
				bls[2-ethythexyl]phthalate		
				chrysene		
				fluoranthene		
				naphthalene		
				phenanthrene		
				phenol		
				pyrene		

<IMG SRC 98143I>
<IMG SRC 98143J>
<IMG SRC 98143K>
<IMG SRC 98143L>

<IMG SRC 98143M>

Table 7

TOXICITY ASSESSMENT SUMMARY TABLE - NONCARCINOGENS

CHEMICAL	CHRONIC RfD (mg/kg/day)		RfD BASIS (species, exposure)	CRITICAL EFFECT		CONFIDENCE LEVEL UF AND MF*
ORAL EXPOSURE						
Aldrin	3.0E-05	(1)	rat; diet	liver toxicity		med/UF=1,000, MF=1
Arsenic	3.0E-04	(1)	human; d water	skin changes		med/UF=3, MF=1
Aluminum	2.9E-00	(5)	not known	not known		not known
Barium	7.0E-02	(1)	human; d water	increased blood pressure		UF=3,000, MF=1
Beryllium	5.0E-03	(1)	rat; drinking water	no effects observed		low/UF=100, MF=1
Bis(2-ethylhexyl)phthalate	2.0E-02	(1)	guinea pig, diet	increased liver weight		med/UF=1,000, MF=1
Cadmium	1.0E-03	(1)	human; chronic	kidney toxicity		high/UF=10, MF=1
Chromium	5.0E-03	(3)	rat; drinking water	no effects observed		low/UF=500, MF=1
Copper	3.71E-02	(4)	human; NA	g.i. tract irritation		NA
2,4-Dimethyl phenol	2.0E-02	(1)	mouse; gavage	clinical/hemat. changes		low/UF=3,000, MF=1
Ethylbenzene	1.0E-01	(1)	rat; gavage	liver and kidney toxicity		low/UF=1,000, MF=1
Fluoranthene	4.0E-02	(1)	mouse; gavage	nephrotox., hemat. et al		low/UF=3,000, MF=1
Mercury	3.0E-04	(2)	rat; oral	kidney toxicity		UF=1,000
Methoxychlor	5.0E.03	(1)	rabbit; gavage	reproductive toxicity		UF=1000, MF=1
Methylene chloride	6.0E-02	(1)	rat; drinking water	liver toxicity		med/UF=100; MF=1
4-Methyl phenol	5.0E-03	(2)	rat; gavage	resp. distress, cyanosis, death		UF=1,000
Naphthalene	4.0E-02	(2)	rat; gavage	low body weight gain		UF=10,000
Phenol	6.0E-01	(1)	rat; gavage	fetotoxicity		low/UF=100; MF=1
Pyrene	3.0E-02	(1)	mouse; gavage	kidney toxicity		UF=3000, MF=1
Silver	5.0E-03	(1)	human; iv	skin argyria		UF=3, MF=1
Toluene	2.0E-01	(1)	rat; gavage	liver/kidney wt change		med/UF=1,000; MF=1
Vanadium	7.0E-03	(2)	rat; drinking water	no effect observed		UF=100
Xylenes	2.0E+00	(1)	rat; gavage	hyperactivity, low b.w.		med/UF=100, MF=1
Zinc	3.0E-01	(1)	human; diet supplements	decreased ESOD	(6)	UF=10

*UF=Uncertainty Factor, MF=Modifying Factor, NA=not applicable, Confidence Levels = high, medium (med), or low.
(1) IRIS
(2) HEAST
(3) Oral RFD for Hexavalent Chromium
(4) The Oral RfD for Copper is extrapolated from a drinking water standard (1.3 mg/l) suggested in HEAST
(5) EPA-ECAO (cited in Region III Rusk-Based Concentration Table, Fourth Quarter 1993)
(6) ESOD = erythrocyte superoxide dismutase concentration
(7) Calculated from inhalation reference concentrations (RfCs) cited in IRIS or HEAST
(8) Inhalation RfC withdrawn from HEAST

<IMG SRC 98143N>

Table 8

TOXICITY ASSESSMENT SUMMARY TABLE - CARCINOGENS

CHEMICAL	WEIGHT OF EVIDENCE		SLOPE FACTOR (SF) (l/(mg/kg/day))		SF BASIS (species, exposure)	TARGET ORGAN
ORAL EXPOSURE						
Aldrin	B2	(1)	1.7E-01	(1)	mouse; diet	liver
Arsenic	A	(1)	1.75E-00	(3)	human, drinking water	skin
Beryllium	B2	(1)	4.3E-00	(1)	rat; drinking water	total tumors (>1 type)
Benzo[a]anthracene	B2	(1)	7.30E-01	(4)	NA	NA
Benzo[b]fluoranthene	B2	(1)	7.30E.01	(4)	NA	NA
Benzo[k]fluoranthene	B2	(1)	7.30E.02	(4)	NA	NA
Benzo[a]pyrene	B2	(1)	7.30E-00	(1)	mouse, diet	stomach
Bis(2-ethylhexyl)phthalate	B2	(1)	1.4E-02	(1)	mouse, diet	liver
Chrysene	B2	(1)	7.30E-03	(4)	NA	NA
Methylene chloride	B2	(1)	7.5E-03	(1)	mouse; d water/inhal	liver
Polychlorinated biphenyls	B2	(1)	7.7E-00	(1)	rat, diet	liver
INHALATION EXPOSURE						
Cadmium	B1	(1)	6.3E+00	(1)	human; inhalation	lung, trachea
Benzo[a]anthracene	B2	(1)	6.1E-01	(4)	NA	NA
Benzo[a]pyrene	B2	(1)	6.1E+00	(5)	hamster, inhalation	respiratory tract
Benzo[b]fluoranthene	B2	(1)	6.1E-01	(4)	NA	NA
Benzo[k]fluoranthene	B2	(1)	6.1E-02	(4)	NA	NA
Chrysene	B2	(1)	6.1E-03	(4)	NA	NA

* NA=not applicable.
(1) IRIS
(2) HEAST
(3) Arsenic slope factor calculated from proposed unit risk of 5E-05 1(ug/l) cited in IRIS
(4) Cited in EPA Region III Risk-Based Concentration Table, Fourth Quarter 1993
    (TEF approach to PAH carcinogenicity, see text Section 4)
(5) Withdrawn from HEAST

APPENDIX-IV

BURNT FLY BOG SUPERFUND SITE

ADMINISTRATIVE RECORD FOR OPERABLE UNIT 3

1. Record of Decision, Burnt Fly Bog - 1983
2. Westerly Wetland Remedial Investigation Final Report, Burnt Fly Bog Site - January 1988
3. Westerly Wetland Ultimate Remedy Feasibility Study Final Report, Burnt Fly Bog Site - January 1988
4. Westerly Wetland Lead Mobility Studies Final Report, Burnt Fly Bog Site - February 1988
5. Westerly Wetland Water Budget Final Report, Burnt Fly Bog Site - February 1988
6. Record of Decision, Burnt Fly Bog, Westerly Wetlands - September 1988
7. Ecological Assessment Final Report, Burnt Fly Bog - June 1992
8. Final Field Sampling and Testing Results Report - Tar Patch Area - May 1994
9. Final Design Report, Burnt Fly Bog Sedimentation Pond Design - September 1994
10. Background Investigation Report, Burnt Fly Bog - March 1994
11. Health and Safety Plan for Burnt Fly Bog Westerly Wetlands - September 1993
12. Public Health Evatluation for the Supplemental Feasibility Study of Burnt Fly Bog - May 1994
13. Burnt Fly Bog Wetland Delineation Report - May 1994
14. Functional Assessment Report for the Supplemental Feasibility Study of Burnt Fly Bog - February 1994
15. Environmental Risk Assessment for the Supplemental Feasibility Study of Burnt Fly Bog - March 1994
16. Burnt Fly Bog Superfund Site Treatability Study Final Report - April 1997
17. Burnt Fly Bog Wetlands Restoration and Environmental Evaluation Study - June 1997
18. Final Supplemental Feasibility Study Report for Burnt Fly Bog Site - October 1997
19. Site Review and Update, Burnt Fly Bog (US Department of Health and Human Services, ATSDR) - December 4, 1997
20. Northerly Wetlands Field sampling Report, Burnt Fly Bog Superfund Site Supplemental Feasibility Study - January 1997
21. Westerly Wetlands Field Sampling Report, Burnt Fly Bog Superfund Site, Supplemental Feasibility study - September 1997
22. Superfund Proposed Plan, Burnt Fly Bog Site - February 1998
23. Community Relations Plan - Update for Remedial Actions at the Burnt Fly Bog Superfund, Site, Marlboro Township, Monmouth County, June 1996
24. Notice of public availability of the Proposed Plan dated February 1998
25. Transcript of the Public Meeting hold on February 19, 1998 in Marlboro September 9, 1998

APPENDIX V

NJDEP's Letter of Concurrence

STATE OF NEW JERSEY

Christine Todd Whitman
Governor

Department of Environmental Protection

Robert C. Shinn, It
Comissioner

Ms. Jeanne M. Fox
Regional Administrator
U.S. EPA - Region II
290 Broadway
New York, NY 10007-1866

SEP 28 1998

Subject: Burnt Fly Bog Superfund Site
Record of Decision (ROD) - Operable Unit 3

Dear Ms. Fox:

The New Jersey Department of Environmental Protection (NJDEP) has evaluated and concurs with the components of the selected remedy as described below for the Burnt at Fly Bog Superfund Site. The selected remedy corresponds to the third operable unit for the Site, which is located in Marlboro Township, Monmouth County, New Jersey.

The major components of the selected remedy include:

1. Excavation and off-site disposal of contaminated soil from the Northerly Wetlands;
2. Excavation and off-site disposal of contaminated soil from the Tar Patch Area;
3. Backfilling the excavated area in the Northerly Wetlands and re-establishing wetlands;
4. Backfilling the excavated area in the Tar Patch Area and creating wetlands;
5. Provision of additional security fencing around the Westerly Wetlands, and the recording of Deed Notices for the Westerly Wetlands, Northerly Wetlands, and Tar Patch Area;
6. Monitoring of surface water and sediment in the Westerly Wetlands, surface water and sediment in the existing sedimentation basin located in the Downstream Area, and surface water, sediment and, if necessary, biota in Burnt Fly Brook; and
7. Biological sampling in the Westerly Wetlands.

NJDEP concurs that the seleced remedy is protective of human health and the environment, complies with requirements, that are legally applicable or relevant and appropriate for the remedial action, and is cost effective. Although the State disagrees with the PCB cleanup number selected by EPA, we still concur with the remedy since it does not affect the selected cleanup methods.

The State of New Jersey appreciates the opportunity afforded to participate in the Superfund process.

APPENDIX VI

Responsiveness Summary
Burnt Fly Bog Superfund Site

This responsiveness summary is divided into the following sections:

A. Overview
B. Background on Community Involvement
C. Summary of Comments received during the Public Comment Period and NJDEP responses.
   -- Part I: Summary and responses to community concerns voiced at the February 19, 1998 public meeting
   -- Part II: Summary and responses to written concerns received during the public comment period

A. Overview

This is a summary of the comments and questions from the public regarding the Proposed Plan, dated February 1998, for remediation of the Burnt Fly Bog (BFB) Superfund Site, and the New Jersey Department of Environmental Protection's (NJDEP) and U.S. Environmental Protection Agency's (USEPA) responses to those comments and questions.

A public comment period was held from February 4, 1998 through May 4, 1998 to provide interested parties the opportunity to comment on the Proposed Plan for the BFB Site. During the comment period, NJDEP held a public meeting on February 19, 1998 at 7:00 PM at the Marlboro Municipal Building to discuss results of the Remedial Investigation and Supplemental Feasibility Study (RI/SFS) reports, and to present the NJDEP/USEPA preferred alternative for remediation of the Site.

The preferred remedial alternative addresses three remaining unremediated areas of the Site under Operable Unit 3. The remedy as such is the preferred remedy for the Westerly Wetlands, Northerly Wetlands and Tar Patch Area at the BFB Site. The remedial alternatives that were evaluated and presented in the Proposed Plan were developed for remediation of the Site in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Specifically, the preferred alternative includes 1) limited action and institutional controls for the Westerly Wetlands; 2) excavation with off-site disposal and wetlands restoration for the Northerly Wetlands; and 3) excavation with off-site disposal and wetlands establishment for the Tar Patch Area.

B. Background on Community Involvement and Concerns

The Burnt Fly Bog has consistently received attention from area residents, municipal, state, county and federal officials as well as the media. In 1981, concerned residents organized the Burnt Fly Bog Citizens Advisory Committee (BFBCAC). The Committee includes citizen representatives from Marlboro and Old Bridge Townships as well as officials from Monmouth and Middlesex Counties. NJDEP representatives have met regularly with this group since 1981 and continue to do so. In 1998, a group known as the Monmouth County Environmental Coalition received a Technical Assistance Grant from the USEPA to hire technical advisors to review documents and offer input to the cleanup process.

A primary concern of the community has always been the protection of the Englishtown Aquifer. Because the Site is a ground water discharge area located within the Englishtown Aquifer, there has been no significant migration of contaminants into this major water supply resource. Also, the Site is underlain by Woodbury clay, which is a significant aquitard in this region. The Woodbury clay separates the Englishtown Aquifer from the Lower Magothy Aquifer, thereby preventing the migration of contaminants to the aquifer below. Other issues of concern have focused on the potential environmental and public health risks posed by the Site. In particular, the ingestion of contaminated water has been an issue because of the high concentrations of lead on the Site. NJDEP routinely tests surface water in Burnt Fly Brook, which receives surface water discharges from the Site, to monitor water quality. Residents and officials of Old Bridge, Perth Amboy and Matawan have also expressed concern about potential contaminant migration to the Deep Run water body, which receives drainage from Burnt Fly Brook and

recharges the Perth Amboy Wellfield. As an interim remedy, a sedimentation basin was constructed in 1996 at a downstream location within the Site to capture sediment before surface water leaves the Site. Residents have also expressed a strong desire to ensure that a remedy does not destroy or significantly impact good quality wetlands.

C. Summary of Comments received during the Public Comment Period and NJDEP/USEPA Responses

Part I: Summary and response to community concerns voiced at the February 19, 1998 public meeting.

Westerly Wetlands Issues

1. COMMENT
A request was made to see the data from the Westerly Wetlands displayed on a grid to determine whether any hot spots exist within the area, which could be removed.

RESPONSE
Maps showing contaminant concentrations are already available. The Ebasco Remedial Investigations report (1988) contains full-size drawings showing cross-sections, concentrations, concentration contours etc. The contamination is found to be widespread throughout the Westerly Wetlands.

2. COMMENT
If humification is allowed to occur while leaving the contamination underneath the "natural" cap, how will it affect the ground water?

RESPONSE
Humification is the creation of humus or organic matter owing to natural bio-degradation of dead vegetative matter.

Ground water in the vicinity of the Westerly Wetlands discharges to the surface. Therefore, migration of contaminants down through the water table is not occurring. Lead and PCBs are expected to be bound with the soil, not mobilized through surface water runoff. In addition, a sedimentation basin was constructed in 1996 at a location downstream of the Westerly Wetlands. This basin is designed to collect sediment from storm runoff originating from contaminated areas, and to allow surface water to continue to flow into Burnt Fly Brook.

3. COMMENT
What would happen if a reversal of hydraulic conditions occurred during dry spells, changing the area into a ground water recharge area?

RESPONSE
Although there has never been an indication that this would occur, the most likely places for a reversal of hydraulic conditions to occur would be the Northerly Wetlands and Tar Patch Area. Removal of contaminated soil from the Northerly Wetlands and the TarPatch Area, as recommended in the preferred alternative, would therefore eliminate the risk of contaminants entering the Englishtown Aquifer.

4. COMMENT
The Monmouth County health officer stated that, based on 20 years of experience with the Site, he is in agreement with NJDEP/USEPA's preferred alternative. He would, however, add that at least once a year, the Department, along with representatives from Old Bridge and Marlboro, inspect the full perimeter of the Site to ensure no breaches in the fencing occurred.

RESPONSE
Inspection of perimeter access controls on a regular basis will ensure that the integrity of the fencing is maintained, and will be included in the operations and maintenance program for the Westerly Wetlands. Old Bridge and Marlboro Township officials are welcome to join the Department officials on these inspections, and should coordinate such visits with the NJDEP operations manager.

5. COMMENT
Concerns were raised that by leaving contamination in place, NJDEP would be creating a "toxic graveyard".

RESPONSE
NJDEP and USEPA disagree with the terminology "toxic graveyard". While contamination will be allowed to remain in the Westerly Wetlands, the process of vegetative humification and sediment buildup will form a barrier, thereby reducing potential exposure to contaminated sediment. In addition, both agencies support leaving contamination behind rather than excavating what is currently a thriving ecosystem. It is believed that these natural processes can successfully cover the contaminated areas within the wetlands. However, extensive monitoring will be performed to ensure that theseprocesses are occurring and that the remedy remains protective over the long term. The primary objective is to allow the wetland ecosystem to remain undisturbed while eliminating potential human exposure through 'restricted access'.

6. COMMENT
Since higher contaminant concentrations are commonly found closer to the source of the problem, hot spots in the Westerly Wetlands could be expected to be present closer to the Tar Patch Area. As remedial work will be done in the Tar Patch Area, the hot spots within the Westerly Wetlands can also be remediated with little or no extra effort in terms of constructing access roads.

RESPONSE
Maps showing contaminant concentrations in the Westerly Wetlands are already available. The Ebasco Remedial Investigations report (1988) contains full-size drawings showing cross-sections, concentrations, concentration contours etc. The contamination is found to be widespread throughout the Westerly Wetlands.

After careful evaluation and investigation of the wetland areas downstream and surrounding the Tar Patch Area, both agencies determined that hot spot removal within the Westerly Wetlands is not appropriate. It is evident from historic data that high levels of contamination extend throughout the Westerly Wetlands, and that accessing and excavating any or all of these higher contamination areas would require destruction of large areas of high quality wetland habitat. Also see RESPONSE No. 5 in Part II.

7. COMMENT
Although data has not changed since the 1992 study, there may be greater bioaccumulation of PCBs through the food chain. Therefore, would NJDEP be willing to extend the remediation of the Tar Patch Area if the trends look like contamination is greater adjacent to the Tar Patch Area in the Westerly Wetlands?

RESPONSE
Regarding the greater bioaccumulation of PCBs, such questions are expected to be answered by the comprehensive monitoring program that the NJDEP and EPA will be implementing. Due to conditions within the Westerly Wetlands which are favorable for vegetative humification and sediment build-up, the selected remedy will allow for the development and monitoring of a natural protective cover over the contamination in the Westerly Wetlands while preserving the ecological integrity of the wetland system.

The remediation of the Tar Patch Area will include a portion of the Westerly Wetlands which is immediately adjacent and similar in appearance to the Tar Patch Area.

8. COMMENT
Do we have the technology to clean up the Westerly Wetlands?

RESPONSE
The only reliable technology that is currently available is excavation and removal of contaminated soil. While the removal of contaminated soil from the Westerly Wetlands is technically feasible, the restoration of wetlands of such high quality has not proven to be as successful. See also RESPONSE No. 5.

Northerly Wetlands and Tar Patch Area

9. COMMENT
How much soil is expected to be removed?

RESPONSE
Approximately 29,000 cubic yards of soil spread over the unvegetated portion of the Tar Patch Area will be

removed. The area involved is about four acres. In the Northerly Wetlands, approximately 4,000 cubic yards spread over 2.5 acres will be removed.

10. COMMENT
Will wetlands be created in the Tar Patch Area?

RESPONSE
Upon completion of the removal action, wetlands will be created in the Tar Patch Area and Northerly Wetlands.

11. COMMENT
Can EPA's Removal Action Program implement the Tar Patch Area remedy more quickly?

RESPONSE
No. NJDEP currently has the lead for this Site and plans to design and construct the selected remedy and, therefore, EPA does not plan to have its removal branch implement the remedy with remedial money. Furthermore, EPA does not believe that this Site would meet the criteria for a removal action. Contamination does not represent any acute threat to human health or the environment, and does not appear to be moving. The sedimentation basin is in place to ensure no contamination threatens the public wellfields further downstream.

12. COMMENT
Have any TCLP tests been done yet on the material to determine how it is going to be disposed of?

RESPONSE
Appropriate tests will be done during remedial design to determine waste classification for the purpose of disposal. Based on existing data and previous experience at the Site, it was assumed in the feasibility study for costing purposes that excavated soil would be disposed of as TSCA regulated material.

13. COMMENT
Will any material being disposed of be used as landfill cover?

RESPONSE
It is expected that, during the classification of soil, the levels of PCBs will most likely prevent the soil from being used as landfill cover. However, if materials qualify for beneficial re-use, then such an action could be implemented.

Traffic Issues

14. COMMENT
A number of questions were asked regarding traffic issues during the remediation. The questions focused on what the plan will be, hours of operation, road restoration, truck routes and the quality of trucks used during the removal.

RESPONSE
NJDEP representatives will meet with township public safety officials after the 65% design is completed. Information gathered at that stage would identify any travel restrictions that will be outlined in the bid documents for the construction contract. The construction contractor will submit the final traffic plan. Trucks used during removal actions are usually lined and covered on top. In general, hours of operation can be suitably restricted, and other measures implemented to satisfy community requirements. Damages caused to roads due to Site-related traffic are also assessed and repaired.

15. COMMENT
Will the truck route go over the remediated Uplands Area?

RESPONSE
Truck routes will be determined during the remedial design stage. Reasonable efforts will be made to prevent damage to the remediated Uplands Area. If necessary, any damage will be repaired. See also RESPONSE No. 14.

Ground Water Issues

16. COMMENT

Does the Site have contaminated ground water?

RESPONSE
The nature of the geology at the Site is such that it is a ground water discharge area where essentially ground water from the Englishtown Aquifer migrates to the surface, thereby creating a wetland environment. The surface water then flows into Burnt Fly Brook. The Woodbury Clay formation, which underlies the entire Site below the Englishtown Aquifer, prevents any migration of contaminants into the Magothy Aquifer below it.
Based on our knowledge of Site conditions, EPA and NJDEP are confident that the clay is competent in providing an impermeable barrier between Site contaminants and Magothy Aquifer. Installing wells through the clay and potentially providing a conduit for the contaminants to enter the Magothy was not deemed necessary in the interest of protecting human health and the environment. EPA and NJDEP believe there is no threat to ground water users from the Site.

17. COMMENT
When the lagoons in the Uplands Area were excavated, was ground water contamination found?

RESPONSE
Some volatile organic compounds and metals were detected in the ground water in the Uplands Area at the time of the remediation of this area. See also RESPONSE No. 16.

18. COMMENT
Is monitoring well data around the Tar Patch Area, Northerly Wetlands or Westerly Wetlands available to confirm that there is no ground water contamination migrating off the Site?

RESPONSE
Yes. Data associated with these areas can be obtained from reports available in the repositories.

Ground water in the upper aquifer above the Woodbury Clay discharges to the surface in the Westerly Wetlands. The surface water drains into Burnt Fly Brook. Surface water flowing into the Brook is being monitored by NJDEP at quarterly intervals.

Monitor wells exist around the recently created sedimentation basin. The three ground water monitor wells in this area are sampled at quarterly intervals to monitor water quality in the upper aquifer near the sedimentation basin.

19. COMMENT
Are any monitoring wells installed on Site that you could definitely say there's no groundwater pollution from the Site?

RESPONSE
There are three monitoring wells installed on Site which are located around the sedimentation basin. These wells are sampled at quarterly intervals to monitor water quality in the upper aquifer near the sedimentation basin. Based on several rounds of quarterly monitoring, the data generated thus far has not indicated any exceedances to groundwater quality standards.

Piezometers will be used to monitor the direction of ground water flow. The installation of additional on-site wells may be considered during the development of a monitoring program for the Westerly Wetlands. Also see RESPONSE Nos. 17 and 18.

Burnt Fly Brook/Sedimentation Basin Issues

20. COMMENT
What levels of lead have been detected in the Burnt Fly Brook and what is the source of the lead?

RESPONSE
Lead has been detected periodically in the Burnt Fly Brook at several locations downstream of the Westerly Wetlands discharge point, as well as upstream of the Westerly Wetlands discharge (background sample locations). Upstream sources, if any, are unknown. Lead surface water levels have been varied; however, during 1996, lead surface water levels were typically below the New Jersey Surface Water Quality Criteria for human health of five micrograms per liter.

21. COMMENT
How do you ensure no contamination is entering Burnt Fly Brook?

RESPONSE
Surface water and sediments in the Burnt Fly Brook are currently being monitored for lead and PCBs at quarterly intervals at the location where surface water flow from the Site enters the Burnt Fly Brook. In addition, routine maintenance of the sedimentation basin allows for removal of sediment buildup at the appropriate time to ensure that the basin is working efficiently.

22. COMMENT
When the sedimentation basin fills up, like it has in the recent past, where does the water go and what happens if it overflows?

An emergency spillway capable of handling a 500-year storm has been built as part of the sedimentation basin construction.

23. COMMENT
There is concern that no sediment sampling was performed along the banks of the Burnt Fly Brook.

RESPONSE
An extensive investigation of the sediment in Burnt Fly Brook was conducted in 1996. Burnt Fly Brook sediments were investigated and sampled beginning from the discharge point from the Site for a distance of approximately 1.5 miles down stream, up to the confluence with Deep Run. The only evidence of contamination in sediments was found in a sample collected at the point at which storm flow from the Site discharges into Burnt Fly Brook. This location was remediated as part of the remediation of the Downstream Area. In addition, a monitoring program will be developed to monitor the Westerly Wetlands which will include additional sampling of Burnt Fly Brook.

Various other Issues

24. COMMENT
Concerns were expressed at the public meeting regarding how the public could be guaranteed that funding would be present throughout the cleanup.

RESPONSE
In general, funding for projects cannot be guaranteed. Funding for the Superfund is appropriated annually by Congress.

25. COMMENT
Concerns were voiced regarding the ecological and biological studies performed and their current value for the decision-making process.

RESPONSE
Ecological receptors were the predominant concern in evaluating alternatives for the Westerly Wetlands. As presented in the Feasibility Study, it has been determined that the ecological community is best served by allowing the natural processes to mitigate future exposure to contaminated soil. The data/studies are considered appropriate for decision making.

26. COMMENT
Is there any connection to Eagle Asphalt or Champion Chemical?

RESPONSE
A portion of the Burnt Fly Bog Site was owned by Eagle Asphalt and operated by both Eagle Asphalt and Champion Chemical Company as a waste oil storage area from 1952 to 1964.

27. COMMENT
What is long-term maintenance?

RESPONSE
Long-term maintenance is estimated to be 30 years for the purpose of determining a present-worth cost. However, long-term maintenance can be increased or decreased, depending on the needs of the Site. Because contaminants will remain on Site, the Site will be reviewed every five years in accordance with the requirements of CERCLA.

28. COMMENT
What happens if NJDEP privatizes?

RESPONSE
Any privatization of NJDEP will have no effect on the remediation of the Site.

29. COMMENT
Why was the Uplands Area capped with no wetlands restoration?

RESPONSE
The Uplands Area, historically, was an upland area where artificial lagoons were constructed. It was not a wetland area. Therefore, no wetland was created in this area.

30. COMMENT
When will actual construction work begin?

RESPONSE
Fence installation around the Westerly Wetlands will begin soon after the ROD is issued. The public procurement process for the remainder of the remedial work requires a design contractor to be hired through a bidding process. Upon completion of the design, a contractor is hired for the construction phase. It is estimated that it would take at least two years before major construction activities begin.

31. COMMENT
When will the project be bid out, and can it be done earlier so funds cannot be taken away from NJDEP?

RESPONSE
Construction funds are not released by USEPA until a design is 95% complete. A design Scope of Work is being. prepared and the design contractor will be engaged as soon as funds for this purpose are obtained soon after the issuance of the ROD. The design contractor will be selected through open competitive bidding. This takes approximately six months. Upon completion of the design, which should take approximately nine months to complete, a construction contract will be bid out.

32. COMMENT
When will the design be complete?

RESPONSE
It is anticipated that the design work will be completed in the year 2000.

Part II: Summary and responses to written concerns received during the public comment period

Comments submitted by Blasland, Bouck & Lee on behalf of certain Potentially Responsible Parties:

1. COMMENT
The assumption of unrestricted (residential) future use for the Site when determining cleanup levels is unreasonable.

RESPONSE
The Public Health Evaluation for the Supplemental Feasibility Study of Burnt Fly Bog Site considered the anticipated future land uses for the Westerly Wetlands, Tar Patch, and Northerly Wetlands. Since the Westerly Wetlands is an isolated wilderness area, it was assumed for the purposes of the Public Health Evaluation that the Westerly Wetlands would remain an undeveloped wetland area for the foreseeable future. The Northerly Wetlands, conversely, is a small track of Palustrine Forested Broad Leaved Deciduous wetland that is partially surrounded by upland areas. The Northerly Wetlands and Tar Patch Area are within several hundred feet of a residential area. Because of the close proximity to human receptors and the uncertainty of the future use of this area, the cancer risk for exposure to Northerly Wetlands soil and Tar Patch Area soil containing PCBs was evaluated for current adult trespassers and hypothetical future residents. Since the cancer risk was estimated to be 7.5 x 10 -3, well outside EPA's acceptable risk range, the application of the most conservative soil cleanup criteria for the Northerly Wetlands soil was determined to be appropriate.

The volume of contaminated soil in the Northerly Wetlands above ecological risk based cleanup numbers is only 150 cubic yards less than that based on human health risk based numbers. Limits for the Tar Patch Area cleanup will be based on visual contamination.

2. COMMENT
The cleanup levels for PCBs and lead should reflect important new data and recognize certain factors not considered during remedy selection.

RESPONSE
With respect to PCBs, NJDEP is currently using a health based soil cleanup criteria based on an A-280 developed slope factor of 1.4 (mg/kg-day) -1 and a 10 -6 risk level, resulting in a residential direct contact soil cleanup criteria of 0.49 mg/kg. While USEPA has conducted a reassessment of cancer dose-response based on PCB mixtures, NJDEP is in the process of re-evaluating cleanup/screening criteria for PCBs for possible future changes in PCB soil cleanup criteria. In this interim period, NJDEP is maintaining its health based cleanup criteria for PCBs. The USEPA residential direct contact soil cleanup criteria for PCBs is 1 mg/kg. The PCB numbers in effect when the ROD is signed will be used as the cleanup criteria. In accordance with New Jersey State law, cleanup criteria for carcinogens are based on a 10 -6 risk level. The slope factor used by NJDEP is 1.4 (mg/kg-day) -1, which is within the newly approved USEPA range of 0.4 to 2.0 (mg/kg-day) -1.

With respect to NJDEP's 400 mg/kg cleanup level for lead, the USEPA Integrated Exposure Uptake Biokinetic (IEUBK) model is appropriate for establishing the cleanup level for the Northerly Wetlands since NJDEP has determined that a future residential scenerio and the application of the most conservative soil cleanup criteria is appropriate for the Northerly Wetlands.

3. COMMENT
The preferred remedy for the Tar Patch Area and Northerly Wetlands is excessively costly. Remedial Action Objectives can be achieved by choosing a suitable 'Limited Action' alternative for these areas, similar to the preferred remedy for the Westerly Wetlands.

RESPONSE
EPA and NJDEP believe that the selected remedy provides the best balance of tradeoffs with respect to the nine evaluation criteria. The Tar Patch Area is located adjacent to, and upstream of, the Westerly Wetlands. A major portion of this area, approximately 4 acres in extent, is denuded. No wetland vegetation currently exists in this area. Visibly contaminated soil exhibiting tarry patches can be seen on the surface. The Tar Patch Area is continuing to act as a source of contamination for other downstream areas, including Westerly Wetlands and Burnt Fly Brook. Erosion of this non-vegetated area occurs during storm events. On the other hand, the Westerly Wetlands is a recovering wetland area covering an area of approximately 21 acres, with conditions favorable for vegetative humification and sediment build-up.

Source removal from the Tar Patch Area has been recommended by choosing excavation and off-site removal of contaminated soil as the preferred remedy for this part of the Site. However, removal of contaminated soil will be restricted to the barren areas only. Once the contaminated soil is removed, wetlands will be established in the excavated areas, which will result in the formation of contiguous wetlands from the Westerly Wetlands to the Northerly Wetlands.

The contaminated Northerly Wetlands area is approximately 2.5 acres in extent. It is located upstream of the Tar patch Area. Unlike in the Westerly Wetlands, there are mature trees within most of the Northerly Wetlands area. Therefore, the rate of vegetative humification is expected to be less in the Northerly Wetlands when compared to the scrub/shrub wetland areas within the Westerly Wetlands. Contaminated sediment and soil can continue to migrate into the remediated Tar Patch Area during storm events. Hence, the preferred remedy for the Northerly Wetlands is excavation and removal of approximately 4,000 cubic yards of contaminated soil, and restoration of wetlands in the excavated areas.

The Burnt Fly Bog ecosystem that encompasses approximately 1700 acres in Monmouth County, New Jersey represents a unique and valuable natural resource. The discharge of hazardous substances to this ecosystem, which has been extensively investigated and characterized as the Burnt Fly Bog Superfund Site, represents a truly significant natural resource injury. The duration of this injury began with the initial discharges to this system, and continues today with significant concentrations of hazardous substances remaining within the system. As discussed above, large areas of the Site are still devoid of natural vegetation, and large areas of the system are still not fully functional wetlands despite the beginning of natural revegetative processes in other areas. In addition to ensuring the overall protection of human health and the environment, NJDEP and
USEPA are also tasked with restoring and enhancing the natural resources of the State of New Jersey for the public welfare. Accordingly, the Department is obligated to make every effort to minimize the duration of identified natural resource injuries and restore these valuable resources of the State whenever restoration is reasonable, effective, and practicable. Both NJDEP and the USEPA strongly believe that the preferred remedy which actively remediates the Tar Patch Area and Northerly Wetlands will begin to restore some of the continuing natural resource injury to the ecosystem in an effective and efficient manner. The Tar Patch Area is devoid of native vegetation and represents a significant area of the Bog system that remains dysfunctional and unable to revegetate naturally, apparently due to such high concentrations of contaminants. Thus, it is logical to actively restore this portion of the Bog resource to a more natural condition and use. It is likewise logical and appropriate to actively restore the Northerly Wetlands area since this upstream area would represent a significant continuing source of recontamination to the immediately adjacent, downstream Tar Patch Area.

Comments submitted by the Monmouth County Environmental Coalition:

4. COMMENT
The limits of excavation within the Tar Patch Area for remedial purposes must be extended into the Westerly Wetlands to include all areas directly down-gradient of the Tar Patch Area.

RESPONSE
The limits of excavation for the Tar Patch Area will be based on visible contamination and obviously stressed areas. The visual goal was chosen because the targeted area is clearly defined due to the lack of vegetation in the area. If an exact number were specified for the cleanup of this area, it would include vegetated portions of the Westerly Wetlands area as well. The targeted area is approximately 4 acres in extent, and is not capable of natural re-vegetation as are the other contaminated areas. Existing wetlands surrounding this core area will not be excavated as part of the remedial activities. Any areas, including wetland areas, disturbed during construction activities will be restored as part of the remedial operations.

5. COMMENT
Removal of 'Hot Spots' within the Westerly Wetlands must also be included in the preferred remedy for this part of the BFB Site.

RESPONSE
After careful evaluation and investigation of the wetland areas downstream and surrounding the Tar Patch Area, both agencies determined that Hot Spot Removal within the Westerly Wetlands is not appropriate. It is evident from historic data that high levels of contamination extend throughout the Westerly Wetlands, and that accessing and excavating any or all of these higher contamination areas would require destruction of large areas of high quality wetland habitat.

Sediment samples were taken in the Westerly Wetlands during remedial investigations performed in 1985 on thirteen transects identified as T-1 through T-13. Based on the sampling data, high concentrations of lead and PCBs in the sediment were found generally along the entire reach of the Westerly Wetlands, in the middle portions of

these transects. Extensive sediment sampling was again performed in the Westerly Wetlands in1996 to confirm the extent of the contamination and current levels of contamination at locations where high concentrations were encountered in 1985.

While hot spot removal was considered as a remedial alternative during Phase I of the Supplemental Feasibility Study, closer examination of the 1985 and 1996 data revealed that the higher contaminated sediments were not restricted to small, easily accessible areas close to the barren Tar Patch Area. Rather, the higher contaminated sediments were distributed along the entire reach of the Westerly Wetlands, and no decreasing concentration gradient in a down-gradient direction beginning from the Uplands Area was observed. In view of the above observations, it was concluded during Phase II of the Supplemental Feasibility Study that the Hot Spot Removal alternative was inappropriate for the Westerly Wetlands. Furthermore, any excavation of sediment from selected areas within the Westerly Wetlands will result in the loss of large areas of thriving wetlands, because large extents of uncontaminated wetland areas will be required to be destroyed or filled to provide access for construction equipment.
Data and other information pertaining to this evaluation can be found in the following reports, which form part of the Administrative Record for this Site:

Westerly Wetland Remedial Investigation Final Report, Burnt Fly Bog Site - January 1988.

Westerly Wetlands Field Sampling Report, Burnt Fly Bog Superfund Site, Supplemental Feasibility Study - September 1997.

Final Field Sampling and Testing Results Report - Tar Patch Area - May 1994.

Northerly Wetlands Field Sampling Report, Burnt Fly Bog Superfund Site Supplemental Feasibility Study - January 1997.

Final Supplemental Feasibility Study Report for Burnt Fly Bog Site - October 1997.

6. COMMENT
Extensive monitoring of soil and surface water must be conducted in the Westerly Wetlands, Sedimentation Basin, and Burnt Fly Brook as part of the cleanup operation.

RESPONSE
Periodic monitoring of the Burnt Fly Bog Site will include biological sampling, surface water and soil sampling in the Westerly Wetlands, surface water, sediment and, if necessary, biological sampling in Burnt Fly Brook, and surface water and sediment sampling within the sedimentation basin. Specific sampling protocol, analytical parameters, and sampling frequency will be provided in a Field Sampling and Monitoring Plan which will be prepared as a component of the remedial action for the Site. In addition and as required by CERCLA, for remedial actions that result in hazardous substances remaining on-site above levels that allow for unrestricted use, review of the selected remedy will be conducted no less than every five years after initiation of the selected remedy.

7. COMMENT
It has been stated that lead was detected at the upstream background sample location in Burnt Fly Brook. Is there any runoff from previously unknown area(s) of BFB discharging into Burnt fly Brook upstream of the existing point of discharge near the sedimentation basin?

RESPONSE
The sedimentation basin was designed, and constructed in 1996, to fully capture storm runoff originating from within the BFB Superfund Site. Limits of the contaminated areas within the Site, and hence the overall limits of the Site, were established through extensive soil sampling conducted in the 1980's and later in 1994, and 1995. Therefore, any low level lead contamination that is detected at the upstream sampling location during the on-going surface water and sediment sampling in Burnt Fly Brook must originate from other non-point sources in the upper reaches of the Brook. Lead levels in sediment at the upstream location range from 4.6 mg/kg to 20.5 mg/kg indicating background/ambient conditions.

Over the past 18 months of operation, regular inspections by NJDEP personnel indicate that the basin is functioning as intended. There is no evidence that Site-related contaminants are bypassing the basin or migrating off-site by other means.

ROD FACT SHEET

SITE

Name	:	Burnt Fly Bog
Location/State	:	Marlboro Township, New Jersey
EPA Region	:	II
HRS Score (date)	:	40 (10/81)
Site ID #	:	NJD 98050 4997

ROD

Date Signed:		September 30, 1998
Remedies:		Excavation of contaminated soil/sediment in Tar Patch and Northerly Wetlands Areas; Limited action and institutional controls in Westerly Wetlands
Operating Unit Number:		OU-3
Capital cost:		$ 16,624,400
Construction Completion:		12/2001
0 & M in 1999:	$ 9,200	(1999 dollars)
2000:	$ 9,200	
2001:	$ 9,200	
Present worth:		$ 136,000 (30 years)
		$ 2,608,000 (7 years)
		$ 13,975,000 (7 years)
		$ 16,719,000
Discount rate:		5 %

LEAD

Remedial/Enforcement:	Remedial (fund)
EPA/State/PRP:	State
Primary contact (phone):	Anton Navarajah (609) 777-0340
Secondary contact (phone):	Thomas Porucznik (212) 637-4370
Main PRP(s):	Dominick and Carmelo Manzo, Ace-Manzo, Inc.
PRP Contact (phone):	N/A

WASTE

Type:	PCBs, Lead
Medium:	Soil, sediment, surface water
Origin:	Unlined lagoons filled with recycled oil
Est. quantity:	33,600 cu. yds.