United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R02-88/075
September 1988

EPA

Superfund
Record of Decision:

Ringwood Mines/Landfill,

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/ROD/R02-88/075	2.	3. Recipient's Accession No.

4. Title and Subtitle SUPERFUND RECORD OF DECISION Ringwood Mines/Landfill, NJ First Remedial Action - Final	5. Report Date 09/29/88
	6.
7. Author(s)	8. Performing Organization Rept. No.
9. Performing Organization Name and Address	10. Project/Task/Work Unit No.
	11. Contract(C) or Grant(G) No. (C) (G)
12. Sponsoring Organization Name and Address U.S. Environmental Protection Agency 401 M Street, S.W. Washington, D.C. 20460	13. Type of Report & Period Covered 800/000
	14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

The Ringwood Mines/Landfill site consists of approximately 500 acres in a historic mining district in Ringwood Borough, Passaic County, New Jersey. The mines lie west of and adjacent to the Town of Ringwood and one mile northwest of Wanaque Reservoir. The site is characterized by a variety of features including abandoned mine shafts and surface pits, an inactive landfill, an industrial refuse disposal area, small surficial dumps, a municipal recycling area, a municipal garage, and approximately 50 residences. Ground water beneath the site discharges to surface streams and the Wanaque Reservoir. The Ringwood mines are a series of iron ore mines that operated from the mid-1700s to the early 1900s and possibly even later. The site was purchased by the U.S. Government prior to 1940, and later sold to a succession of owners including Ringwood Realty Corporation (RRC), a subsidiary of Ford Motor Company (Ford), in January 1965. Between 1967 and 1974, RRC deposited waste products for Ford, including car parts, solvents, and paint sludges, on the ground surface and in abandoned mine shafts. In 1970, RRC donated 290 acres in the southern portion of the site to Ringwood Solid Waste Management Authority (RSWM), which began operating a permitted municipal disposal area in March 1972. In 1976, the New Jersey Department of Environmental Protection (NJDEP) closed the landfill after determining that leachate emanating from the landfill was contaminating
(See Attached Sheet)

17. Document Analysis a. Descriptors

Record of Decision
Ringwood Mines/Landfill, NJ
First Remedial Action - Final
Contaminated Media: gw, soil
Key Contaminants: petroleum hydrocarbons, metals (arsenic, lead)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 41
	20. Security Class (This Page) None	22. Price

EPA/ROD/R02-88/075
Ringwood Mines/Landfill, NJ
First Remedial Action - Final

16. ABSTRACT (continued)

surface water in the area. In July 1982, NJDEP detected moderate levels of VOCs, as well as naturally occurring heavy metals, in ground water in the northern section of the site, which had been retained by RRC and a portion used for industrial waste disposal. The site was subsequently divided into four discrete areas for investigation. Between October 1987 and February 1988, Ford International Services, Inc. conducted a removal action, entailing excavation and offsite disposal of 7,000 yd^3 of surficial paint sludge containing lead and arsenic from four onsite areas. Subsequent sampling, however, indicated that soil within a small area (less than one acre) still contains concentrations of lead and total petroleum hydrocarbons in excess of health-based levels. Furthermore, there is sporadic and moderate ground water contamination, generally confined to paint sludge locations, exceeding MCLs for lead and arsenic. The primary contaminants of concern affecting the soil and ground water are arsenic, lead, and petroleum hydrocarbons.

The selected remedial action for this site includes: confirmatory sampling of soil with excavation and offsite disposal of any soil exceeding health-based levels, followed by backfilling and revegetation; and ground water, surface water and wetlands monitoring. Since ground water in the vicinity of the paint sludge areas in not used as a drinking water source and natural attenuation is expected to reduce contamination levels of below health based levels after removal of the source, ground water will not be treated. The estimated capital cost for this remedial action is $225,000 with annual O&M of $50,000.

DECLARATION STATEMENT

RECORD OF DECISION

SITE NAME AND LOCATION

Ringwood Mines/Landfill, Ringwood Borough, Passaic County, New Jersey

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Ringwood Mines/Landfill Site in Ringwood, New Jersey, developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), 42 U.S.C. §9601 et seq. and to the extent practicable, the National Contingency Plan (NCP), at 40 C.F.R. Part 300.

The attached index identifies the documents in the administrative record upon which the selection of the remedial action is based.

The State of New Jersey concurs on the selected remedy.

DESCRIPTION OF THE REMEDY

The remedial action identified in this document is designed to address potential soil, surface water and ground-water contamination at the Ringwood Mines/Landfill Site. A surficial paint sludge removal action was conducted at the Site pursuant to a CERCLA §106 unilateral order to remediate soil contamination and to eliminate the direct contact hazard to human health and the environment. Under the unilateral order any soil contaminated with lead and total petroleum hydrocarbon concentrations that exceed the New Jersey Cleanup Objectives for Soil will be removed from the Site.

There is no detectable ground-water contaminant plume at the Site, and contamination is not entering the surface waters which drain the Site.

A long-term ground-water and surface-water monitoring program will be initiated at the Site. The long-term monitoring program will last a minimum of thirty years.

The major components of the monitoring program include:

- Sampling and analyses of potable wells in the vicinity of the Site.

- Performance of geophysical surveys in order to determine ground-water flow and optimum placement of monitoring wells.

- Performance of soil and rock geochemical surveys to determine background concentrations of metals.

- Sampling and analyses of new and existing ground-water monitoring wells, surface waters, and wetlands exiting the Site.

DECLARATION

Consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 as amended by the Superfund Amendments and Reauthorization Act of 1986, and the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300, I have determined that the selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate to the remedial action and is cost effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this Site. However, since treatment of the principal threats of the Site was not found to be practicable, this remedial action 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-site above health-based levels, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

9-29-88
Date

William J. Muszynski
William J. Muszynski, P.E.
Acting Regional Administrator

Decision Summary

Ringwood Mines/Landfill

1.0 Site Location and Description

The Ringwood Mines/Landfill Site (the Site) consists of approximately 500 acres in a historic mining district in the Borough of Ringwood, which is located in the northeast corner of Passaic County, New Jersey (Figure 1). The Site, which is about one-half mile wide and one and one-half miles long, consists of rugged forested areas, open areas overgrown with vegetation, abandoned mine shafts and surface pits, small surficial pits, an inactive landfill, an industrial refuse disposal area, small surficial dumps, a municipal recycling area, the Ringwood Borough garage and approximately 50 private homes. The Mines are located immediately west of the town of Ringwood, approximately one-quarter mile west of Ringwood Manor State Park and one mile northwest of the northern most segment of the Wanaque Reservoir (Figure 2).

1.1 Site Geology

The Site is situated at the southeastern extension of the New Jersey Highlands (Figure 1). The rocks of the New Jersey Highlands are chiefly Precambrian age (more than 600 million years old) banded gneisses, schists and igneous intrusives or pegmatites. Topography consists mostly of northeast-southwest trending broad-topped parallel ridges, which were carved out by the continental ice sheet which spread over the area during the Pleistocene Epoch, approximately 2 million years ago. Bedrock outcrops are fairly common along the ridges, but are scarce in the valleys. The bedrock in the valleys is generally covered by unconsolidated and reworked glacial deposits. Folding is the primary structural geologic feature in the vicinity of the Site and the magnetite (iron ore) is associated with the folds.

The combined action of folding, faulting and glaciation have all had an impact on the hydrogeology of the Site. Two aquifers have been identified beneath the Site. The upper aquifer consists of glacial till and overburden and extends down to a depth of approximately 60 feet. The direction of ground-water flow in the upper aquifer is generally to the south. Ground-water discharge from the upper aquifer is to surface streams and the Wanaque Reservoir. The lower aquifer consists of fractured gneiss bedrock. The gneiss itself is not permeable so that ground-water flow is along fractures in the rock. The complex fracture system in the lower aquifer makes ground-water flow directions difficult to predict (Figure 3). The upper aquifer near the Site is not used as a potable water source. Furthermore, New Jersey State law requires that all wells in the region must withdraw water below 50 feet. Well yields within the lower aquifer generally range from 5 gallons per minute (gpm) to 50 gpm. Better well yields are found where the wells are screened within cross-cutting fractures. Hydraulic conductivity between the upper and lower aquifers is poor. Deep monitoring

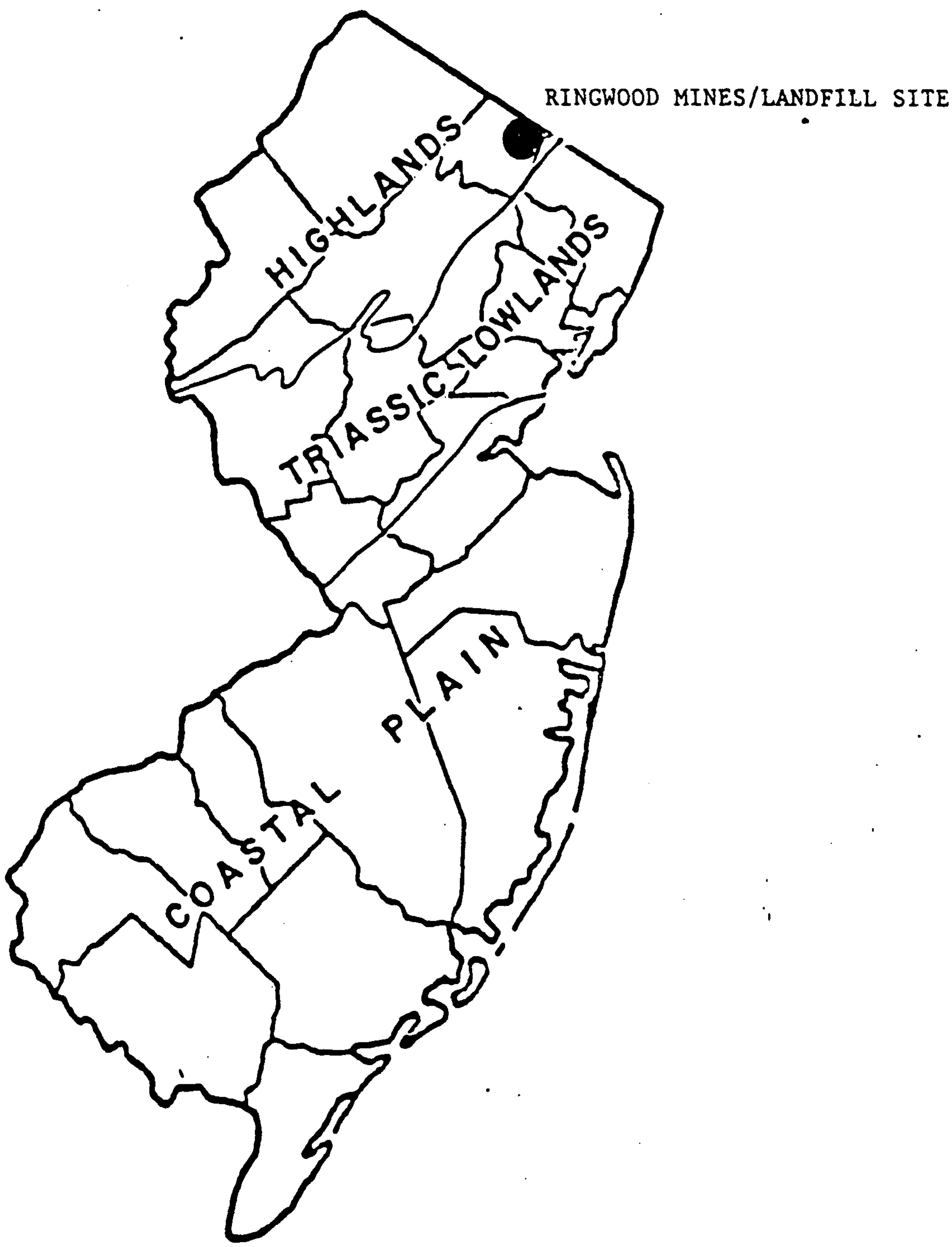


Figure 1 .- LOCATION AND GEOLOGIC SETTING OF RINGWOOD MINES/LANDFILL SITE

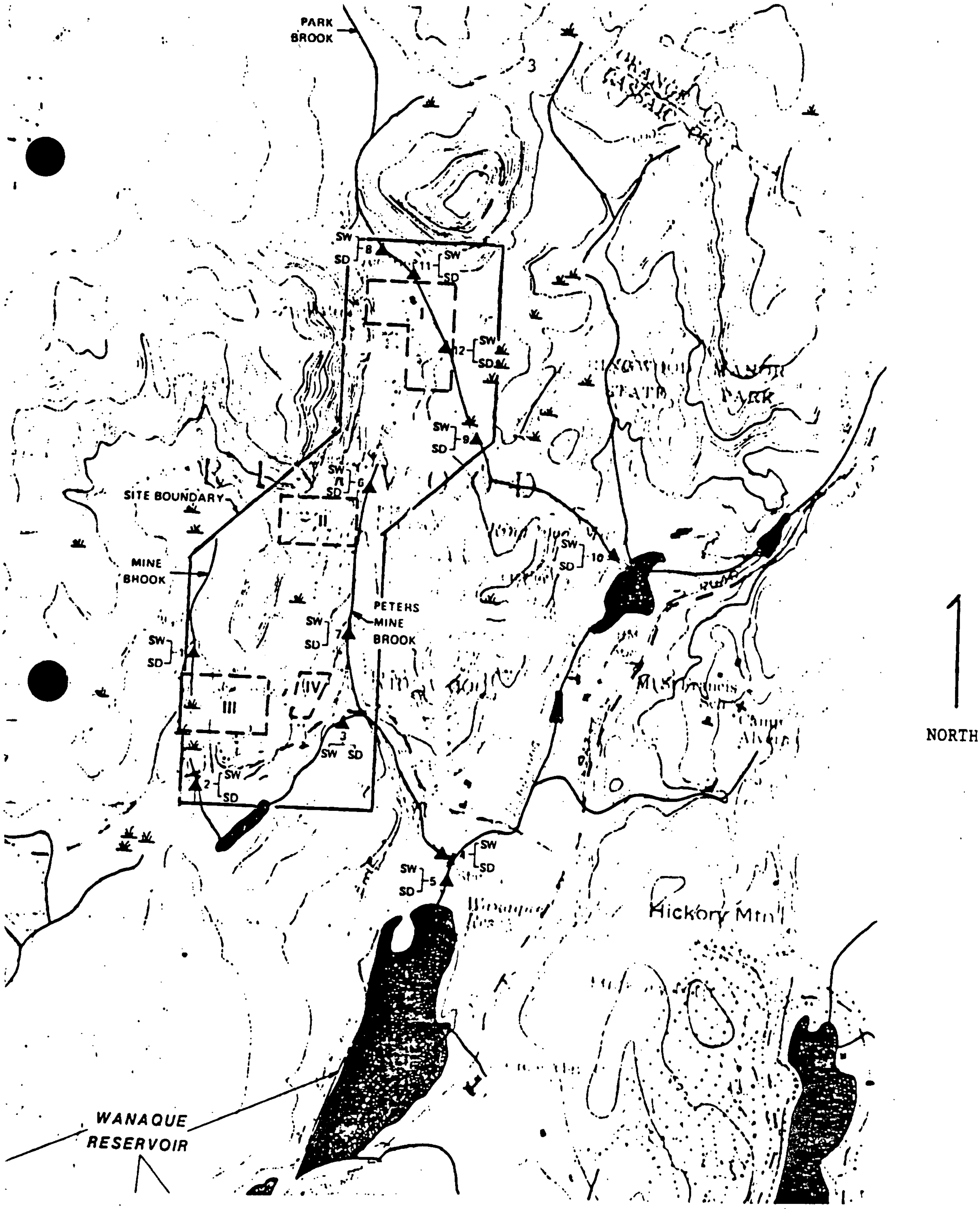


Figure 2 - RINGWOOD MINES/LANDFILL SITE DRAINAGE PATTERNS WITH SEDIMENT AND SURFACE WATER SAMPLE LOCATIONS

SW = SURFACE WATER SAMPLE
SD = SEDIMENT SAMPLE

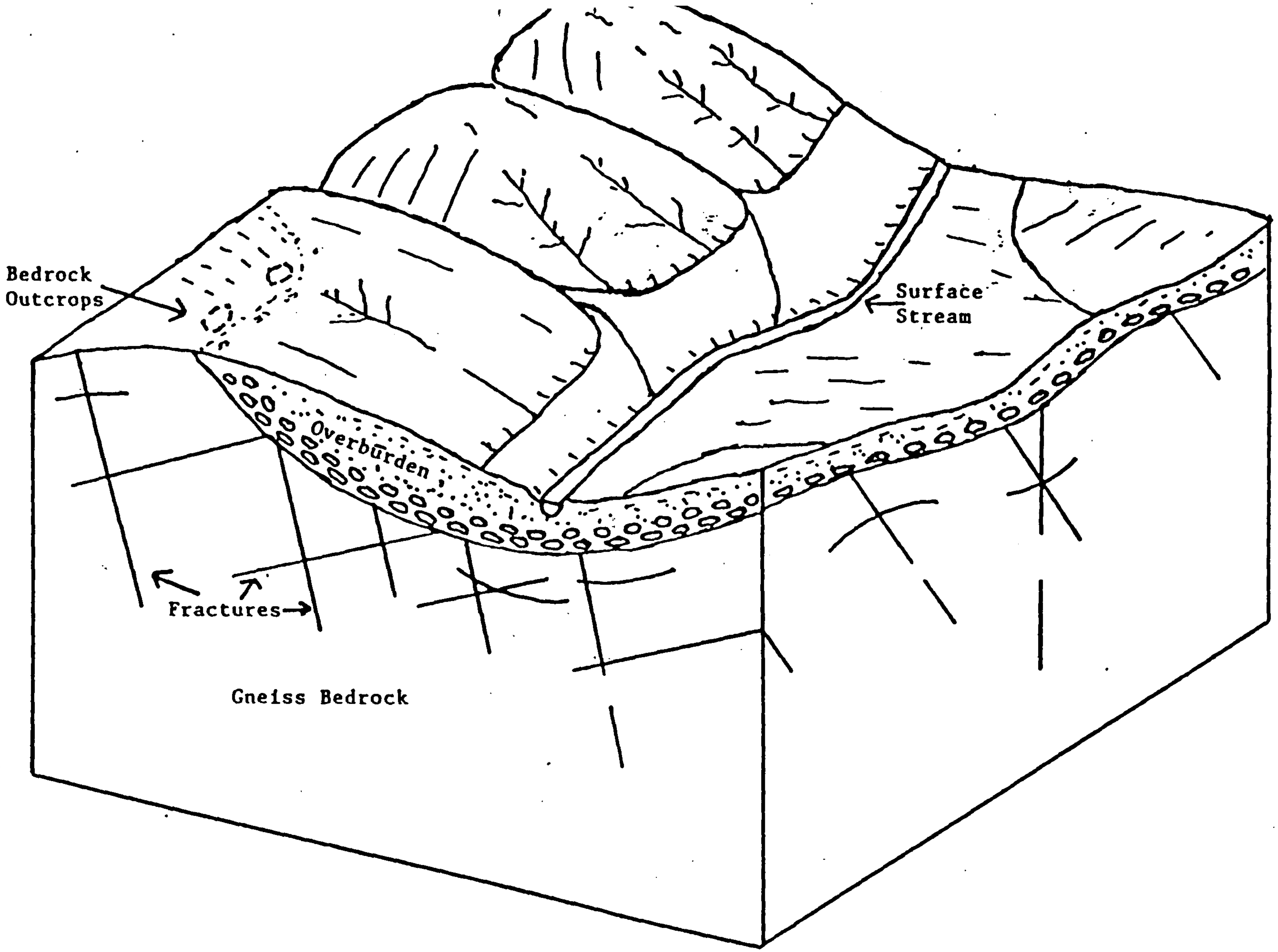


Figure 3
SCHEMATIC DIAGRAM OF THE GEOLOGY AT THE RINGWOOD MINES/LANDFILL SITE

wells (below 100 feet) have shown that fracturing is less evident as depth increases and where fractures do occur, they are generally filled with silica. The existence of perennial streams with relatively small drainage basins further implies rejected recharge from the deep bedrock aquifer (lower aquifer).

The Highlands in Passaic County are drained by the Pequannock, Wanaque and Ramapo Rivers which join to form the Pompton River, a tributary of the Passaic River. There are three surface water streams that drain the Site (Figure 2). They are Mine Brook, Peters Mine Brook and Park Brook. Peters Mine Brook joins Mine Brook along the southern boundary. Mine Brook flows into Ringwood Creek, just upstream (north) of the Wanaque Reservoir. Park Brook flows into Ringwood Creek just one mile upstream of its confluence with the Wanaque Reservoir.

2.0 Site History

The Ringwood Mines are a series of iron ore mines that were operated almost continuously from the mid-1700s to the early 1900s. Prior to 1940, the entire mine area was purchased by the U.S. Government and administered by the U.S. Government Defense Plant Corporation. The mine area was subsequently leased to the Alan Wood Steel Company as part of the World War II effort. Extensive subsurface mapping of the mines was conducted during the early 1940s. In 1956, the U.S. Government sold the property to the Pittsburgh Pacific Company, of Hibbing, Minnesota. Use of the Site between 1956 and 1965 is not well documented. Aerial photographs taken in 1959 indicated that the mines were in operation at that time.

On January 1, 1965, the Pittsburgh Pacific Company sold the mine area to the Ringwood Realty Corporation, a wholly-owned subsidiary of Ford Motor Company (Ford). The property was administered by J.I. Keelak Inc. of Trenton, New Jersey. A Bureau of Mines Safety Inspection Report, dated 1965, indicated that some refuse, including municipal waste, was already present in the abandoned mining pits and shafts and recommended procedures for safeguarding the mines.

Beginning in 1967, Ringwood Realty used the site to deposit waste products from the Ford factory in Mahwah, New Jersey. These waste products included, but may not have been limited to, car parts, solvents and paint sludges. Some of these wastes were deposited on the ground surface in both natural and man-made depressions. Other wastes were allegedly dumped into the abandoned mine shafts.

In 1970, Ringwood Realty divided the property, donating 290 acres to the newly-formed Ringwood Solid Waste Management Authority (RSWMA). The remaining land (approximately 150 acres) in the vicinity of Peters' Mine was retained by the Ringwood Realty Corporation. A portion of the 150-acre tract was known as the O'Connor Refuse Disposal Area and it was used for industrial refuse disposal by Ford which used O'Connor Trucking as the hauler. Property records suggest that by 1974, Ford was no longer sending waste of any type to the Ringwood Mines/Landfill site, including the O'Connor Refuse Disposal Area. In 1973, Ringwood Realty donated the remaining 150 acres of the mine area to the Housing Operation With Training Opportunity Inc. (How To Inc.).

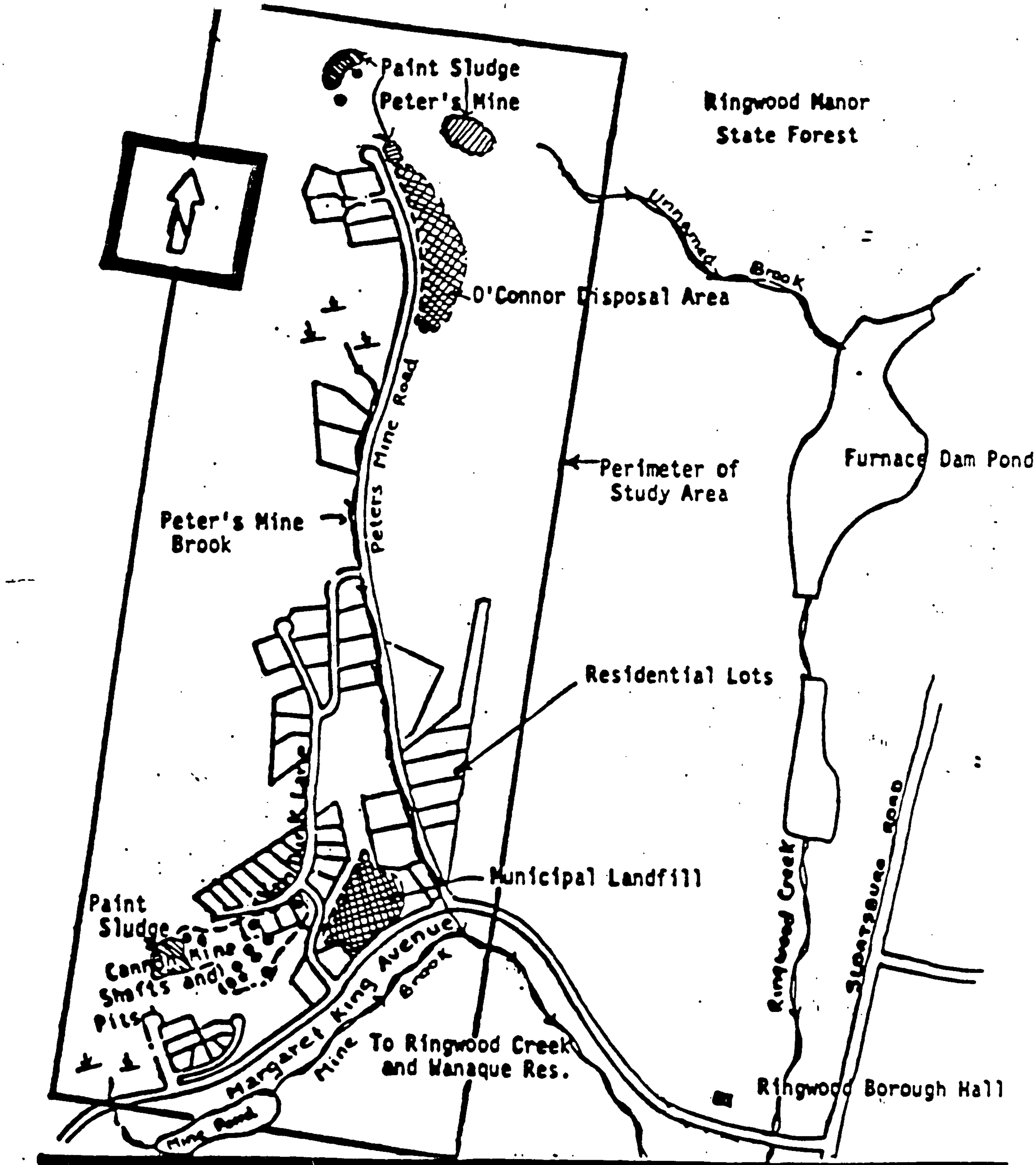
In March 1972, the North Jersey District Water Supply Commission, (NJDWSC), which is responsible for administering the downstream Wanaque Reservoir and the New Jersey Department of Environmental Protection (NJDEP), agreed to permit the development of a municipal refuse area on RSWMA property. This municipal disposal area, located near Margaret King Avenue (Figure 4) was supposed to be limited to municipal refuse and industrial packing and waste parts from Ford (not including liquid waste, chemical or petroleum products). In 1976, the NJDEP sampled surface water from the vicinity of the Municipal Disposal Area and determined that it was contaminated by leachate emanating from the landfill. NJDEP closed the landfill in 1976. Preliminary Assessments were conducted by the United States Environmental Protection Agency (EPA) and NJDEP between November 1979 and April 1980 for the entire Site.

In July 1982, NJDEP conducted a Site Inspection of the Ringwood Mines/Landfill site. Based on ground-water sampling results taken from waters in the Peters' Mine shaft which contained moderate amounts of benzene, ethylbenzene, xylene, chloroethane and bis (2-ethylhexyl) phthalate, as well as naturally occurring heavy metal contamination (nickel, cadmium, tin and chromium) found in samples from Peters' Mine Brook, the Site scored high enough on EPA's Hazard Ranking System to be proposed for the National Priorities List (NPL) in December 1982. The Site was officially added to the NPL in 1983. Pursuant to a March, 1984 Section 3013 Resource Conservation and Recovery Act (RCRA) Administrative Order on Consent between EPA and Ford International Services, Inc. (Services), Woodward-Clyde Consultants (WCC) was retained to perform the field studies and conduct a Remedial Investigation (RI). The RI was conducted in four phases between March, 1984 and April, 1988 under EPA oversight.

In June, 1987 a Section 106 Comprehensive Environmental Response, Compensation, and Liability Act unilateral order was issued by EPA to Services to conduct a Feasibility Study (FS). WCC was retained by Services to perform the FS. In addition, Environ Corporation was retained by Services and WCC to conduct an endangerment assessment in order to evaluate any potential risk to public health and the environment posed by the Site.

Under a separate unilateral Administrative Order issued by EPA in June, 1987, Services and its contractors in accordance with an EPA approved work plan, excavated and removed 7,000 cubic yards of surficial paint sludge containing lead and arsenic from four areas at the Site. The paint sludge was disposed of at an out-of-state facility in compliance with Federal and State regulations. Paint sludge removal operations began in October, 1987 and ended in February, 1988.

In August 1988 at a meeting between EPA and Ringwood Borough officials, EPA agreed to monitor potable ground-water wells which may have been affected by the Site as part of the proposed remedial action.



LEGEND

PAINT SLUDGE

LANDILL AREA

MINE SHAFTS, PITS

STREAM

WETLANDS

Figure 4 - GENERALIZED SITE PLAN
RINGWOOD MINES/LANDFILL SITE
RINGWOOD, NEW JERSEY

SOURCE: TAX ASSESSMENT MAP OF
BOROUGH OF RINGWOOD
G. WALDO RUDE&ASSOC. 198[illegible]
AND USGS GREENWOOD LAKE
QUADRANGLE
7.5 MINUTE SERIES, 1965

Approx. Scale
1" = 900'

3.0 Community Relations History

The Ringwood Borough and concerned citizens have been actively involved in activities related to the Site since reports of dumping were first received in the late 1960s. Ringwood residents and Borough officials aided NJDEP and EPA in determining sampling locations for the Preliminary Assessment and Site Investigation completed in 1979 and 1980.

Prior to the paint sludge removal operations in the fall of 1987, a briefing and pre-removal meeting was held by EPA with potential removal contractors and Borough officials. Some concerns were expressed at that time about possible hazards (including fire) related to the removal operations, but these concerns were addressed by EPA and removal contractor responses.

During performance of the field studies for the RI, the Borough officials were kept informed of site activities. In early 1988 following removal activities, local Borough and County health officials requested that EPA and/or Services conduct ground-water monitoring of potable wells which might be impacted by the Site. EPA has informed the public health officials that monitoring of site-related potable wells will take place during the Remedial Action phase.

The RI/FS reports were sent to the Ringwood Borough Library which is the local information repository. Upon the library's receipt of these reports, the public comment period commenced and was extended from August 9, 1988 to September 6, 1988. Copies of the RI/FS were also sent to the Ringwood Borough Hall. A public meeting was held on August 17, 1988 at which time EPA presented the results of the RI/FS along with the preferred remedial alternative for the Site. Prior to the public meeting, a briefing was held between EPA and local Borough officials on August 12, 1988.

4.0 Scope and Role of Response Action Within Site Strategy

The scope of this Record of Decision is to make a final determination of appropriate remedial action for the soils, surface waters and ground waters (upper and lower aquifers) of the Ringwood Mines/Landfill site, and to provide for institutional controls (e.g. controls on the drilling of ground-water wells and/or deed restrictions) and long-term monitoring. A complete description of the long-term monitoring program is given in section 4.5.

As discussed above, a removal action was conducted by Services in 1987-1988, and entailed the excavation and disposal of 7,000 cubic yards of paint sludge contaminated with lead.

Based on aerial photographs and ground reconnaissance, the Site was divided into four areas of potential environmental concern. Area I (Peter's Mine), Area II (St. Georges Pit/Miller Keeler Pit), Area III (Cannon Mine), and Area IV (the inactive Borough Landfill). The selected remedy addresses all of these Areas.

4.1 Area I (Peter's Mine)

4.11 Soil

Surficial paint sludge containing lead was removed from three locations totaling nine acres in Area I. These former paint sludge locations were sampled and then backfilled with clean soil. These sampling results indicated that residual levels of lead (1300 ppm) and total petroleum hydrocarbons (1060 ppm) may remain within a less than one-acre area from which paint sludge was removed (see Tables I &II).

4.12 Surface Water

No significant contamination has been found in the surface waters of Area I. The recommended response action is a long-term monitoring program for at least thirty years to monitor surface water quality.

4.13 Ground Water

4.131 Upper Aquifer

The EPA Maximum Contaminant Levels (MCLs) and New Jersey Ground Water Quality Standards (NJGWQS) for both lead and arsenic are 50 ppb. Lead concentrations in the upper aquifer in two of seven wells from Area I exceeded Maximum Contaminant Levels (MCLs) by a maximum of 35 ppb. In addition the MCL was exceeded only once during one of three sampling events. The arsenic concentration in one of seven wells exceeded the MCL by 6.6 ppb. Furthermore, the lead and arsenic contamination is localized and a ground-water contaminant plume has not been detected in Area I. The upper aquifer will be monitored to verify that contamination has decreased to acceptable health-based levels through natural attenuation processes.

4.132 Lower Aquifer

The lower aquifer in Area I is free of contamination and does not pose a threat to human health and the environment. A long-term monitoring program of both the upper and lower aquifers is recommended to ensure future protection of public health and the environment.

TABLE I

SOIL: SUMMARY OF HAZARDOUS SUBSTANCE LIST METALS DETECTED IN POST PAINT SLUDGE REMOVAL SAMPLES RINGWOOD MINES/LANDFILL SITE

	Soil Samples from Former Paint Sludge Locations											
	Location A					Location B			Location C		Location D	
	A2	A3	A4	A5	A6	B1	B2	B3	C3	C7	D1	D2
Antimony					0.60	6.3	0.74					
Arsenic	1.8	1.5	1.7	1.4	9.6	1.0	0.99	1.0	0.95	1.0	1.8	1.7
Barium	24	39	34	25	100	400	69	54	58	39	38	31
Chromium	18	22	19	18	9.1	50	21	40	33	20	16	15
Copper	15	46	30	21	72	0.778	0.346	0.319	1.38	0.546	29	16
Lead	14	4.0	11	25	110	1300	40	5.6	13	6.6	23	3.0
Nickel	14	16	16	14	15	0.794	0.483	0.683	0.460	0.267	14	14
Silver					0.70							
Thallium					19							
Zinc	35	36	36	30	140	97	33	35	38	29	35	36

NOTES:
1. Samples collected on 14 and 15 March 1988
2. Values reported in micrograms per gram (ug/g)

TABLE 11

SOIL: SUMMARY OF ORGANIC COMPOUNDS DETECTED

IN POST PAINT SLUDGE REMOVAL SAMPLES
RINGWOOD MINES/LANDFILL SITE

	Soil Samples from Former Paint Sludge Locations											
	Location A					Location B			Location C		Location D	
	A2	A3	A4	A5	A6	B1	B2	B3	C3	C7	D1	D2
Benzene												
Trans-1,2-dichloroethene			3J									
Tetrachloroethene			2J		1J							2J
4-methyl-2-pentanone				2J		33						
M-xylene						4J				2J		
O, P-xylene						4J						
Bis (2 etylhexyl) phthalate	120J	260J	100J	300J	71J	5600	170J	42J	94J			
di-n-butyl phthalate						110J						
Phenanthrene					200J	77J		120J				
Anthracene					35J							
Fluoranthene					190J	65J	46J	360J				
Pyrene					210J	69J	46J	370J				
Chrysene					120J	42J		180J				
Indeno (1,2,3-cd) pyrene					49J			66J				
Benzo (g,h,i) perylene					56J			77J				
Benzo (a) anthracene					130J		46J	170J				
Benzo (b) fluoranthene*					200J			320J				
Benzo (k) fluoranthene*					200J			320J				
Benzo (a) pyrene					99J			180J				
Naphthalene						2100						
2-methylnaphthalene						1100						

NOTES:
1. Samples collected on 14 and 15 March 1988
2. Values reported in microgram per kilogram (ug/kg)
3. * = indistinguishable isomer
4. J = estimated value. This flag is used when the mass spectral data indicate the presence of a compound that meets the identification criteria but the result is less than the specified detection limit but greater than zero.

4.2 Area II (St. Georges Pit/Miller Keeler Pit)

Contaminant concentrations found in all media in Area II (Soils, sediment, surface water, seep water and ground water) were within acceptable health based levels. Long-term monitoring of surface water and ground water is recommended for Area II to ensure future protection of public health and the environment.

4.3 Area III (Cannon Mine)

4.31 Soil

Surficial paint sludge was removed from one location in Area III. Total volatile organics exceeded the New Jersey Cleanup Objective for Soil by 0.4 ppm in one soil test pit sample obtained prior to paint sludge excavation (TP-3, Table III). Two additional tests pits were dug (TP-19 and TP-20) during the post paint sludge removal sampling round to confirm that the contamination had been removed from the TP-3 area. The total volatile organics were undetectable in TP19 and TP-20; therefore it is concluded that the soil in Area III no longer poses a threat to public health and the environment and further remediation of soils is not necessary.

4.32 Surface Water

No significant contamination has been found in the surface waters of Area III. Long-term monitoring of surface water is recommended for Area III to ensure future protection of public health and the environment.

4.33 Ground Water

Contaminants of concern were not detected in the ground water from Area III. Therefore, the ground water does not pose a threat to human health and the environment. Long-term monitoring of ground water is recommended for Area III.

4.4 Area IV (the inactive Borough Landfill)

4.41 Soil

No significant soil contamination was detected in Area IV. Soil does not pose a threat to public health and the environment; therefore remediation is not recommended.

4.42 Surface Water

Samples taken from the surface streams around Area IV did not detect contaminants of concern.

4.421 Seep Water

Seep-water quality is believed to be representative of surface water quality at the Ringwood Mines/Landfill site. Seep water in one sample (S-3) taken in 1984 contained mercury contamination

TABLE III

SOIL: SUMMARY OF ORGANIC COMPOUNDS DETECTED IN SAMPLES FROM TEST PITS
RINGWOOD MINES/LANDFILL SITE

	TP-1 (Soil)	TP-2 (Soil)	TP-3 (Fill)	TP-3 (Top Soil)	TP-4 (Fill)	TP-4 (Leaf Litter)	TP-5 (Fill	TP-6 (Fill)	TP-7 (Fill)	TP-7 (Soil)	TP-8 (Soil/ Fill)	TP-9 (Soil)	TP-10 (Soil)
	NS	NS	NS				NS	NS	NS	NS			NS
Benzene				34									
Toluene				510									
Ethylbenzene				140									
Methylene Chloride					36							22	
1,1,2,2-tetrachloroethylene				26									
Total Aliphatic Hydrocarbons				665	81								
Total Alcohols and Ketones												262	

NOTES:
1. Samples TP-1 through TP-13, and TP-15 were collected during July 1984
   Samples TP-16 through TP-18 were collected on 10 March 1986
   Samples TP-19 and TP-20 were collected on 15 March 1988
2. Fill = fill soil
3. NS = not submitted. Organic vapor monitoring did not indicate the presence of organic vapors associated with the test pit. Samples were therefore not submitted for laboratory analysis.
4. Values reported in microgram per kilogram (ug/kg).
5. NR = not reported. Since paint sludge and associated contaminated soil have been removed, the sample results are not representative of site conditions.

TABLE III (continued)

SOIL: SUMMARY OF ORGANIC COMPOUNDS DETECTED IN SAMPLES FROM TEST PITS
RINGWOOD MINES/LANDFILL SITE

	TP-11 (Fill) NS	TP-12 (Soil) NS	TP-13 (Fill) NS	TP-14 (Paint Sludge) NR	TP-14 (Soil) NR	TP-14 (Fill) NR	TP-15 (Fill) NS	TP-16 (Fill-6 ft)	TP-16 (Fill-8 ft)	TP-17 (Fill) NS	TP-18 (Fill) NS	TP-19 (Fill)	TP-20 (Fill)
Benzene													
Toluene													
Ethylbenzene													
Methylene Chloride													
1,1,2,2-tetrachloroethylene													
Total Aliphatic Hydrocarbons								20					
Total Alcohols and Ketones													

NOTES:
1. Samples TP-1 thorugh TP-13, and TP-15 were collected during July 1984
   Samples TP-16 through TP-18 were collected on 10 March 1986
   Samples TP-19 and TP-20 were collected on 15 March 1988
2. Fill = fill soil
3. NS = not submitted. Organic vapor monitoring did not indicate the presence of organic vapors associated with the test pit. Samples were therefore not submitted for laboratory analysis.
4. Values reported in microgram per kilogram (ug/kg).
5. NR = not reported. Since paint sludge and associated contaminated soil have been removed, the sample results are not representative of site conditions.

above the MCL. Subsequent sampling and analysis conducted in March, 1988 did not show detectable mercury contamination. Therefore, it was concluded that seep water does not pose a threat to public health and the environment.

Long-term monitoring of surface water in Area IV is recommended to ensure future protection of public health and the environment.

4.43 Ground Water

4.431 Upper Aquifer

Contamination was not detected in the upper aquifer in Area IV. The upper aquifer does not pose a threat to human health and the environment.

4.432 Lower Aquifer

Benzene concentrations were above MCLs in two of eleven samples from one lower aquifer well in Area IV. These two samples are not statistically valid because two subsequent sampling events taken in 1986 and 1988, did not reveal benzene concentrations in detectable amounts. Therefore the lower aquifer does not pose a threat in Area IV. Long-term monitoring of both the upper and lower aquifers is recommended to ensure future protection of public health and the environment.

4.5 Description of Long-Term Monitoring Program

The long-term monitoring program will be designed to monitor on-site and off-site ground-water and surface-water quality to ensure the future protection of public health and the environment.

A geochemical study of the soils and rocks at the Site will be conducted in order to determine the background concentrations of metals.

Presently ground-water wells are required by the NJDEP to be screened at a depth of at least fifty (50) feet. Ground water in the vicinity of the former paint sludge disposal areas is not used as a drinking water source. Residences in the area are serviced by a public water supply.

Specifically, the monitoring network will include all potentially affected drinking-water wells and surface-water tributaries leading to the Wanaque Reservoir. A separate geophysical study will be conducted to optimize the location and placement of monitoring wells. The geophysical study should include a surficial fracture-trace analysis as well as subsurface reflection seismograph analyses to locate fractures within the deep bedrock.

5.0 Summary of Site Characteristics

Six different media were sampled during the RI: seep water, soils, overburden (upper aquifer) ground water, deep bedrock ground water, surface water and stream sediments. As previously stated, WCC divided the Site into four areas of potential environmental concern: Area I (Peters Mine), and Area II (St. Georges Pit/Miller Keeler Pit), Area III (Cannon Mine), Area IV (the inactive Borough Landfill). These Areas were delineated based upon aerial site reconnaissance, previous site history information and geologic mapping. Each Area was investigated separately to ensure that all portions of the Site which were potentially impacted could be properly characterized.

5.1 Ground-Water Investigation

The monitoring wells at the Site range in depth from 14 feet to 543 feet below ground level. Seventeen upper and four lower aquifer monitoring wells were installed and sampled.

Existing data indicate that at Ringwood, as well as other areas in the New Jersey Highlands, bedrock permeabilities typicallly decrease with depth; that is the tightness of the rock mass increases with depth. Even though fractures exist within the bedrock, the frequency of these fractures decreases with depth (Figure 3). Therefore, the potential for water transmission also decreases with depth. Bedrock permeabilities below 100 feet reported in the Phase II RI investigations averaged on the order of 1×10^{-5} centimeters per second. Based on these permeabilities, as well as investigations of the same rock at other areas in New Jersey, there is very low potential at deep depths for water flow and associated transport of contamination.

Only where vertical faults/fractures are encountered and are open to flow is significant ground water found. Fractures found at depth which are filled with silica will not transmit water. A geologic study was conducted as part of the Phase I RI investigations to locate possible faults, fractures or joints. Four deep lower aquifer monitoring wells were located to investigate these faults or joints. A total of five faults were detected. Water production did not increase significantly in the wells when these faults were encountered. Therefore, it can be concluded that the faults do not serve as a good conduit of water and associated contamination.

The upper aquifer consists of an upper zone of glacial fill plus a lower zone of fractured gneiss bedrock. These fractures were probably caused by buckling of the bedrock during geologic uplift and erosion. The lower fractured bedrock unit however is less permeable than the upper unit. Permeability of the bedrock unit for both the upper and lower aquifers depends on the fracture frequency and spacing which generally decrease with depth.

Arsenic, cadmium, chromium, iron, lead, manganese and zinc are metals found in ground water which exceed the MCLs at the Ringwood Mines/ Landfill site (Table IV). Chromium, iron, manganese and zinc are all related to the iron ore, magnetite. Magnetite is part of a mineral group called the Spinels. Spinels are metallic oxides in which metallic cations can substitute for each other within the chemical framework of the mineral. These metallic cations may include chromium, iron, manganese and zinc. As a result of this substitution, all of these metals are considered to be naturally occurring substances at the Site. Since these metals are naturally occurring, they are not considered a threat to public health and the environment and are not addressed further.

A summary of contaminants which exceeded applicable or relevant and appropriate standards (ARARs) is listed in Table V and these contaminants are addressed below by Area.

5.11 Area I (Refer to Table V)

Arsenic concentrations in the upper aquifer exceed the MCL by 6.6 ppb in one sampling round from one well in Area I. Arsenic concentrations in all wells were below the MCL in two additional sampling rounds.

The cadmium concentration in the lower aquifer exceeded the MCL by 10 ppb in one well during the first sampling round. Cadmium was not detected in any well in two subsequent sampling rounds.

Lead concentrations exceeded the MCLs by a maximum of 35 ppb in three of seven wells in the upper aquifer. In each of these wells lead was detected in only one of three sampling rounds. This lead contamination was most likely a result of residual contamination following the paint sludge removal.

5.12 Area II

Ground-water contaminants did not exceed MCLs or other ARARs in Area II.

5.13 Area III

Contaminants of concern did not exceed MCLs or other ARARs in Area III.

5.14 Area IV

Benzene concentrations exceeded the New Jersey Interim Action Levels for Drinking Water by 19.3 ppb in two of eleven samples which were taken in 1984 from one lower aquifer well. In two subsequent sampling events, benzene concentrations were not detected.

A ground-water contaminant plume has not been identified for any of the contaminants found in any of the Areas at the Site. Results of the RI indicate that ground-water contamination occurs at a low level, and is scattered and generally confined to paint sludge locations. No

TABLE IV

SUMMARY OF CONTAMINANTS FOUND IN GROUND-WATER MONITORING WELLS
RINGWOOD MINES/LANDFILL SITE

	OB-1			OB-2			OB-3				OB-4			OB-5			OB-6		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
									U	F									
Arsenic																			
Cadmium																			
Chromium																			
Iron	1.1			4.6	NT		9.3	NT	NT	NT	33	NT		31	NT		4.1		
Lead																			
Manganese	0.12			0.44	NT		0.14	NT	NT	NT	4.1	NT		1.1	NT		0.09		
Zinc				0.01	NT		0.01	NT			0.04	NT			NT		0.02		
Benzene																			

	OB-7			OB-8			OB-9				OB-10			OB-11			OB-12		
Arsenic							0.007	0.0106			0.031			0.006					
Cadmium													NT						
Chromium													NT						
Iron	7	NT		13			0.45	NT	NT	NT	9.5		NT	20	NT	NT		NT	NT
Lead							0.065							0.06					
Manganese	0.042	NT		1.9			0.32	NT	NT	NT	5.4		NT	2.9	NT	NT		NT	NT
Zinc	0.01	NT		0.1				NT	.054	.088	.6		NT	0.02	NT	0.046	0.011	NT	NT
Benzene																			

NOTES:
1. First (1st), second (2nd), and third (3rd) refer to rounds of sampling
   First round samples were collected during August and September 1984
   Second round samples were collected during June 1986
   Third round samples were collected during March 1988
2. Values are reported in milligrams per liter (mg/l)
3. NT = not tested
4. U = unfiltered
5. F = filtered (in the field)

TABLE IV (continued)

SUMMARY OF CONTAMINANTS FOUND IN GROUND-WATER MONITORING WELLS
RINGWOOD MINES/LANDFILL SITE

	OB-13			OB-14A				OB-14B				OB-15A			OB-15B			
	1st	2nd	3rd	1st	2nd	3rd		1st	2nd	3rd		1st	2nd	3rd	1st	2nd	3rd	
						U	F			U	F						U	F
Arsenic					0.015	0.0566	0.0294		0.0036							0.0022		
Cadmium			NT			NT	NT			NT	NT							
Chromium			NT			NT	NT			NT	NT							
Iron			NT		NT	NT	NT		NT	NT	NT					NT	NT	NT
Lead						0.085												
Manganese		NT	NT		NT	NT	NT		NT	NT	NT					NT	NT	NT
Zinc		0.027	NT		0.078	NT	NT		0.032	NT	NT				0.021			
Benzene																		

	RW-1			RW-2				RW-3				RW-4		
	1st	2nd	3rd	1st	2nd	3rd		1st	2nd	3rd		1st	2nd	3rd
						U	F			U	F			
Arsenic	NT			NT										NT
Cadmium	NT			NT				0.02						NT
Chromium	NT			NT		NT	NT				0.058			NT
Iron	NT			NT		NT	NT	0.16		NT	NT	0.42	NT	NT
Lead	NT			NT				0.05						NT
Manganese	NT			NT		NT	NT	0.13		NT	NT		NT	NT
Zinc	NT			NT		0.074	0.040	0.02		0.018	0.037	0.03		NT
Benzene				*										

NOTES: 1. First (1st), second (2nd), and third (3rd) refer to rounds of sampling.
First round samples were collected during August and September 1984.
Second round samples were collected during June 1986.
Third round samples were collected during March 1988.
2. Values are reported in milligrams per liter (mg/l) except for methylene chloride which is reported in micrograms per liter (ug/l).
3. NT = not tested
4. U = unfiltered
5. F = filtered
6. * = See table V for benzene values

TABLE V

SUMMARY OF ARAR/CRITERIA EXCEEDANCES
ADDRESSED AT RINGWOOD MINES/LANDFILL SITE

WCC's Area	ENVIRON's Area	Constituent	Sample Location	Media	Sampling Results by Round (ppm) 1st	2nd	3rd U	3rd F	ARAR/Criteria Title	ARAR/Criteria Value	Comment(s)
I	Paint Sludge Location D	Lead	OB-11	GW	0.06	ND	ND	ND	MCL NJGWQS NJCGWPR	0.05 0.05 0.05	• Fill well screened across material which may be mine tailings. • Detected in unfiltered sample.
I	Paint Sludge Location D	Cadmium	RW-3	GW	0.02	ND	ND	ND	MCL NJGWQS NJCGWPR	0.01 0.01 0.01	• Detected in unfiltered sample • Not detected in any other ground water, seep and surface water samples
I	O'Connor Disposal Area	Arsenic	OB-14A	GW	-	0.015	0.0566	0.0294	MCL NJGWQS NJCGWPR	0.05 0.05 0.05	• Fill well apparently screened across fill soil and debris associated with the O'Connor Disposal Area
I	O'Connor Disposal Area	Lead	OB-14A OB-9	GW GW	- ND	ND 0.065	0.085 ND	ND ND	MCL NJGWQS NJCGWPR	0.05 0.05 0.05	• Fill well apparently screened across fill soil and debris associated with the O'Connor Disposal Area (OB-14A) • Detected in unfiltered samples
III-IV	Municipal Landfill	Benzene	RW-2	GW	0.009*	ND	ND	-	NJIALDW	0.00068	• Presence not confirmed in subsequent rounds

NOTES:
1. Table based on Risk Assessment performed by ENVIRON (1988).
2. Concentrations reported in ppm (mg/l for water and mg/kg for soil and sediment).
3. The samples were analyzed for total chromium. We conservatively assumed that the chromium was present in the more toxic hexavalent form.
4. The concentration for benzene in RW-2 is an average of the selective zone samples calculated by ENVIRON (1988).
5. U = Unfiltered
6. F = Filtered (in the field)
7. ARAR:
   - NJGWQS = New Jersey Ground Water Quality Standard
   - NJCGWPR = New Jersey Criterion for Ground Water Protection and Response
   - MCL = USEPA Maximum Contaminant Level for Drinking Water
   - NJAWQC = New Jersey Ambient Water Quality Criteria

   Non-Promulgated Criteria:
   - NJCO = New Jersey Cleanup Objective for Soil
   - NJGWCC = New Jersey Ground Water Cleanup Criteria
   - NJIALDW = New Jersey Interim Action Levels for Drinking Water
   - AWQC = USEPA Ambient Water Quality Criteria
8. * = of ten selective zone samples, only two hits. The maximum concentration is reported.
9. GW = ground water
10. ND = not detected

detectable migration of ground-water contamination has been identified at the Site.

5.2 Surface Water Investigation

There are three surface water streams that drain the Site (Figure 2). WCC measured stream flows from these streams on five different occasions so that seasonal variations could be considered.

Three rounds of surface water sampling were conducted and a summary of the analytical data results is presented in Table VI.

Iron and zinc consistently exceeded ARARs, but as explained in the Ground-Water Investigation section, these metals are naturally occurring substances.

5.21 Seep Water Sampling

As previously mentioned, seep water quality is believed to be representative of surface water quality. Mercury contamination exceeding MCLs was found in one seep water sample from Area III in 1984. Subsequent sampling events did not detect mercury contamination.

Surface water quality at the Site is acceptable and contaminants are not affecting the downstream Wanaque Reservoir.

5.22 Stream Sediment Sampling

Arsenic was found in stream sediment samples from Park Brook and Peters Mine Brook. The highest concentration found was 31 mg/kg. Arsenic concentrations as high as 13.5 mg/kg were found in upstream samples.

5.3 Soil Investigation

Soil test pits were dug in each Area. In one soil test pit sample from Area III taken prior to the paint sludge removal, total volatile organics exceeded the New Jersey Cleanup Objective for Soils by 0.4 ppm. Two additional test pits were dug following the paint sludge removal and the total volatile organics were undetectable in these test pits.

5.31 Paint Sludge Waste

Paint sludge was identified at four locations at the Site (Figure 4). As part of the Paint Sludge Removal Program, the paint sludge from each of the four locations was sampled and analyzed to determine a waste classification. Based on these analyses, the sludge was identified as EP toxic for lead.

After excavating the paint sludge, soil samples were taken from the excavated surfaces of each of the former paint sludge locations. One sample, B-1, contained concentrations of lead and total petroleum hydrocarbons that exceed the non-promulgated NJDEP Cleanup Objectives

TABLE VI

SUMMARY OF CONTAMINANTS FOUND IN SURFACE WATER SAMPLES

RINGWOOD MINE/LANDFILL SITE

	SW-1				SW-2				SW-3			SW-4			SW-5			SW-6		
	1st	2nd	3rd U	3rd F	1st	2nd	3rd U	3rd F	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3ı U
Arsenic							0.04													
Barium																				C
Calcium	4.3	4.2	NT	NT	5.0	4.2	NT	NT	5.1	5.6		11	15		6.6	8.7		16	24	NT
Iron	0.11	0.064	NT	NT	0.27	0.15	NT	NT	0.29	0.12		0.94	0.19		0.33	0.18		4.2	3.0	NT
Manganese			NT	NT	0.03	0.02	NT	NT				0.23	0.12		0.06	0.03		1.4	1.2	NT
Zinc						0.049				0.13			0.091			0.19		0.01	0.31	0.
Di-n-octylphathalate																				

	SW-7			SW-8				SW-9			SW-10			SW-11				SW-12		
	1st	2nd	3rd	1st	2nd	3rd U	3rd F	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd U	3rd F	1st	2nd	3rd U
Arsenic																				
Barium																				
Calcium	24	31		5.1	5.3	NT	NT	14	13		14	12				NT	NT			NT
Iron	3.1	0.24		0.17	0.26	NT	NT	2.4	1.0		1.7	0.44				NT	NT			NT
Manganese	1.7	0.053			0.026	NT	NT	0.29	0.25		0.12					NT	NT			NT
Zinc		0.31			0.086			0.01	0.52			0.07				0.039				0
Di-n-octylphathalate				14				18												

NOTES:

1. First (1st), second (2nd), and third (3rd) refer to rounds of sampling
   First round samples were collected on 10 July 1984
   Second round samples were collected on 3 April 1985
   Third round samples were collected on 17 March 1988
2. Values are reported in milligrams per liter (mg/l) except for Di-n-octylphathalate which is reported in micrograms per liter (ug/l).
3. NT = not tested
4. U = unfiltered
5. F = filtered

for soil. In sample B1 lead was reported at a concentration of 1,300 ppm and total petroleum hydrocarbons were reported at a concentration of 1,060 ppm (Table II). The NJDEP Cleanup Objective for lead ranges from 250 to 1,000 ppm, and the objective for total petroleum hydrocarbons is 100 ppm. This location was backfilled with three feet of clean soil; however, it still poses a threat to public health and the environment as access to this location is unrestricted.

6.0 Summary of Site Risks/Contaminant Pathways

The RI/FS studies at the Site and the surrounding area indicate that there are limited pathways for the migration of contaminants associated with site disposal activities through local soils, ground water and surface waters. A discussion of the locations and media (soil, sediment, seep water, surface water, and ground water) where contaminants were detected, and a separate evaluation of potential impacts to public health and the environment are contained in the document entitled An Assessment of the Human Health and Environmental Risks Associated With the Ringwood Mines/Landfill Site, by Environ Corporation.

Environ Corporation, under contract to Woodward Clyde Consultants and Ford International Services, Inc., performed a risk assessment for the Site. Numerical estimates of risk were calculated for sixteen indicator chemicals[1] for each potential route of exposure, on the basis of Acceptable Intake for Chronic Exposure (AIC) or Cancer Potency Factors (CPFs) and the human intakes estimated for each exposure scenario. For the Site, the potential health risks were evaluated for the following indicator chemicals: benzene, benzo[a]pyrene, methyene chloride, 1,1,2,2-tetrachloroethylene, arsenic, barium, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, thallium and zinc.

In the risk assessment, individual contaminants were separated into two categories of chemical toxicity depending upon whether they cause carcinogenic or non-carcinogenic effects. In the case of chemicals exhibiting carcinogenic effects, exposure and associated risks were expressed in an exponential nomenclature; 1×10^{-4} (one in ten thousand), 1×10^{-7} (one in ten million) etc.[2]

For chemicals exhibiting non-carcinogenic effects, exposure and associated risks are expressed as a ratio. This ratio was determined

---

[1] Indicator chemicals for the Site were chosen using the ranking scheme described in the Superfund Public Health Evaluation Manual (USEPA 1986). This ranking scheme incorporates information on each constituent chemical's toxicity, concentration, environmental persistence and mobility, in order to select those constituent chemicals predicted to have the greatest impact on human health or the environment.

[2] EPA considers health risks between 10^{-4} and 10^{-7} to be acceptable, with risks below 10^{-7} considered negligible and risks above 10^{-4} considered unacceptable.

by dividing the maximum daily dose (MDD) that would be encountered on site, by the AIC for each chemical compound. The AIC represents the amount of a compound that an individual can be exposed to on a daily basis over a long period of time, with no adverse health effects. When this ratio does not exceed one (1.0), non-carcinogenic health effects would not be expected to occur under those conditions.

Health risks due to exposure to ground water, surface water, sediments, seep water and soils were considered for the Site. Highly conservative exposure scenarios were utilized in estimating contact with each media. For ground-water ingestion, for example, it was assumed that individuals would drink only the most contaminated ground water identified in each area over a seventy-year lifetime.

The risk assessment concluded that lifetime ingestion of arsenic present in ground water from three sampling locations in the upper aquifer, lifetime ingestion of lead and thallium in two of the same sampling locations in the upper aquifer, and lifetime ingestion of cadmium and lead from one sampling location in the lower aquifer would pose unacceptable health risks. It is noted however, that much of the contamination appeared only sporadically in the sampling, and was clearly not widespread throughout the Site. Additionally, the residents of Ringwood receive water from a municipal water supply, and NJDEP will not permit installation of wells to minimize the possibility of any future use of water from the upper aquifer. Furthermore, natural attenuation processes should bring the sporadic contamination down to health-based levels.

EPA determined further that the presence of residual soils from the paint sludge removal action in a small area around soil sample B1, could potentially pose a health risk over time, and EPA will confirm this contamination through resampling, and, if necessary, supervise the removal of these soils from the Site.

The risk assessment determined that exposure to other site soils and surface water does not present significant risk to public health and the environment.

Table VII lists compounds and their current pathways where a risk greater than 1×10^{-6} and a MDD/ADI ratio greater than one was estimated.

7.0 Documentation of Significant Changes

EPA's preferred alternative as documented in the Proposed Remedial Action Plan (PRAP) was the No Further Action with Long-Term Periodic Monitoring alternative. This alternative has been altered because a Health Consultation conducted by the Agency for Toxic Substances and Disease Registry (ATSDR) has shown that soil in a small portion of Area I may pose a threat to human health.

Post paint sludge removal sampling revealed that one soil sample

SUMMARY OF POTENTIAL PUBLIC HEALTH CONCERNS

ADDRESSED AT RINGWOOD MINES/LANDFILL SITE

WCC's Area	ENVIRON'S Area	Constituent	Sample Location	Media	Sampling Results By Round (ppm) 1st	2nd	3rd U	3rd F	Lifetime Cancer Risk	Maximum MDD/ADI Ratio	Exposure Scenario	Comments	Existing Path Yes
I	Paint Sludge Location A	Arsenic	08-15B	GW	-	0.002	ND	ND	1.01×10^{-4}	-	• Assumes ingestion of upper aquifer ground water.	• Detected in unfiltered sample. • Does not exceed ARAR/Criteria.	
I	Paint Sludge Location D	Arsenic	08-11	GW	0.006	ND	ND	ND	2.74×10^{-4}	-	• Assumes ingestion of upper aquifer ground water.	• Fill well screened across material which may be mine tailings. • Does not exceed ARAR/Criteria. • Detected in unfiltered sample.	
I	Paint Sludge Location D	Lead	08-11	GW	0.06	ND	ND	ND	-	2.52	• Assumes ingestion of upper aquifer ground water.	• Fill well screened across material which may be mine tailings. • Detected in unfiltered sample.	
I	Paint Sludge Location D	Thallium	08-11	GW	0.01	--	ND	ND	-	14.7	• Assumes ingestion of upper aquifer ground water.	• Fill well screened across material which may be mine tailings. • Detected in unfiltered sample.	
I	Paint Sludge Location D	Cadmium	RW-3	GW	0.02	ND	ND	ND	-	4.06	• Assumes ingestion of lower aquifer ground water.	• Detected in unfiltered sample. • Not detected in any other ground water, seep and surface water samples.	
I	Paint Sludge Location D	Lead	RW-3	GW	0.05	ND	ND	ND	-	2.15	• Assumes ingestion of lower aquifer ground water.	• Detected in unfiltered sample. • Does not exceed ARAR/Criteria.	
I	Paint Sludge Location D	Chromium (see note 8)	RW-3	GW	ND	ND	ND	0.058	-	-	-	• Detected in filtered sample only. • Not detected in any other ground water, seep and surface water samples.	

SUMMARY OF POTENTIAL PUBLIC HEALTH CONCERNS
ADDRESSED AT RINGWOOD MINES/LANDFILL SITE

WCC's Area	ENVIRON'S Area	Constituent	Sample Location	Media	Sampling Results By Round (ppm) 1st	2nd	3rd U	3rd F	Lifetime Cancer Risk	Maximum MDD/ADI Ratio	Exposure Scenario	Comments	Exis Path Yes
I	O'Connor Disposal Area	Arsenic	OB-14A	GW	-	0.015	0.0566	0.0294	2.59×10^{-3}	-	• Assumes ingestion of upper aquifer ground water.	• Risk based on concentration in OB-14A.	
			OB-14B	GW	-	0.036	ND	ND				• Do not exceed ARAR/Criteria (OB-14B, OB-9, and OB-10).	
			OB-9	GW	0.007	0.0106	ND	ND					
			OB-10	GW	0.031	-	ND	ND					
I	O'Connor Disposal Area	Arsenic	SD-9	SED	31.4	-	-	-	1.32×10^{-5}		• Assumes dermal contact with sediment.	• Constituent occurs naturally. concentration equivalent to background	X
			SD-10	SED	27.3	-	-	-	4.65×10^{-6}		• Assumes incidental ingestion of sediment.		
I	O'Connor Disposal Area	Lead	OB-14A	GW	-	ND	0.085	ND	-	3.57	• Assumes ingestion of upper aquifer ground water.	• Ratio based on concentration in OB-14A.	
			OB-9	GW	ND	0.065	ND	ND				• Detected in unfiltered samples.	
II-	Municipal Landfill	Benzene	RW-2	GW	0.009*	ND	ND	-	2.38×10^{-6}	-	• Assumes ingestion of lower aquifer ground water and inhalation while showering.	• May be an artifact of sampling.	
									4.25×10^{-6}				

NOTES:
1. Table based on Risk Assessment performed by ENVIRON (1988).
2. Concentrations reported in ppm (mg/l for water, and mg/kg for soil and sediment).
3. The concentration for benzene in RW-2 is an average of the selective zone samples calculated by ENVIRON (1988).
4. U = Unfiltered
5. F - Filtered (in the field).
6. * = of ten selective zone samples, only two hits. The maximum concentration is reported.
7. ND = Not Detected
8. The samples were analyzed for total chromium. We conservatively assumed that chromium was present in the more toxic hexavalent form.

(B1) in Area I contained lead and total petroleum hydocarbons which exceed the health-based levels (see Table I). The remedial action will now include confirmatory sampling and excavation and off-site disposal of this soil. The removal area will then be graded, back-filled with clean soil and revegetated. The capital cost for this action is estimated at $75,000.

8.0 Description of Alternatives

A Feasibility Study (FS) was initiated in March 1988. The FS evaluated various alternatives for site cleanup based upon the findings of the RI. Four ground-water alternatives were developed which addressed the localized and low level contamination in Areas I, III and IV. These alternatives are described in the FS document and in the Proposed Remedial Action Plan.

As documented in the Summary of Site Risks section of this document, the ground water at the Site currently does not pose a significant risk to human health and the environment. Therefore, alternatives discussed in the FS for ground-water remediation are not included in the Record of Decision and only alternatives and proposals which address the threats posed by the Site are described in this document.

8.1 Proposal for Confirmatory Sampling Then Removal of Soil, Backfilling, Grading and Revegetation in Area I

As stated in the Site History section of this document, 7,000 cubic yards of surficial paint sludge were excavated and removed by Services under a unilateral Administrative Order issued by EPA in June, 1987. Post removal sampling revealed that soil within a small portion of Area I (less than one acre) still contained lead and total petroleum hydrocarbon concentrations in excess of health-based levels. Confirmatory sampling will be performed in order to verify the results of the post-removal sampling. If these results are verified, then the remaining contaminated soil exceeding health-based levels will be removed from/and around the location of post paint sludge excavation sample B1 and transported to a RCRA hazardous waste facility. The area will be resampled, then graded, backfilled with clean soil and revegetated.

The lead concentration in sample B1 was 1,300 ppm. The NJDEP Cleanup Objective for lead in soils is from 250 to 1,000 ppm. This proposal is expected to reduce the lead level to below 250 ppm.

The total petroleum hydrocarbon concentration in sample B1 was 1,060 ppm. The NJDEP Cleanup Objective for total petroleum hydrocarbons in soil is 100 ppm. This proposal should reduce the total petroleum hydrocarbon concentration to below 100 ppm.

The estimated capital cost for this proposal is $75,000.

8.2 Ground-Water and Surface Water Alternative: No Further Action with Periodic Long-Term Monitoring

This alternative addresses the ground water and surface water at the Site. A long-term ground-water and surface-water monitoring program is included in this alternative in order to confirm that chemical concentrations in the ground water of the upper aquifer in Area I reach health-based levels within a short period of time, and to protect against possible future threats to the ground water and surface water throughout the Site.

This alternative acknowledges that the suspected source of ground-water contamination (i.e. paint sludge) has been eliminated and assumes that any residual contamination levels will decrease over time to acceptable levels. The monitoring network will include all potentially affected drinking water wells and surface water tributaries to the Wanaque Reservoir. Geophysical studies such as fracture-trace analyses and mapping of faults, folds, lineations and joints will be conducted to optimize the location and placement of long-term monitoring wells. Geochemical analyses of surrounding rocks and soil will be conducted in order to establish background concentrations of metals. After five years the monitoring program will be reevaluated to ensure that the ground water has reached health-based levels and the surface water is not impacting the Site. However, long-term monitoring for the entire Site should continue for a period of thirty years.

Presently, the shallow aquifer is not being used as a potable water source and restrictions on shallow wells should remain in effect in the forseeable future. Within a short period of time, natural attenuation should bring levels of contaminants of concern below ARARs.

Capital, operation and maintenance and net present worth costs are estimated as follows:

Capital Costs = $150,000
Operation and Maintenance Costs = $50,000
* Net Present Worth = $712,889

* Based on 8% discount rate and 30-year period of performance.

9.0 Comparative Analysis of Alternatives

Each proposal and alternative was evaluated and analyzed according to the following nine criteria:

- Overall protection of human health and the environment

- Compliance with ARARs

- Long-term effectiveness and permanence

- Short-term effectiveness

- Reduction of toxicity, mobility or volume
- Implementability
- Cost
- State Acceptance
- Community Acceptance

9.1 Overall Protection of Human Health and the Environment

The proposal to conduct confirmatory sampling and remove soil that is above health-based levels in Area I is protective of human health and the environment because it eliminates the remaining source of ground-water and soil contamination.

The No Further Action with Periodic Long-Term Monitoring Alternative will provide adequate protection of human health and the environment. The source of suspected contamination (i.e., paint sludge) has been removed and the long-term monitoring program will be designed to protect against future threats to human health and the environment.

9.2 Compliance with ARARs

The proposal to conduct confirmatory sampling of soil above health-based levels will eliminate the contaminated soil around the B1 area which is above the New Jersey Cleanup Objectives (NJCO) for soils. This proposal will bring the remaining contaminated soil in compliance with the NJCO. This portion of the Site will be closed consistent with alternate clean-closure requirements under RCRA.

The paint sludge which has already been removed from the Site, was found to be a RCRA characteristic waste for lead. Due to the small amount of contaminated soil remaining and its lower lead concentration, the remaining soil is not expected to be a RCRA characteristic waste. Because the remaining soil is not a RCRA characteristic waste, land ban requirements do not apply.

The purpose of the long-term ground-water and surface-water monitoring program is to ensure that the ground water and surface water are at State and Federal MCLs.

9.3 Long-Term Effectiveness and Permanence

Confirmatory sampling and removal of the soil in Area I will permanently eliminate the remaining contaminated soil from the Site.

The monitoring program provides for a minimal period of thirty years of surface-water and ground-water monitoring and, therefore, is effective in providing long-term protection of human health and the environment.

9.4 Short-Term Effectiveness

The proposal to conduct confirmatory sampling and then to remove the soil in Area I provides for short-term effectiveness.

The No Further Action with Periodic Long-Term Monitoring Alternative relies on natural attenuation processes to bring the remaining contamination down to acceptable health-based levels. Natural attenuation of ground water and surface water should take a relatively short period of time. The monitoring program will be reevaluated in five years to ensure that the ground water and surface water is at acceptable health-based levels.

9.5 Reduction of Toxicity, Mobility or Volume

Only alternatives which involve treatment are analyzed under this criterion. Neither the Soil Removal Proposal nor the No Further Action Alternative involve treatment and, therefore, they are not analyzed under this criterion.

9.6 Implementability

Implementability addresses how easy or difficult it would be to implement a given alternative from the design stage through construction and long-term operation and maintenance.

The No Further Action Alternative, does not present any implementation problems, except that before any additonal monitoring wells are installed a detailed geochemical and geophysical survey must be performed to optimize placement of these wells.

The Confirmatory Sampling, Removal of Soil, Grading, Backfilling and Revegetation in Area I Proposal, would be easy to implement. It may require some time to mobilize heavy equipment before the removal can be implemented. Revegetation may require some maintenance of the vegetative cover to stabilize the soil and prevent erosion.

9.7 Cost

The cost criteria for each proposal and alternative include the estimated capital costs and operation and maintenance costs (O & M) and the net present worth costs.

The capital, O & M and net present worth costs are presented in the Description of Alternatives section of this document. The proposal to conduct confirmatory sampling and remove soil in Area I is a one-time action which does not involve operation and maintenance nor net present worth costs.

9.88 State Acceptance

This evaluation criterion addresses the concern and degree of support that the State government has expressed regarding the remedial alternatives being addressed. NJDEP has reviewed the RI, FS, Risk Assessment and this document. NJDEP has given its concurrence on the selected remedial action.

9.9 Community Acceptance

EPA held a public meeting on August 17, 1988 at which time the results of the RI and FS were presented along with EPA's preferred remedy. Questions and comments raised during this meeting are summarized in the Responsiveness Summary section of this document.

Prior to the public meeting EPA met with Ringwood Borough officials on August 12, 1988 to discuss the proposed remedy. Ringwood officials stated their desire for the monitoring of potable wells near the Site and gave their support of the proposed long-term monitoring program.

10.0 The Selected Remedy

EPA's selected remedy has three components:

1. Achieving health-based levels in the upper aquifer of Area I through natural attenuation processes.

2. Implementation of a long term surface water and ground-water monitoring program to confirm that ground-water contamination in Area I meets health-based levels and to protect against future threats to the ground water and surface water throughout the Site.

3. Confirmatory soil sampling and possible removal of contaminated soils to levels meeting NJCO. This action will be conducted pursuant to the CERCLA 106(a) unilateral removal order Index No. II-CERCLA-70102.

11.0 The Statutory Determinations

Section 121 of CERCLA requires that EPA select a remedy which is protective of human health and the environment, attains ARARs, is cost effective and utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

Based upon the analysis presented in the Comparative Analysis of Alternatives and Selected Remedy sections, the following conclusions are reached regarding the Soil Removal Proposal and the No Further Action with Periodic Long-Term Monitoring Alternative.

11.1 Protection of Human Health and the Environment

Long-term ground-water and surface water monitoring are protective of human health and the environment because the source of contamination (i.e., paint sludge) in the ground water has been removed except for a small portion of Area I. Removal of soil above health-based levels around sample B1 will eliminate the remaining contaminated soil in Area I.

There is no immediate threat to the downgradient Wanaque Reservoir. Surface water sampling to date has shown that no contamination is entering the reservoir from the Site. The long-term monitoring program will be designed to monitor on-site and off-site ground-water and surface-water quality to ensure future protection of public health and the environment.

11.2 Attainment of ARARs

Promulgated regulations which apply to the Ringwood Mines/Landfill Site include the New Jersey Ground Water Quality Standard, the New Jersey Criterion for Ground Water Protection and Response, and the USEPA Maximum Contaminant Level for Drinking Water. The principal ARAR is to achieve 50 ppb arsenic and lead in the upper aquifer. Non-promulgated criteria include the New Jersey Cleanup Objectives for Soil.

As explained in the Comparative Analysis of Alternatives section, samples exceeding ARARs are localized and minimal. Removal of the soil in Area I which is confirmed to be above health-based levels will bring contamination levels below the New Jersey Cleanup Objectives for Soil. It is expected that contaminants in the ground water will reach health-based levels within a short period of time. Ground-water monitoring will be utilized to confirm this hypothesis.

11.3 Cost-Effectiveness

The estimated costs associated with each alternative are presented in the Description of Alternatives section. Combining the Proposal for Confirmatory Sampling and Removal of Soil in Area I and the No Further Action with Periodic Long-Term Monitoring Alternative provides the maximum protection for human health and the environment and is cost effective.

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

Confirmatory sampling and removal of the contaminated soil around sample B1 provides a permanent remedy for the soil medium in Area I.

11.41 RATIONALE FOR REMEDY SELECTION

Confirmatory sampling and removal of the remaining contaminated soil in Area I combined with long-term ground-water and surface water monitoring is the preferred remedy for the Site. The rationale for the selection of this remedy is as follows:

° The selected remedy is a straight-forward action and an obvious solution. It is consistent with other actions already taken at the Site (i.e., paint sludge removal).

° The paint sludge removal already completed at the Site has eliminated the suspected source of ground-water contamination in the upper aquifer, except for a small portion of Area I which the Soil Removal Proposal addresses.

° The residual concentration of contaminants in the ground water was found to be low level and localized. No ground-water contaminant plume has been identified at the Site.

° Presently, ground water in the vicinity of the former paint sludge disposal areas is not used as a drinking water supply source. Residences in the area are on a public water supply system.

° There is no threat to the downgradient Wanaque Reservoir. Surface water sampling to date has shown that no contamination is entering the reservoir from the Site.

° Analyses of soil samples from test pits at the former paint sludge locations and at the former O'Connor Landfill did not show significant contamination except for a small portion of Area I. This remaining contaminated soil will be excavated, if necessary, and properly disposed of off-site.

° Although ground-water treatment technologies are proven and reliable, they may not be feasible to implement because of the low level and scattered nature of ground-water contamination at the Site. Specifically, extraction wells would draw clean water from outlying areas into the areas of contamination, thus diluting the already low levels of contamination in the ground water. This further dilution would make ground-water treatment impractical.

For the reasons stated above the Confirmatory Sampling and Soil Removal Proposal combined with the No Further Action with Periodic Long-Term Monitoring Alternative is the most appropriate remedy for the Ringwood Mines/Landfill Site. This remedy addresses the soil, surface-water and ground-water media at the Site and is protective of human health and the environment.

RESPONSIVENESS SUMMARY

FOR THE PROPOSED REMEDIAL ACTION
AT THE RINGWOOD MINES/LANDFILL SITE
RINGWOOD, NEW JERSEY

TABLE OF CONTENTS

		Page
I.	Introduction	1
II.	Site Contamination Concerns	1
	A. Iron Mines	1
	B. Ground-Water Monitoring	2
	C. Drinking Water	3
	D. Sampling	3
III.	Additional Areas of Concern	4
	A. Municipal Landfill	4
	B. Other Concerns	5
IV.	Written Comments	5

RESPONSIVENESS SUMMARY

FOR THE PROPOSED REMEDIAL ACTION AT THE RINGWOOD MINES/LANDFILL SITE RINGWOOD, NEW JERSEY

I. Introduction

The United States Environmental Protection Agency (EPA) held a public comment period from August 9, 1988 to September 6, 1988, to provide an opportunity for interested parties to comment on EPA's proposed remedial action of the Ringwood Mines/Landfill Superfund site in Ringwood, New Jersey. EPA held a public meeting to present the proposed remedial action plan on August 17, 1988. Approximately 15 community residents attended the meeting. Copies of the proposed remedial action plan were distributed at the meeting and placed in the information repositories for the site.

The purpose of this Responsiveness Summary is to document EPA responses to comments and questions raised during the public comment period. Sections II and III below present a summary of the questions and comments expressed by the public at the August 17 meeting. Section IV presents a summary of written comments received following the meeting. The questions and comments are grouped into general categories of subjects. All questions or comments are followed by EPA's responses.

II. Site Contamination Concerns

A. Mines

1. A group of citizens asked for information about what is allegedly in the former Ringwood iron mines.

   <u>EPA response</u>: Although there have been allegations of hazardous waste dumping in those mine shafts, they have not been supported by any documentation. Allegedly, the Ford Motor Company dumped solid and industrial waste form car manufacturing and assembly.

   EPA's investigation at the site was targeted toward determining the quality of ground water in the mines. To that end, contractors sampled ground water which is hydrologically connected to the mine shafts. This sampling was accomplished by drilling monitoring wells into fractures that run through the mines. No contamination was detected.

B. Ground-Water Monitoring

1. One attendee spoke of the ground-water monitoring wells that were installed at Furnace Dam Pond and asked whether these wells were tested only for lead. In addition, he wondered whether monitoring is being conducted to test the iron content in wells near the Furnace Dam Pond, as people use water from these wells because they believe that they are "natural".

   EPA Response: In one round of monitoring, water from the Furnace Dam Pond area was tested for a comprehensive range of hazardous substances. Other rounds tested for hazardous substances which included some heavy metals found in very low concentrations. Lead was not found. The level of contamination is not likely to have changed in the past four years, as there is no contaminant plume moving from the site. This area will be considered in the long-term monitoring program designed for the Site.

2. One resident noted that road workers are blasting to create Interstate 287 and wanted to know whether the blasting would cause fractures in the bedrock which could effect the Wanaque Reservoir.

   EPA Response: Blasting can create fractures, but not deep enough to affect deep bedrock ground-water wells. Blasting to create 287 should not affect ground water near the Wanaque Reservoir, as these two locations are divided by a ridge system which serves as an effective ground-water barrier.

3. One attendee questioned the Borough of Ringwood's reasons for installing gas vents in his yard, which borders the Municipal Landfill, and wondered whether gases would be pumped out through monitoring wells.

   EPA Response: The vents have been installed to prevent the buildup of methane gas, which arises from decomposition and could lead to explosions within the landfill. Monitoring wells would not draw gases as they are screened in the ground water.

C. Drinking Water

1. One citizen expressed his concern about the possibility of contamination of drinking-water wells in Erskine Lakes and asked for EPA's assurance that the water is suitable for drinking.

   EPA Response: The Borough samples the drinking water in Erskine Lakes regularly and there is no reason to believe that the water has been affected by contamination at the Ringwood Mines/Landfill site.

2. One attendee asked whether EPA had studied the locations and depths of public and private wells and whether ground-water wells were monitored at the proper depth.

   EPA Response: In 1983, EPA in consultation with the Borough of Ringwood, conducted a potable well inventory. Wells adjacent to the Site were analyzed and were found to be free of contamination. Monitoring wells were screened at a variety of depths commensurate with potable wells in the area.

3. An attendee wanted to know the depths of potable wells.

   EPA Response: Potable well depths in the area range from 70 feet to 600 feet, averaging approximately 200 feet.

4. A citizen asked the depth of the well from which the Borough draws its water.

   EPA Response: Approximately 300 feet.

D. Sampling

1. One attendee wanted to know who actually performed the sampling conducted as part of the remedial investigations at the Site.

   EPA Response: Woodward-Clyde Consultants (WCC) performed sampling activities at the Site as a contractor working for the Ford Motor Company, with oversight by EPA.

2. One attendee questioned whether WCC works for EPA; whether it has a laboratory in-house; and whether EPA approved the laboratory that was used by WCC.

   EPA Response: WCC does not work for EPA; it was retained by the Ford Motor Company to perform technical investigations at the site. WCC sends its samples to an outside laboratory which was approved by EPA.

3. One attendee asked whether, because EPA is relying on WCC and its laboratory, there are people taking civil and legal responsibility for the results, and who is liable in the event results have been falsified. He also asked what percentage of samples are "split," so that EPA tests the same samples as the contractor laboratory to check for inconsistent results.

   EPA Response: Falsification of data is a serious offense; however, EPA feels comfortable with the quality of the remedial investigation data due to the Agency's quality assurance/quality control approval process, sample splitting, and the fact that WCC used three different laboratories. Although the percentage of samples that are split between EPA's laboratory and the laboratory used by WCC varies, it is usually 25 to 30 percent.

III. Additional Areas of Concern

A. Municipal Landfill

1. One attendee asked what EPA is planning to do about the waste at the Municipal Landfill, which he believes to be toxic, and wondered whether monitoring wells could be installed in the landfill itself. He feels that EPA is not familiar enough with the region to identify all problem areas.

   EPA Response: EPA has ensured that monitoring wells have been installed immediately downgradient of the Municipal Landfill to obtain ground-water data representative of what was disposed of in the landfill. Therefore, it is not necessary to install wells directly into the landfill to obtain water quality data.

   Up to this point, it has been EPA's understanding that there is no hazardous waste in the Municipal Landfill. There are two monitoring wells in the landfill area which revealed no contamination related to hazardous waste disposal activities. During the course of the long-term monitoring program, EPA will install more wells, if needed. EPA would be willing to accompany residents on a field visit to locate any unaddressed areas of concern.

B. Other Concerns

1. One citizen stated that his announcement of the public meeting had been delivered in the mail only that afternoon.

   EPA Response: In addition to mailing the announcement of the meeting to interested persons, EPA placed advertisements in local newspapers announcing the meeting.

IV. Written Comments

A. The Proposed Remedy

1. Mr. Robert Westerdale of Hewitt, New Jersey expressed his belief that "no further action" is not a suitable alternative for remediation of the site. He stated his concern that alleged uncontrolled dumping in the mine area has caused high levels of ground-water contamination and that ground-water movement may be deceptive. Therefore, it may cause EPA to believe that the Site is safe but in reality, there may actually be a highly-contaminated plume that will infiltrate a drinking-water source someday.

   EPA Response: High levels of ground-water contamination have not been found at the Site, and there is no evidence of a contaminant plume. The long-term monitoring program will be designed in such a way that any contaminant plume that may develop in the future will be detected. Potable drinking-water wells will be monitored to protect drinking-water sources.

2. Ms. Joan Helinski of the Northern New Jersey Water Supply Commission expressed her support of the remedy selected by EPA for the Site.