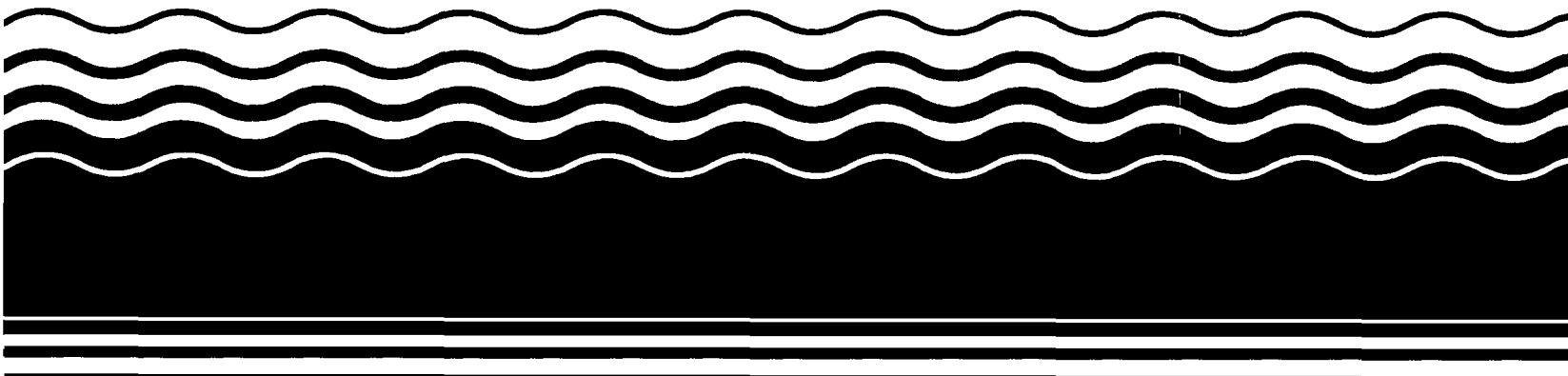




Superfund Record of Decision:

American Cyanamid, NJ



REPORT DOCUMENTATION PAGE		1. REPORT NO. EPA/ROD/R02-93/203	2.	3. Recipient's Accession No.
4. Title and Subtitle SUPERFUND RECORD OF DECISION American Cyanamid, NJ First Remedial Action			5. Report Date 09/28/93	
7. Author(s)			6.	
9. Performing Organization Name and Address			8. Performing Organization Rept. No.	
			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 800/800	
15. Supplementary Notes PB94-963832			14.	
16. Abstract (Limit: 200 words) The 575-acre American Cyanamid site is a manufacturing facility located in the southwestern section of Bridgewater Township, Somerset County, New Jersey. Land use in the area is predominantly residential, commercial, and industrial. The entire site lies on the Raritan River, about 20 miles upstream from where the river discharges into the Atlantic Ocean. The estimated 30,000 people who reside within the 33-square miles of the township use the Elizabethtown Water Company's two water intakes, located approximately 1,800 feet upriver from the site, to obtain their drinking water supply. Beginning in 1918, American Cyanamid has used the facility to produce rubber chemicals, pharmaceuticals, dyes, pigments, chemical intermediates, and petroleum-based products. In 1981, American Cyanamid conducted preliminary onsite studies which determined that contamination sources were confined to the main plant production area and around 27 onsite impoundments in the main plant area. As a result of reported spills and leakage of various plant wastes, a number of onsite investigations were conducted by the PRP and the State, which revealed PCB- and PAH-contaminated soil that could potentially affect ground water in the area. In 1988, 16 of the 27 onsite impoundments were determined to be potentially contributing to ground water contamination due to waste (See Attached Page)				
17. Document Analysis				
a. Descriptors Record of Decision - American Cyanamid, NJ First Remedial Action Contaminated Media: soil, sludge, debris Key Contaminants: VOCs (toluene, xylenes), metals (arsenic, chromium, lead)				
b. Identifiers/Open-Ended Terms				
c. COSATI Field/Group				
18. Availability Statement			19. Security Class (This Report) None	21. No. of Pages 72
			20. Security Class (This Page) None	22. Price

Abstract (Continued)

leakage; and RCRA closure procedures were implemented for four impoundments. These 16 impoundments, being addressed under the Superfund cleanup program, were taken out of service before the RCRA regulations were promulgated. Beginning in 1989, American Cyanamid implemented several remedial actions at the site, including the removal of pumpable tars for use as an offsite fuel, and a berm stability evaluation program. In 1992, eight surface soil areas requiring removal action were identified under the 1992 Surface Soils Remedial/Removal Action (SSR/RA) Program, and included the excavation and offsite disposal of PCB-contaminated soil; excavation and disposal of PAH-contaminated soil in the onsite RCRA permitted disposal facility; capping of another PAH-contaminated area; and the placement of a geotextile, soil, and vegetative cover over a chromium-contaminated area. In addition, tars from impoundments 4 and 5 are being removed and blended in an onsite RCRA permitted hazardous waste fuel blending facility and four onsite impoundments have been closed, to be replaced by the new RCRA permitted Impoundment 8 facility. This ROD addresses the contamination in Group 1 Impoundments, consisting of four onsite surface impoundments, as OU1. The sludge contained in the Group 1 Impoundments is believed to have originated from onsite wastewater treatment operations, and it originally was deposited into another impoundment before being dredged and/or pumped into these Impoundments. Future RODs will address other impoundment areas and onsite ground water. The primary contaminants of concern affecting the soil, sludge, and debris are VOCs, including toluene and xylenes; and metals, including arsenic, chromium, and lead.

The selected remedial action for this site includes excavating and treating 176,500 yd³ of soil, sludge, and debris from the Group 1 Impoundments onsite using cement-based solidification; consolidating the solidified material into the onsite RCRA permitted facility; collecting volatile emissions using a blower and treating them with a carbon adsorber, as needed; monitoring the ground water; and revegetating the impoundment area. The estimated present worth cost for this remedial action is \$12,500,000.

PERFORMANCE STANDARDS OR GOALS:

Soil cleanup goals are based on health-based risk criteria and will not exceed the State health level of 10⁻⁶. Chemical-specific goals were not provided.

NOTICE

THIS DOCUMENT HAS BEEN REPRODUCED FROM THE BEST COPY FURNISHED NTIS BY THE SPONSORING AGENCY. ALTHOUGH IT'S RECOGNIZED THAT CERTAIN PORTIONS ARE ILLEGIBLE, IT IS BEING RELEASED IN THE INTEREST OF MAKING AVAILABLE AS MUCH INFORMATION AS POSSIBLE.

ROD FACT SHEET

SITE

Name : American Cyanamid
Location/State : Bound Brook/New Jersey
EPA Region : 2
HRS Score (date): 50.28 (Sept. 1983)

ROD

Date Signed: September 24, 1993
Remedy: Solidification
Operable Unit Number: OU-1
Capital cost: \$12,500,000 (in 1993 dollars)
Construction Completion: to be determined during RD
O & M in 1993: Not Applicable (N/A), None required
1994:
1995:
1996:
Present worth: N/A

LEAD

Remdial/Enforcement:	Enforcement
EPA/State/PRP:	State of New Jersey
Primary contact:	Haiyesh Shah, NJDEPE, (609) 633-1455
Secondary contact:	Rocco Grassi, EPA, (212) 264-6314
Main PRP(s):	American Cyanamid
PRP Contact:	Joel Jerome, (908) 862-6000

WASTE

Type: Volatile and semivolatile organics, heavy metals
Medium: Sludge
Origin: Lagoons
Est. quantity: 176,500 cubic yards

SUPERFUND RECORD OF DECISION

AMERICAN CYANAMID SITE
BRIDGEWATER TOWNSHIP
SOMERSET COUNTY
NEW JERSEY



PREPARED BY: N.J. DEPARTMENT OF ENVIRONMENTAL PROTECTION AND ENERGY
SITE REMEDIATION PROGRAM
BUREAU OF FEDERAL CASE MANAGEMENT
SEPTEMBER 1993

**AMERICAN CYANAMID SITE
RECORD OF DECISION**

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**DECLARATION STATEMENT
RECORD OF DECISION
AMERICAN CYANAMID SITE**

SITE NAME AND LOCATION

American Cyanamid Site
Bridgewater Township, Somerset County, New Jersey

STATEMENT OF BASIS AND PURPOSE

This decision document, prepared by the New Jersey Department of Environmental Protection and Energy (NJDEPE) as lead agency, presents the selected remedy for the American Cyanamid Site. The selected remedy was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Re-authorization Act of 1986 (SARA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision document explains the factual and legal basis for selecting the remedy for this site. This decision is based on the administrative record for this site. The attached index identifies the items that comprise the administrative record.

The United States Environmental Protection Agency (USEPA), support agency for this site, concurs with the selected remedy and has provided a concurrence letter to that effect which is attached to the responsiveness summary section of this document.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to human health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

This ROD addresses only one operable unit (Group I Impoundments) consisting of four on-site surface impoundments 11, 13, 19 and 24. The selected remedy is "Solidification with Consolidation into the on-site Resource Conservation and Recovery Act (RCRA) Permitted Impoundment 8 Facility".

The major components of the selected remedy include:

- Excavation of the waste material from Group I Impoundments (11, 13, 19 & 24)
- On-site solidification of excavated material by using cement-like material

- Consolidation of the solidified material into the on-site RCRA Permitted Impoundment 8 facility

Ground water monitoring will be performed to assess potential influences from Impoundments 19 and 24 on water quality of the Raritan River. The NJDEPE and USEPA may consider the results of pilot studies for in-situ solidification treatment for Impoundment 24.

DECLARATION OF STATUTORY DETERMINATIONS

The Solidification with Consolidation into the on-site RCRA Permitted Impoundment 8 Facility has been selected based on the results of the Impoundments Characterization Program, Baseline Endangerment Assessment and Corrective Measure Study/Feasibility Study (CMS/FS) for Group I Impoundments, which have shown the remedy to be protective of human health and the environment. The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally 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.

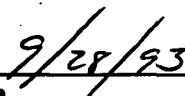
Because this remedy will result in hazardous substances remaining on the site, a review will be conducted pursuant to CERCLA every five (5) years after the commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Final site-wide remediation including all impoundments, soils and ground water will comply with the applicable or relevant and appropriate requirements (ARARs).

The State of New Jersey general guidelines on contaminant cleanup levels as found in the formerly proposed "Cleanup Standards for Contaminated Sites" were published in the February 3, 1992 New Jersey Register. These guidelines are protective to 10^{-6} risk level. Final site-wide remediation will insure that there is no current or future unacceptable risk to human health and the environment including compliance with the State of New Jersey 10^{-6} risk level.



Signature
Lance R. Miller, Assistant Commissioner



Date



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION II

JACOB K. JAVITS FEDERAL BUILDING

NEW YORK, NEW YORK 10278-0012

27 SEP 1993

Jeanne Fox, Acting Commissioner
State of New Jersey
Department of Environmental
Protection and Energy
401 East State Street, CN 402
Trenton, New Jersey 08625-0402

Re: Record of Decision
American Cyanamid Superfund Site
Bridgewater Township, Somerset County, New Jersey

Dear Commissioner Fox:

The United States Environmental Protection Agency (EPA), Region II, has reviewed the draft Record of Decision (ROD) dated August 1993 for the American Cyanamid Superfund Site (Site), which is located in Bridgewater Township, Somerset County, New Jersey.

EPA concurs with the selected remedy, which includes the excavation and on-site solidification of the waste material from the Group I Impoundments (11, 13, 19 and 24) and has determined that the draft ROD is consistent with Section 121 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) based on the administrative record for the Site. This finding shall not affect EPA's right to conduct five-year reviews of the Site or to take or require appropriate action pursuant to such review, in accordance with Section 121(c) of CERCLA. EPA further reserves the right to take response and enforcement actions pursuant to Sections 104, 106 and 107 of CERCLA with respect to the remedy and any additional future work at the Site.

Sincerely,

A handwritten signature in black ink, appearing to read "William J. Muszynski".

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

DECISION SUMMARY

1. SITE DESCRIPTION

The American Cyanamid Company site (facility, site or Cyanamid) is located in north-central New Jersey in the southwestern section of Bridgewater Township, Somerset County. The facility encompasses approximately 575 acres and is bounded by Route 28 to the north, the Raritan River to the south, Interstate 287 and the Somerset Tire Service property to the east, and Foothill Road and the Raritan River to the west. The southern perimeter of the property follows the north bank of the Raritan River for nearly 1.5 miles, approximately .20 miles upstream from the river's discharge into the Atlantic Ocean. The general location of the site is shown on Figure 1.

The Raritan River provides recreational value (fishing and boating) along its course through Somerset County. The river is also used as a primary supply of residential water by the Elizabethtown Water Company, which operates two water intakes upriver (approximately 1,800 feet upriver) of the site.

Ground water in the general vicinity of the site is not used as a potable water supply. Potable water is supplied primarily by the Elizabethtown Water Company. A search of available well records indicate that there are no public community water supply wells or zones of contribution for such wells in the general area of the site.

The Township of Bridgewater encompasses an area of approximately 33 square miles, with a population of about 30,000 (Census data, 1990). The boroughs of Bound Brook, South Bound Brook, Manville, and Somerville are in close proximity. The Township of Bridgewater is well-developed, providing areas zoned for residential, commercial business, and manufacturing uses. The northern three-quarters of the township are primarily zoned for commercial business, manufacturing, office/rental, high density residential (R-10 and R-20), and multifamily residential use. The land use/zoning classification for the entire Bound Brook facility is manufacturing "M-1A" and "M-1B" (Township of Bridgewater 1991).

Areas in the southern section of the township along the Raritan River, and areas adjoining the river in the surrounding townships and boroughs, are zoned primarily for industrial and manufacturing uses.

2. SITE HISTORY

Throughout its 75-year manufacturing history, numerous organic and inorganic chemical raw materials were used at the Cyanamid facility to produce products such as rubber chemicals, pharmaceuticals, dyes, pigments, chemical intermediates, and petroleum-based products. Currently, only pharmaceuticals are being manufactured at the facility. There are 27 on-site surface impoundments at the facility, some of which were used for the storage or disposal of industrial wastes.

Preliminary investigations conducted by Cyanamid in 1981 verified that approximately one-half of the site never supported manufacturing, waste storage, or waste disposal activities, and that contamination sources are confined primarily to the main plant area (including the production area and West Yard) and the on-site waste storage impoundments. Most of the wastes generated from past manufacturing operations were stored in the on-site surface impoundments, while general plant wastes, debris, and other materials were primarily disposed on the ground at various locations in the West Yard.

Figure 2 shows location and important features of the site.

Cyanamid and the NJDEPE entered into an Administrative Consent order (ACO) in May 1988 to address 16 of the 27 on-site impoundments, site-wide contaminated soils, and ground water. In addition, a New Jersey Pollutant Discharge Elimination System (NJPDES) permit had been issued in 1987. This permit requires that Cyanamid conduct extensive ground-water monitoring on a quarterly basis and continue pumping three bedrock production wells, at a minimum rate of 650,000 gallons per day, to contain ground-water contamination within the production area and West Yard.

The USEPA issued a Hazardous and Solid Waste Amendments (HSWA) permit in November 1988 which, in conjunction with the operating permit issued by NJDEPE, constitutes the Resource Conservation and Recovery Act (RCRA) permit for the Cyanamid facility. The HSWA permit requirements are consistent with the ACO and the NJPDES permit.

While a total of 27 impoundments exist at the Cyanamid facility, 16 of these were determined through investigative efforts to be potentially contributing to ground-water contamination and are covered by the Superfund cleanup program. These 16 impoundments include impoundments 1, 2, 3, 4, 5, 11, 13, 14, 15, 16, 17, 18, 19, 20, 24 & 26. The other 11 impoundments (Impoundments 6, 7, 8, 9, 9A, 10, 12, 21, 22, 23 & 25) were either never used (Impoundments 9, 10, and 12), contain only river silt from the facility's former river water treatment plant (Impoundments 22 and 23), contain emergency fire water (Impoundment 21), have been closed with NJDEPE approval (Impoundment 25, 1988) or are being closed in accordance with approved RCRA closure plans (Impoundments 6, 7, 8 and 9A). Impoundments 6, 7, 8 and 9A are being closed under RCRA because they were classified as RCRA Treatment/Storage/Disposal (TSD) facilities.

RCRA closure procedures were implemented for Impoundments 6, 7, 8 and 9A after the use of Impoundments 6 and 7 was discontinued and interim TSD status expired. Impoundment 9A has been closed in-place. The 16 Impoundments being addressed under this Superfund cleanup program were taken out of service before the RCRA regulations were promulgated and, therefore, were never given interim status as TSD facilities under RCRA. The same 16 impoundments, potentially contributing to ground water contamination, were used for storing by-products of rubber chemical production, dye production, and coal tar distillation, as well as for disposal of general plant

waste and demolition debris. A total of approximately 877,000 tons of waste material are contained in these 16 Impoundments.

American Cyanamid Company is the sole responsible party for contamination at this site.

3. ONGOING OR COMPLETED REMEDIAL PROGRAMS

Cyanamid has implemented, or is currently conducting, several remedial programs at the site. Completed programs include removal of pumpable tars (3.1 million gallons) from Impoundment 2 for off-site use as a supplemental fuel (1986-1987), removal of pumpable tars from Impoundment 1 (1960s), and a berm stability evaluation program (1989).

Surface Soils Remedial/Removal Action Program

The 1992 Surface Soils Remedial/Removal Action (SSR/RA) Program was developed to address areas of surface soil contamination that pose a potential risk to worker health and safety, as determined by the risk evaluation presented in the Baseline Endangerment Assessment Report. The program had identified eight surface soil areas requiring removal action. The removal action program included excavation and off-site disposal of Polychlorinated Biphenyl (PCB) contaminated soils, excavation and disposal of Polyaromatic Hydrocarbon (PAH) contaminated soil in the on-site RCRA permitted Impoundment 8 facility, and capping of another PAH contaminated area, as well as placement of a geotextile, soil and vegetative cover over a chromium contaminated area. These areas, except for one PAH Area (Area 11), will be revisited as part of the site-wide soil remediation program. PAH Area 11 was determined to be clean based on post excavation sampling results which indicated no surface contamination and based on the Soil Remedial Investigation data which indicated no sub surface contamination above the applicable State Cleanup Criteria. The SSR/RA was completed in December 1992.

Impoundments 4 & 5 Fuel Blending Program

Under the Impoundments 4 & 5 fuel blending program, tars from these impoundments are being removed and blended in an on-site RCRA permitted hazardous waste fuel blending facility. The blended material is then being sent off-site for use as a supplemental fuel in cement kiln operations.

Impoundment 8 Program

The Impoundment 8 program involves closure of four (4) on-site impoundments (Impoundments 6, 7, 8 & 9A) and the construction of a RCRA permitted facility (New Impoundment 8 facility). Half of the state-of-the-art RCRA permitted Impoundment 8 facility has been constructed (western half) which includes a triple liner, leachate detection and collection system and ground water monitoring system. Half of the waste from the old Impoundment 8 has been dewatered, solidified and consolidated into the western half of the RCRA permitted Impoundment 8 facility. Waste from

Impoundments 6 and 7 as well as half of the waste from the old Impoundment 8 are to be dewatered, solidified and consolidated into the eastern half of the RCRA permitted Impoundment 8 facility. The construction of this eastern half of Impoundment 8 will also include a triple liner, leachate detection and collection system and ground water monitoring system. This activity is expected to be completed in early 1994. The NJPDES permit issued under the authority of RCRA allows the Impoundment 8 facility to receive other on-site solidified/stabilized waste materials. Impoundment 9A has been closed in-place by installing a double synthetic liner capping system (60-mil High Density Poly Ethylene).

Bedrock Ground-Water Pumping/Control System Program

For the past 60 years, Cyanamid has withdrawn water from on-site bedrock production wells for use as non-contact cooling water in production operations. Cyanamid's present average withdrawal of over 650,000 gallons per day results in ground water flow inward from the perimeter of the site towards the pumping wells. This system effectively contains the majority of the ground water contamination within the production area and west yard area on the site. Recovered ground water is treated on-site before discharge to the adjacent Somerset-Raritan Valley Sewerage Authority (SRVSA) waste water facility for further treatment. Any ground water not captured by the NJPDES pumping system flows to the Raritan River. A previous study (Lawler, Matuskey, & Skelley, 1983) concluded that the Cyanamid facility did not have a significant impact on water quality in the Raritan River. Further study of the Raritan River water quality to determine the potential impact from the Cyanamid facility will be conducted as part of the site-wide remediation program. Cyanamid is in the process of relocating the production wells to an area within the manufacturing portion of the facility to more effectively contain contaminated ground water to areas beneath the production area and the West Yard, where most of the sources of contamination still exist.

4. HIGHLIGHTS OF COMMUNITY PARTICIPATION

The following documents were made available to the public for review:

- Impoundment Characterization Program Final Report (ICPFR);
- Technology Evaluation Work Plan for Group I Impoundments;
- Baseline Site-Wide Endangerment Assessment Report;
- Group I Impoundments CMS/FS Report;
- Proposed Plan for the Group I Impoundments; and
- Draft Modified HSWA Permit and supporting documentation.

These documents are part of the administrative record and are located in an information repository maintained at the NJDEPE Docket Room in Trenton, New Jersey, at the Somerset County Public Library and at the Bridgewater Township Municipal Complex. The notice of availability for these documents was published in the Courier News on June 29, 1993. A public comment period on the documents was held from June 30, 1993 to September 12, 1993. In addition, a briefing with the mayor of Bridgewater Township and

a public meeting were held on August 5, 1993. At this meeting, representatives from NJDEPE answered questions about the results of investigations and the remedial alternatives under consideration for Group I Impoundments at the site. A follow-up meeting was held on August 24, 1993 with Bridgewater Township officials and representatives of CRISIS (citizens group which was recipient of the USEPA Technical Assistance Grant from the Superfund) to discuss the comments received during the August 5, 1993 public meeting in detail. NJDEPE provided detailed responses to the Township and CRISIS prior to the meeting in the letter dated August 20, 1993. The responses were acceptable to the attendees of the August 24, 1993 meeting with additional comments. NJDEPE provided detailed responses to additional comments received during August 24, 1993 meeting to the Township and CRISIS in the letter dated August 30, 1993. A response to the comments received during the public comment period and the public meeting (including the follow-up responses mentioned above) is included in the Responsiveness Summary, which is attached to the ROD. A complete background on community involvement throughout the remedial process is included in the Responsiveness Summary. Comments received on the Draft Modified HSWA permit will be addressed in the Final Modified HSWA permit.

5. SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION WITHIN SITE STRATEGY

Due to practical limitations, all 16 of the CMS impoundments cannot be remediated concurrently. The impoundments have been grouped into three impoundment groups according to waste type, nature of contaminants, and geographical location on the site. This concept allows this complex site to be subdivided into discrete, more manageable units.

The impoundments groups are as follows:

- Group I - Impoundments 11, 13, 19 & 24
- Group II - Impoundments 1, 2, 15, 16, 17 & 18
- Group III - Impoundments 3, 4, 5, 14 & 26

Impoundment 20 was initially included in Group I Impoundments. However, because of the similar concentration of contaminants, an appropriate remedy for Impoundment 20 will be evaluated along with either Group II or Group III Impoundments.

This ROD addresses the remediation of Group I Impoundments only. Remediation of the remaining impoundment groups will be addressed in separate CMS/FS reports completed in accordance with the schedules set forth in the May 1988 ACO and the November 1988 HSWA Permit. The CMS/FS report for the Group II Impoundments will be completed in November 1993 and the CMS/FS report for the Group III Impoundments will be completed in May 1995. A Remedial Investigation of the site-wide soils was completed in 1992. A feasibility study addressing the site-wide soils remediation will be initiated after completion of the remediation of 16 on-site impoundments. Final remediation for site-wide ground water contamination will be addressed after completion of the remediation of site-wide soils.

Final site-wide remediation will insure that there is no current or future unacceptable risk to human health and the environment.

6. GROUP I IMPOUNDMENT CHARACTERIZATION

The Group I Impoundments were characterized as reported in the January 1990 Impoundment Characterization Program Final Report (ICPFR). The locations of the impoundments are indicated on Figure 2. The sludges contained in the Group I Impoundments (Impoundments 11, 13, 19 & 24) are believed to have originated from on-site waste water treatment operations and were originally deposited into Impoundment 6 before being dredged and/or pumped from Impoundment 6 into the Group I Impoundments. Similar chemical constituents are present in all of the Group I Impoundments. The existing data from analysis of the contents of each of the Group I Impoundments were used to estimate the average concentrations of total organic, total inorganic, total non-carcinogenic and total potentially carcinogenic contaminants in the Group I Impoundments. The ratio of inorganic to organic contaminants in the Group I Impoundments is as follows: 12 to 1 for Impoundment 11, 30 to 1 for Impoundment 13, 11 to 1 for Impoundment 19, and 15 to 1 for Impoundment 24. These estimates demonstrate that the contaminants present in the Group I Impoundments are predominantly inorganics. Concentrations and ratios of contaminants detected in the Group I Impoundments are listed in Table 1 and 2 respectively. An overview of the characterization of the Group I Impoundments follows:

Impoundment 11

Impoundment 11 has a surface area of approximately 2.6 acres, is covered with a thin layer of soil with sparse vegetation, and is relatively flat. The contents of the impoundment consist of sludge, filling soil and clay. Total volume of material in this impoundment is approximately 25,500 cubic yards. The predominant volatile organic contaminants of concern detected in Impoundment 11 have a range of average concentrations from 1 to 40 parts per million (ppm) and include: Acetone, Ethylbenzene, Chlorobenzene, Methylene Chloride, Toluene, and total Xylenes. The detected predominant semivolatile organic contaminants of concern have a range of average concentrations from 100 to 7,000 ppm and include: Acenaphthalene, Benzo(a)Anthracene, Fluorene, 2-Methylnaphthalene, and Naphthalene. The detected predominant inorganic contaminants of concern have a range of average concentrations from 15 to 3,000 ppm and include: Chromium, Copper, Lead, Mercury, Nickel, and Zinc.

Impoundment 13

Impoundment 13 has a surface area of approximately 3.9 acres, is covered by soil with dense vegetative growth, and is graded. The contents of the impoundment consist of sludge, silt, clay, lime, debris and filling soil. Total volume of material in this impoundment is approximately 67,500 cubic yards. The detected predominant volatile contaminants of concern have a range of average concentration from 1 to 20 ppm and include: Benzene, Ethylbenzene, Chlorobenzene, Toluene, and total Xylenes. The detected

predominant semivolatile organic contaminants of concern have a range of average concentration from 20 to 2,000 ppm and include: Acenaphthalene, Fluorene, 2-Methylnaphthalene, Naphthalene, and 1,2,4-Trichlorobenzene. The detected predominant inorganic contaminants of concern have a range of average concentrations from 7 to 1,500 ppm and include: Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, and Zinc.

Impoundment 19

Impoundment 19 has a surface area of approximately 2.3 acres. Its surface is partially covered with topsoil and vegetation, and is sloped toward the center of the impoundment. The contents of the impoundment consist of sludge, fill debris, tar, lime and filling soil. Total volume of material in this impoundment is approximately 12,000 cubic yards. The detected predominant volatile organic contaminants of concern have a range of average concentrations from 30 to 1,200 ppm and include: Benzene, Ethylbenzene, Chlorobenzene, Methylene Chloride, Toluene, and total Xylenes. The detected predominant semivolatile organic contaminants of concern have a range of average concentrations from 200 to 10,000 ppm and include: 1,2-Dichlorobenzene, 2-Methylnaphthalene, Naphthalene, and 1,2,4-Trichlorobenzene. The detected predominant inorganic contaminants of concern have a range of average concentrations from 3 to 120,000 ppm and include: Arsenic, Calcium, Chromium, Copper, Iron, Lead, Magnesium and Nickel.

Impoundment 24

Impoundment 24 has a surface area of approximately 3.2 acres, is covered by soil and lime, and is graded to the top of the surrounding berm. Almost no vegetation exists on this impoundment because of high concentration of lime at its surface. The contents of this impoundment consist of silty clay, lime, debris, sludge and filling soil. Total volume of material in this impoundment is approximately 71,500 cubic yards. The detected predominant volatile organic contaminants of concern have a range of average concentrations from 5 to 130 ppm and include: Acetone, Chlorobenzene, Methylene Chloride, Toluene, and total Xylenes. The detected predominant semivolatile organic contaminants of concern have a range of average concentrations from 95 to 2,600 ppm and include: Dibenzofuran, 1,2-Dichlorobenzene, 2-Methylnaphthalene, and Naphthalene. The detected predominant inorganic contaminants of concern have a range of average concentrations from 1 to 126,000 ppm and include: Arsenic, Chromium, Copper, Iron, Lead and Nickel.

7. SUMMARY OF EXISTING SITE RISK

Based upon the results of the ICPFR, a Baseline EA was conducted to estimate the risks associated with current site conditions. The Baseline EA estimates the human health and ecological risk presented by the contamination at the site prior to implementation of remedial action. The results of the Baseline EA were reported in the January 1990 (Amended March 1992) Baseline Site-Wide EA report.

Human Health Risk Assessment

A four-step process is utilized 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 well-water) by which humans 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 assessments to provide a quantitative (e.g., one-in-a-million excess cancer risk) assessment of site-related risks.

As a first step of the Baseline EA, contaminants of concern were selected which would be representative of site risks. The contaminant selection criteria was based primarily on frequency of detection, the availability of toxicity criteria, and numerical threshold criteria. The Baseline EA identified a total of 55 contaminants of concern for the Cyanamid site. Of these 55 contaminants, those that were detected most frequently or in the highest concentrations within the Group I Impoundments are Acetone, Benzene, Ethylbenzene, Toluene, Chlorobenzene, Methylene Chloride, total Xylenes, 1,2-Dichlorobenzene, 2-Methylnaphthalene, Naphthalene, 1,2,4-Trichlorobenzene, Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, and Zinc. Of these contaminants of concern, only Benzene, Arsenic, Cadmium, Chromium, and Lead are known or suspected carcinogens according to the USEPA Carcinogen Assessment Group (CAG) classification system.

Using the evaluation of the Baseline EA of potential exposure pathways for on-site and off-site human receptors, a number of potentially significant exposure pathways were identified and evaluated quantitatively to determine the risk levels presented by existing site conditions.

Exposure to contaminated ground water was not identified as a significant exposure pathway at the present time because American Cyanamid pumps 650,000 gallons per day of contaminated ground water from NJPDES permitted production wells, which contains ground water contamination on the production area and west yard area of the site. Any ground water not being captured by NJPDES permitted pumping flows to the Raritan River at a point that is not being used as drinking water source.

Summary of Human Health Risks

Through an assessment of exposure pathways for the 55 contaminants of concern, specific health risk levels were calculated for each potentially significant exposure pathway to enable a quantitative evaluation of potential, site-wide health risks for human receptors.

Current federal guidelines for acceptable exposures are individual lifetime excess carcinogenic risk in the approximate range of 1×10^{-4} to 1×10^{-6} . This can be interpreted to mean that an individual may have a one in ten thousand to a one in a million increased chance of developing cancer as a result of a site-related exposure to a carcinogen under specific exposure conditions. Current federal guidelines for acceptable exposures for non-carcinogenic risk are maximum Health Hazard Index of 1.0. A Hazard Index greater than 1.0 indicates that the exposure level exceeds the protective level for that particular chemical.

A quantitative analysis of the risks associated with the Group I Impoundments was not conducted because there are no current, complete exposure pathways. Direct contact with the wastes of Group I Impoundments is restricted due to site security and the impoundments' covers. Potential for inhalation of air contaminants from the Group I Impoundments is absent because dust suppression measures as well as water and vegetative covers are in place.

However, there is a potential future risk to human health and the environment if the Group I Impoundments are not remediated. The Group I Impoundments are a continuous source of ground water contamination, which eventually discharges into the Raritan River. In addition, the ground water in the vicinity of the site is classified as a source of drinking water, although it is not used as drinking water. Although there is a pumping program to control the migration of contaminated ground water by recovering 650,000 gallons of contaminated ground water per day, the population around the site could be potentially exposed to contaminated ground water under a future use scenario. For these reasons, remediation of the Group I Impoundments is warranted.

Final site-wide remediation will insure that there is no current or future unacceptable risk to human health and environment including compliance with the State of New Jersey 10^{-6} risk level.

Qualitative Ecological Risk Assessment

In the Ecological Assessment, a reasonable maximum environmental exposure is evaluated utilizing a four step process for assessing site-related ecological risks. These steps are: *Problem Formulation* - development of the objectives and scope of the ecological assessment; description of the site and ecosystems that may be impacted; identification of contaminants of concern. *Exposure Assessment* - identification of potential ecological receptors and exposure pathways; quantitative evaluation of exposure pathways; fate and transport mechanisms for contaminants. *Ecological Effects Assessment* - literature reviews, field studies, and toxicity tests, linking contaminant concentrations to effects on ecological receptors. *Risk Characterization* - measurement or estimation of both current and future adverse effects.

The results of a site-wide habitat survey and direct field observations were compared to the Natural Heritage Data Base [NJDEPE, 1991(a)] to confirm that the on-site habitat does not support threatened or endangered species.

Undeveloped areas with valuable wildlife habitat exist south of the Raritan River, which are effectively isolated from the Cyanamid facility by the River and the on-site berm.

There will be no wetland impacts associated with this proposed remedial action because no wetland areas exist within the Group 1 Impoundments. A site-wide natural resources assessment, consisting of a Wetlands Assessment (using federal and state guidance), a Cultural Resources Survey and a Flood Plain Assessment is presently being conducted, to ensure that these resources are evaluated prior to implementation of future remedial actions at the site. A Cultural Resources Assessment (Stage 1A) completed in July 1993 determined that the remediation of Group 1 Impoundments is not of concern due to absence of significant cultural resources. The information gathered in the site-wide Natural Resources Assessment, expected to be completed by December 1993, will help define the resources in terms of their functional value and historical or cultural significance, and will help to develop any appropriate mitigation of impacts as a result of any future proposed remedial actions at the site. In disturbed areas of the Cyanamid facility (due to historic and ongoing activities) and in areas of continued construction and demolition, the potential for wildlife habitat values are greatly reduced. In sufficiently undisturbed areas, conditions exist to support wildlife. These undisturbed areas are far enough removed or physically separated enough from the site wastes to restrict significant exposure to wildlife.

Risks to off-site environmental receptors through contact with Raritan River water that may have received discharges of contaminated ground water from the Cyanamid facility are likely to be insignificant because of the dilution in the river and the relatively small quantities of site-related contaminants detected in the ground water. A previous study (Lawler, Matusky & Skelly, 1983) concluded that the Cyanamid facility did not have a significant impact on water quality in the Raritan river. However, as previously stated, further study of the Raritan River water quality to determine the potential impacts from the Cyanamid facility will be conducted as part of the site-wide remediation program. A work plan is being finalized to collect surface water and sediment samples from the Raritan River to determine any potential impacts on the Raritan River from the Cyanamid site.

8. REMEDIAL ACTION OBJECTIVES

Remedial action objectives are specific goals to protect human health and the environment; they take into account the contaminant(s) of concern, the exposure route(s), receptor(s), and acceptable contaminant level(s) for each exposure route. These objectives are based on available information and standards such as applicable or relevant and appropriate requirements (ARARs).

The remedial action objectives for the Group 1 Impoundments are as follows:

1. Eliminate source of contamination;
2. Contribute to compliance with ground water ARARs.

9. SUMMARY OF REMEDIAL ALTERNATIVES

CERCLA requires that each selected site remedy be protective of human health and the environment; be cost-effective; comply with other statutory laws; 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.

The CMS/FS report includes a preliminary screening of all potentially applicable technologies, followed by elimination of inappropriate or infeasible alternatives and identification of applicable technologies based solely on technical feasibility. The resulting number of technologies are then developed into remedial alternatives. The CMS/FS report evaluates in detail the following five remedial alternatives for addressing the contamination associated with the Group I Impoundments.

These alternatives are:

1. No-action
2. In-Place Containment
3. Solidification
4. Biological Treatment
5. Moderate Temperature Thermal Treatment

A brief description of each of the remedial alternatives is provided below:

(Note: The Superfund program requires that the "no-action" alternative be considered as a baseline for comparison with other alternatives.)

Since the contents in the Impoundments of Group 1 are not identical, the remedial alternatives identified below are not universally applicable to all Impoundments. Some of the remedial alternatives were not evaluated in detail for all of the impoundments. Biological treatment was evaluated for Impoundments 11, 13, and 19 only, because treatability testing indicated that the high degree of heterogeneity of waste in Impoundment 24 would render biological treatment impractical for this impoundment due to an inordinate amount of equalization/dilution required to initiate biotreatment.

Alternative 1 - No-Action (or Limited Action)

The no-action alternative would involve simply leaving the impoundments in their current condition. A slight modification of the no-action alternative is the limited action alternative that may include the establishment of institutional controls as well as improvements in physical site access controls that could be achieved at minimal cost. This alternative was evaluated for all Group 1 Impoundments.

Total Cost: \$ 100,000

Time to Implement: 1 Year

Alternative 2 - In-place Containment

The in-place containment alternative would consist of clearing vegetation (where necessary), consolidating and/or compacting materials, construction of a cap, and/or installation of a ground water monitoring system. This alternative was evaluated for all Group I Impoundments.

Total Cost: \$ 5,900,000
Time to Implement: 1 Year

Alternative 3 - Solidification

The solidification alternative would consist of excavating the contents of the impoundments, treating the waste materials via solidification, and consolidating the treated waste into the on-site RCRA-permitted Impoundment 8 facility. This facility is triple lined and has leachate detection and collection system as well as ground water monitoring system. Measures would be taken subsequent to excavation to promote natural re-vegetation of each impoundment area. Volatile emissions from the solidification treatment unit will be collected with a blower and treated in a carbon absorber, if necessary. This alternative was evaluated for all Group I Impoundments.

Total Cost: \$ 12,500,000
Time to Implement: 1.5 Years

Alternative 4 - Biological Treatment

The biological treatment alternative would consist of excavation of the contents of the impoundment, process-related dilution of the contents, and then biological treatment. Biological treatment would occur in a slurry-phase reactor from which residual biomass would be solidified and consolidated into the on-site RCRA-permitted Impoundment 8 facility. Measures would be taken subsequent to excavation to promote natural re-vegetation of each impoundment area. The Biological Treatment alternative was evaluated for Impoundments 11, 13, and 19. Impoundment 24 would require Solidification or Thermal Treatment.

Total Cost: \$ 37,700,000
Biotreatment cost for Impoundments 11, 13 and 19:
\$ 33,400,000
Solidification cost for Impoundment 24: \$ 4,300,000

OR

Total Cost: \$ 51,500,000
Biotreatment cost for Impoundments 11, 13 and 19:
\$ 33,400,000
Thermal Treatment cost for Impoundment 24: \$ 18,100,000

Time to Implement: 6 Years

Alternative 5 - Moderate Temperature Thermal Treatment

The moderate temperature thermal treatment alternative would involve excavation of the waste materials, followed by indirect application of heat to promote volatilization of volatile and semivolatile organic compounds. Thermal treatment residuals would be solidified and consolidated into the on-site RCRA permitted Impoundment 8 facility. Measures would be taken subsequent to excavation to promote natural re-vegetation of each impoundment area. This alternative was evaluated for all Group I Impoundments.

Total Cost: \$ 51,500,000

Time to Implement: 3.5 Years

10. Evaluation of Remedial Alternatives

During the detailed evaluation of remedial alternatives, each alternative was assessed against the nine CERCLA evaluation criteria, as described below:

- o **Overall protection of human health and the environment:** addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Alternative 1 would not be protective of human health and the environment since it offers no control of potential releases of contaminants to shallow ground water. Alternative 2 would offer protection of human health and the environment by reducing the potential for direct contact with contaminants and by minimizing future release of contaminants to the ground water and by isolating the contaminants from all potential receptors. Alternatives 3, 4, and 5 would achieve greater overall protection of human health and the environment than Alternatives 1 and 2 by eliminating exposure pathways through removal, treatment and consolidation of the contaminated source material.

- o **Compliance with applicable or relevant and appropriate requirements (ARARs):** addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of federal and state environmental statutes and other requirements or provides grounds for invoking a waiver.

Alternative 1 would not contribute to achieving site-wide ground water ARARs. Alternatives 2, 3, 4, and 5 would contribute in achieving site-wide ground water ARARs. Contribution to compliance with the ARARs will be achieved by containing the contaminated source in case of Alternative 2 and by removal, treatment and consolidation of the contaminated source material in case of Alternatives 3, 4 and 5. Land Disposal Restrictions (LDRs) are not ARARs for Impoundments 11, 13, 19 and 24 because they are designated as contiguous areas of contamination along with Impoundments 6, 7, and 8.

Wetlands Assessment, Cultural Resources Assessment and Flood Plain assessment, are presently being conducted. This site-wide assessment, expected to be completed in December 1993, will determine the compliance of the site-wide remediation program with location specific ARARs, i.e., Wetlands, Cultural Resources and Flood Plains. A Cultural Resources Assessment (Stage 1A) completed in July 1993 determined that the remediation of Group I Impoundments is not of concern due to absence of significant cultural resources. Table 3 lists ARARs and To be Considered Criteria (TBCs).

- o **Long-term effectiveness and permanence:** refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met.

Alternative 1 would not achieve the long-term effectiveness criterion since future risks will increase if contamination migrates from the impoundments. Alternative 2 would depend on the long-term maintenance and ground water monitoring program to ensure long-term effectiveness. Alternatives 3, 4, and 5 will provide for long-term effectiveness by eliminating the potential for migration of contaminants. Alternative 3 would immobilize the inorganic contaminants, bind up the organic contaminants in the solidified mass and would provide maximum risk reduction through consolidation into the RCRA-permitted Impoundment 8 facility. Alternative 4 would degrade organic contaminants into non-toxic compounds. Some organic compounds would not be biodegraded as determined by a treatability study. The biomass and inorganic residual would then require solidification and consolidation into the Impoundment 8 facility. Alternative 5 would destroy or remove all organic contaminants. This alternative would then require solidification and consolidation into the Impoundment 8 facility to address the majority of the contaminants, inorganics. Alternative 3 would provide long term effectiveness for inorganic contaminants by solidification treatment while Alternatives 4 and 5 would provide greater long term effectiveness for organic contaminants by degrading and destroying them, respectively. Alternatives 4 and 5 would also provide long-term effectiveness for inorganic contaminants by solidification treatment.

- o **Reduction of toxicity, mobility, or volume:** through treatment is the anticipated performance of the treatment technologies a remedy may employ.

Alternative 1 does not achieve any reduction in toxicity, mobility, or volume. Alternative 2 reduces only the mobility of contaminants by reducing infiltration of rain water. Alternative 3 would decrease the mobility of both organic and inorganic contaminants by binding them in a solidified matrix while slightly increasing the volume of waste material. The risk posed by the material's toxicity would be reduced because of the reduction in the mobility. Consolidating the solidified material into the Impoundment 8 facility would provide an added reduction in mobility of the organic and inorganic contaminants. Alternative 4 would reduce toxicity and mobility by degrading some of the organics,

but residual organics and inorganics would remain requiring a second step of either consolidation into Impoundment 8. The mobility of the residual organic and inorganic contaminants would be reduced through solidification. Alternative 5 would reduce toxicity, mobility and volume of organics by destroying or removing them. Alternative 5 will not reduce toxicity or volume of the inorganics requiring a second step of consolidation into the Impoundment 8 facility. The mobility of the inorganic contaminants would be reduced through solidification. Alternative 3 would provide a reduction of toxicity and mobility for both organic and inorganic contaminants. Alternatives 4 and 5 would provide a greater reduction of toxicity, mobility and volume for organic contaminants and would also provide a reduction of toxicity and mobility of the inorganic contaminants by solidification treatment.

- o **Short-term effectiveness:** addresses the period of time needed to achieve protection from any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

Alternative 1 will not have any short-term adverse impacts because no construction or treatment is required. Alternative 2 achieves a degree of protection in a relatively short period of time and would result in minimal short-term impacts associated with its implementation. While Alternatives 3, 4, and 5 would exhibit comparable short-term impacts to human health and the environment, Alternative 3 could be implemented in a substantially shorter time period than Alternatives 4 and 5, further reducing short-term adverse impacts on human health and the environment and providing short-term effectiveness.

- o **Implementability:** is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

Alternative 1 is the simplest alternative to implement from a technical standpoint because it involves no construction or operation. The operations associated with Alternatives 2, 3, 4, and 5 employ well established, readily available construction methods and are all considered technically and administratively feasible. Alternatives 1 and 2 could be implemented in a short period of time. Alternative 3 would require 1.5 years to implement due to design and construction of a solidification treatment unit and contracting out to vendors. Alternative 4 would require approximately 6 years to implement due to the necessity for technicians specifically trained in the operation of this technology and treatment unit, slow rate of contaminants degradation, and time for designing and constructing the treatment unit. Alternative 5 would require 3.5 years to implement due to design, construction and operation of the treatment unit. Alternatives 4 and 5 would require additional time for addressing residual material either by consolidating into Impoundment 8. Alternative 3 provides a somewhat greater degree of implementability than Alternatives 4 and 5 because the time to

implement is shorter and construction and treatment components are readily available.

- o **Cost:** includes estimated capital and operation and maintenance costs, and net present worth costs.

Total cost for Alternative 1 is \$ 100,000. Total cost for Alternative 2 is \$ 5,900,000. Alternative 3 provides remediation for all Group 1 Impoundments at a total cost of \$ 12,500,000. Alternative 4 provides remediation of Impoundments 11, 13, and 19 by using Biotreatment at a total cost of \$ 33,400,000. Impoundment 24 would require additional cost of approximately \$ 4,300,000 for Solidification Treatment or \$ 18,100,000 for Thermal Treatment under Alternative 4. The total cost then for Alternative 4 for all Group 1 Impoundments would be \$ 37,700,000 by using Biotreatment for Impoundments 11, 13, and 19 and Solidification Treatment for Impoundment 24 or \$ 51,500,000 by using Biotreatment for Impoundments 11, 13, and 19 and Thermal Treatment for Impoundment 24. Alternative 5 provides remediation of Group 1 Impoundments at a total cost of \$ 51,500,000. The cost differences between Alternatives 3 and 4 as well as Alternatives 3 and 5 are \$ 25,200,000 or \$ 39,000,000, and \$ 39,000,000, respectively. Alternative 3 is significantly less costly than Alternatives 4 and 5. Detailed costs of solidification, bioremediation, and thermal treatments for the Group 1 Impoundments are included in Table 4.

- o **USEPA concurrence:** indicates whether, the federal regulatory agency concur, oppose, or have no comment on the selected remedy.

USEPA concurs with the selected remedy described in this ROD.

- o **Community acceptance:** assessment of the public comments received on the ICPFR, Baseline EA report, CMS/FS report, Proposed Plan and the draft modified HSWA permit.

Community concerns/Comments received during the public comment period and the public meeting are included in the responsiveness summary, together with NJDEPE responses, which is part of this ROD.

11. SELECTED REMEDY (REMEDIAL ALTERNATIVE)

Based upon an evaluation of the various alternatives and after consideration of public comments, NJDEPE and USEPA has selected Alternative 3 (Solidification with consolidation into the on-site RCRA facility) as the remedy for the Group 1 Impoundments (11, 13, 19 and 24) because it best satisfies the requirements of CERCLA and the NCP's nine evaluation criteria for remedial alternatives. Impoundment 8 Facility is triple lined with leachate detection and collection systems as well as ground water monitoring system. Leachate is being monitored on a monthly basis while ground water is being monitored on a quarterly basis at the Impoundment 8 Facility. Figure 3 describes the cross section of Impoundment 8 facility with triple liner and leachate detection as well as leachate collection systems. Detailed

schedule for implementation will be developed as part of design for the selected remedy.

Solidification of the sludges from the Group I Impoundments would involve excavating the sludge from the impoundments, mixing with cement like materials (most likely in a mixing unit), and consolidating the solidified sludge in the on-site RCRA facility. The NJDEPE and USEPA may consider the results of pilot studies for in-situ solidification treatment for Impoundment 24. Additionally, two ground water monitoring wells would be installed hydrologically downgradient of Impoundments 19 and 24 to assess potential influences on surface water quality of the Raritan River and associated ecosystems. Ground water monitoring would be performed for contaminants of concern (as determined by prior chemical analyses) associated with Impoundments 19 and 24. The wells would be installed in the shallow overburden aquifer at locations in close proximity to the Raritan River which best represent potential exposure pathways to potential environmental and human receptors.

This alternative satisfies the remedial action objectives and the requirements of CERCLA, as amended by SARA, the National Contingency Plan, RCRA, as amended by HSWA, and the ACO including the NJDEPE Ground Water Quality Standards. Because this remedy will result in hazardous substances remaining on the site, a review will be conducted every five (5) years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Final site-wide remediation will insure that there is no current or future unacceptable risk to human health and environment including compliance with the State of New Jersey 10^{-6} risk level.

12. STATUTORY DETERMINATIONS

Under their legal authorities, NJDEPE's and USEPA's primary responsibility at Superfund sites is to undertake remedial actions that achieve adequate protection of human health and the environment. In addition, section 121 of CERCLA establishes several other statutory requirements and preferences. These specify that when complete, the selected remedial action for this site must comply with applicable or relevant and appropriate environmental standards established under State and Federal environmental laws unless a statutory waiver is justified. The selected remedy also must be cost-effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element.

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally 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. Because this remedy will

result in hazardous substances remaining on the site, a review will be conducted every five (5) years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Since the majority of the contaminants in the Group I wastes are inorganic, thermal and biological treatment offer little advantage over solidification alone in the effective long-term treatment of these wastes.

The solidification alternative will be used to chemically bind the inorganic contaminants into a matrix, preventing migration of contaminants and thus indirectly reducing the potential toxicity of the sludge. Solidification and consolidation into the RCRA-permitted Impoundment 8 facility will also reduce the mobility of any residual organic contaminants by decreasing the permeability of the sludge and consequently the potential for infiltration of water and generation of leachate. The other treatment options (thermal or biological) provide an insignificant incremental protection of human health and the environment when compared to solidification, but are significantly more costly and more difficult to implement. The total cost for Alternatives 3, 4, and 5 for all Group 1 Impoundments are \$ 12,500,000, \$ 37,700,000 or \$ 51,500,000, and \$ 51,500,000, respectively. Spending well over \$ 25,200,000 or \$ 39,000,000 and \$ 39,000,000 under Alternatives 4 and 5, respectively, compared to Solidification under Alternative 3 is not justifiable because Solidification provides similar protection of public health and the environment in a shorter time frame at significantly less cost.

While biological and thermal treatment degrade, destroy, and/or otherwise remove contaminants, a secondary step, solidification, is required to ensure immobilization of the contaminants remaining in the treatment residuals. Solidification with consolidation of the solidified waste into the RCRA-permitted Impoundment 8 facility achieves the overall remedial objectives and satisfies the nine CERCLA criteria. The RCRA-permitted Impoundment 8 facility is triple lined and has a leachate detection and collection system as well as a ground water monitoring system which will provide adequate protection of public health and the environment. The wastes in the Group I Impoundments are compatible with the Impoundment 8 facility liner. While the volume of waste is increased slightly with solidification, the mobility of the waste materials, specifically the inorganic contaminants will be substantially reduced. Adequate capacity for the solidified waste materials is available in the on-site RCRA-permitted Impoundment 8 facility. Solidification is a conventional, proven technology that is readily implementable in the shortest time frame of all the treatment alternatives evaluated.

The selected alternative will contribute to achieving the ARARs more quickly, or as quickly, and at significantly less cost than the other options. The selected alternative will provide the best balance of trade-offs among alternatives with respect to the CERCLA nine evaluation criteria. NJDEPE and USEPA have selected solidification as the remedial alternative because it will be protective of human health and the environment, will comply with ARARs, will utilize permanent solutions and alternative treatment technologies

or resource recovery technologies to the maximum extent practicable and will be cost effective. The selected remedy also will meet the statutory preference for the use of treatment as a principal element to the maximum extent practicable.

13. DOCUMENTATION OF SIGNIFICANT CHANGES

There is no change from the Preferred Remedy described in the Proposed Plan and the Selected Remedy described in this ROD.

GLOSSARY Of Terms Used In the Record of Decision

This glossary defines the technical terms used in this Proposed Plan. The terms and abbreviations contained in this glossary are often defined in the context of hazardous waste management, and apply specifically to work performed under the Superfund program. Therefore, these terms may have other meanings when used in a different context.

Administrative Consent Order: A legal and enforceable agreement between NJDEPE and the potentially responsible parties (PRPs). Under the terms of the Order, the PRPs agree to perform or pay for site studies or cleanup work. It may also describe the oversight rules, responsibilities, and enforcement options that the government may exercise in the event of non-compliance by the PRPs. This Order is signed by the PRPs and the state government; it does not require approval by a judge.

ARAR: Applicable or relevant, and appropriate requirements.

Berm: A ledge, wall, or a mound of earth used to prevent the migration of contaminants.

Cap: A layer of material, such as clay or a synthetic material, used to prevent rainwater from penetrating wastes and spreading contaminated materials. The surface of the cap is generally mounded or sloped so water will drain off.

CERCLA: Comprehensive Environmental, Response, Compensation, and Liability Act of 1980, 42 U.S.C. § 9601 et.seq., as amended, commonly known as Superfund.

Closure: The process by which a landfill stops accepting wastes and is shut down under federal and state guidelines that provide protection for public health and the environment.

Distillation: A process of first heating a mixture to separate the more volatile from the less volatile parts, and then cooling and condensing the resulting vapor so as to produce a more nearly pure or refined substance.

HSWA: Hazardous and Solid Waste Amendments.

NJDEPE: New Jersey Department of Environmental Protection and Energy.

NCP: National Contingency Plan, 40 CFR part 300.

PPM: Parts per million.

RCRA: Resource Conservation and Recovery Act of 1976 as amended.

SARA: Superfund Amendments and Reauthorization Act.

USEPA: United States Environmental Protection Agency.

Volatile Organic Compounds (VOCs): VOCs are produced as secondary petrochemicals. They include light alcohols, acetone, trichloroethylene, perchloroethylene, dichloroethylene, benzene, vinyl chloride, toluene, and methylene chloride. These potentially toxic chemicals are used as solvents, degreasers, paints, thinners, and fuels. Because of their volatile nature, they readily evaporate into the air, increasing the potential exposure to humans. Due to their low water solubility, environmental persistence, and wide-spread industrial use, they are commonly found in soil and ground water.

Wetland: An area that is regularly saturated by surface or ground water and, under normal circumstances, capable of supporting vegetation typically adapted for life in saturated soil conditions.

ADMINISTRATIVE RECORD INDEX

AMERICAN CYANAMID COMPANY

BRIDGEWATER TOWNSHIP, SOMERSET COUNTY

1. Lagoon 1 & 2 Characterization Report, O'Brine & Gere, October 1982.
2. Phase IV Report Source Assessment and Remedy Program, O'Brine & Gere, February 1983.
3. Monitoring Groundwater Impact on the Raritan River Report, Lawler, Matusky, & Skelly (LMS), October 1983.
4. Source Assessment and Remedy Program Final Report, O'Brine & Gere, December 1984.
5. Sludge Solidification Report for Lagoon 20, IT Corporation, November 1986.
6. Final Report on Continuous Monitoring Assessment Program for Lagoons 6,7,13,19, and 24, Camp Dresser & Mckee (CDM), March 1983.
7. Ground water investigation and site-wide ground water model results, CDM 1985.
8. Continued assessment of ground water at Impoundments 17 and 18, CDM 1986.
9. New Jersey Pollutant Discharge Elimination System-Discharge to Ground Water (NJPDES/DGW) permit # NJ0002313, effective October 30, 1987.
10. Modification to the existing NJPDES/DGW permit # NJ0002313 issued on November 07, 1987 for the closure of Impoundment 8 facility (Impoundments 6,7,8 and 9A) under the authority of RCRA delegated to the NJDEPE from USEPA.
11. Continued assessment of ground water at Impoundments 6,7,13,19 and 24, CDM 1988.
12. New Jersey Department of Environmental Protection and Energy (NJDEPE) Approval Letter for "No Action" Closure of lagoon 23, May 1988.
13. Administrative Consent Order (ACO) Signed by Cyanamid and NJDEPE, May 1988.
14. Quality Assurance/Quality Control (QA/QC) Plan Submitted for Impoundment Characterization Program by Cyanamid, Blasland, Bouck & Lee (BB&L), September 1988.
15. Hazardous and Solid Waste Amendments (HSWA) permit I.D. # NJD0002173276 issued by USEPA on November 8, 1988.
16. Impoundment Characterization Program Sampling and Analysis Work Plan, BB&L, November 1988.
17. NJDEPE Approval Letter for QA/QC Program for Impoundment Characterization, December 1988.
18. Berm Failure Prevention Plan, BB&L, February 1989.
19. Impoundments 11,20, and 26 Resource Conservation and Recovery Act (RCRA) Facility Investigation Work Plan, BB&L, February 1989.
20. NJDEPE Community Relations Plan, February 1989.
21. NJDEPE Approval Letter for Berm Failure Prevention Plan, March 1989.

22. NJDEPE Approval Letter for Impoundments 11,20, and 26 RCRA Facility Investigation Work Plan, August 1989.
23. Impoundment Characterization Program Final Report, BB&L, January 1990.
24. NJDEPE Approval Letter for Implementation of Fuel Blending Program as Interim Remedial Action For Lagoons 4 and 5, August 1990.
25. NJDEPE Approval Letter for Impoundment Characterization Program Final Report, October 1990.
26. Impoundment Corrective Measure Study/Feasibility Study (CMS/FS) Work Plan, (BB&L), October 1990.
27. NJDEPE Air Permit for Lagoon 4 & 5 Fuel Blending Program, October 1990.
28. NJDEPE Stream Encroachment Permit for Lagoon 4 & 5, March 1991.
29. NJDEPE RCRA Permit Application Approval For Lagoons 4 & 5, June 1991.
30. Technology Evaluation Work Plan (TEWP) for Group I Impoundments, BB&L, July 1991.
31. NJDEPE/USEPA Review and Concurrence Letter for TEWP-I, September 1991.
32. TEWP for Group II Impoundments, BB&L, December 1991.
33. NJDEPE/USEPA Review and Concurrence Letter for TEWP-II, January 1992.
34. Amended Baseline Site-Wide Endangerment Assessment Report (Including Hill Property), BB&L, March 1992.
35. NJDEPE/USEPA Approval Letter for Baseline Site-Wide Endangerment Assessment Report, April 1992.
36. Amended Hill Property Remedial Investigation Report (RI), BB&L, March 1992.
37. NJDEPE/USEPA Approval for Hill Property RI, April 1992.
38. Amended Soils RI/FS Work Plan, BB&L, May 1992.
39. Surface Soils Remedial/Removal Action (SSR/RA) Plan, BB&L, July 21, 1992.
40. A Work Plan for Coal Pile Removal to Impoundment 8 Facility, Cyanamid, August 13, 1992.
41. Hazardous Waste Site Safety and Health Program, Cyanamid, August 31, 1992 (prepared on 07/20/88).
42. CMS/FS report for Group 1 Impoundments, BB&L, October 1992.
43. NJDEPE/USEPA approval letter for Group 1 Impoundments CMS/FS report, October 29, 1992.
44. Surface Soil Removal/Remedial Action Final Report, BB&L, March 5, 1993.
45. Superfund Proposed Plan for Group I Impoundments, June 30, 1993.
46. Draft Modified HSWA permit I.D # NJD002173276, June 30, 1993.
47. Transcript for August 5, 1993 Public Meeting/Hearing for the Group I Impoundments (11, 13, 19 & 24) Proposed Plan and Draft Modified HSWA Permit.

**RESPONSIVENESS SUMMARY
RECORD OF DECISION
AMERICAN CYANAMID SITE
GROUP I IMPOUNDMENTS (11, 13, 19 & 24)**

INTRODUCTION:

A responsiveness summary is required by New Jersey Department of Environmental Protection and Energy (NJDEPE) and Superfund policies. It provides a summary of citizen's comments and concerns received during the public comment period and the public meeting, and the NJDEPE's and United State Environmental Protection Agency's (USEPA's) responses to those comments and concerns. All comments summarized in this document have been considered in NJDEPE's and USEPA's final decision for the selection of a remedial alternative for the American Cyanamid Site.

OUTLINE:

This Responsiveness Summary is divided into the following sections:

- A. Overview
- B. Background on Community Involvement and Concerns
- C. Summary of Comments Received During the Public Meeting and Comment Period and Agency Responses
- D. Community Relations Activities at the American Cyanamid Company Site

A. OVERVIEW

This is a summary of the public's comments and concerns regarding the Proposed Plan for Remediation of the Group I Impoundments at the American Cyanamid Company Superfund Site and the New Jersey Department of Environmental Protection and Energy's (NJDEPE) responses to those comments. The comments which were received in writing are attached to this section.

The public comment period originally extended from June 30, 1993 through August 13, 1993 to provide interested parties the opportunity to comment on the Proposed Plan, Technology Evaluation Work Plan; Impoundment Characterization Program Final Report (ICPFR), Baseline Site-Wide Endangerment Assessment Report (Baseline EA), and the Corrective Measures Study/Feasibility Study (CMS/FS) for the American Cyanamid Company Site. During the comment period, the NJDEPE and USEPA held a public meeting/public hearing on August 5, 1993 at 7:00 PM at the Bridgewater Township Municipal Court to discuss the results of the ICPFR, Baseline EA and CMS/FS and to present the preferred remedy. This public comment period and meeting also met the public participation requirements for the modification of the Hazardous and Solid Waste Amendments (HSWA) Permit for the American Cyanamid Site. The Draft Modified HSWA Permit was made available for public review at the same repositories as the other documents

listed above. In response to requests from a citizen group at the August 5, 1993 meeting, NJDEPE and USEPA agreed to extend the public comment period through September 12, 1993.

On the basis of the information contained in the above referenced documents, NJDEPE has selected the following remedy for the Group I Impoundments (11, 13, 19 and 24) at the American Cyanamid Site: Solidification with consolidation into the on-site RCRA permitted Impoundment 8 Facility.

B. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

Since 1988 there has been a great deal of concern about a proposal by American Cyanamid to build a commercial hazardous waste incinerator on the site. At present, Cyanamid has no plans to pursue the incinerator. The Somerset-Raritan Valley Sewage Authority already operates a sludge incinerator on property adjoining the American Cyanamid site. In addition, the Somerset County Freeholders designated a tract next to the Authority site for a trash incinerator, while this facility is no longer proposed, a solid waste transfer station is now in operation at this location.

In January 1989, a briefing for public officials and concerned citizens was held in Bridgewater to discuss the remedial work under the 1988 ACO and the initiation of the Remedial Investigation/Feasibility Study (RI/FS). A public meeting was held on February 21, 1989 in Bridgewater to discuss the RI/FS. On both occasions citizens and local officials expressed concern and anger that they were bearing more than their fair share of society's waste cleanup burden. They made it clear that they did not want the Superfund remediation process to become a back door for Cyanamid to site a commercial hazardous waste incinerator.

Attendees at the January and February meetings also were confused about the remedial process at the site. The main cause of confusion is that some lagoon closures at the site are being handled under the Resource Conservation and Recovery Act (RCRA) because the Cyanamid plant is an operating facility. NJDEPE representatives prepared a response to these concerns and forwarded it along with the RCRA response document to public comments received at the June 14, 1988 RCRA public hearing to those attending the January and February Superfund meetings. The subject of the June 14, 1988 RCRA hearing was the permitting of a permanent waste impoundment for storage of treated materials from the closure of other site impoundments.

NJDEPE held a public meeting in Bridgewater on March 11, 1991 to provide an update on the progress of the RI. Residents and officials again expressed their opposition to any type of incineration at the site. Attendees at the meeting also raised concerns about the ongoing closure of the RCRA impoundments and the consolidation of these materials in the new Impoundment 8 facility. Concerns focused on the location of the new facility, safety of the liner and air pollution from ongoing site activities. NJDEPE issued a fact sheet addressing these concerns in June of 1991

Citizen concerns at the American Cyanamid site have been focused through two local groups, CRISIS and the Boundbrook Citizens Association. In March of 1991 representatives of CRISIS expressed concerns regarding a proposed modification of a Hazardous Waste Facility permit to allow storage and blending of tars from lagoons 4 and 5. This permit modification was needed so that materials could be blended and heated for off-site shipment for use as alternative fuel in cement kilns. During the summer of 1991, Mayor Dowden of the Township of Bridgewater and other local officials and residents publicly stated that NJDEPE was working too closely with Cyanamid and keeping the township in the dark on site activities.

NJDEPE representatives met with Mayor Dowden and other township representatives in Bridgewater to discuss these concerns and review the status of remedial activities on November 27, 1991. As a result of the November meeting, a representative of the Bridgewater Health Department was invited to attend monthly site remediation progress meetings, NJDEPE reaffirmed its policy of placing site information in local repositories as soon as documents were completed and NJDEPE offered to meet with township and citizen representatives before the start of major site activities.

In 1992 CRISIS received a Technical Assistance Grant (TAG) under the Superfund program from USEPA and hired a consultant to review and evaluate documents on the ongoing Superfund remedial program. On August 4, 1992 NJDEPE held a briefing for local officials and representatives of CRISIS in Bridgewater to discuss the planned Surface Soils Remedial/Removal Action (SSRRA) at the American Cyanamid Site. Township and CRISIS representatives were supportive of the surface soil work but asked for additional information on the health and safety plan for this project which was provided before commencement of work. During the August 4th meeting officials expressed concern about possible pollution of Cuckhold's Brook during the work and stated that the public was still not convinced that Cyanamid's ground water pumping system was controlling water pollution at this site. In an August 31, 1992 letter, CRISIS requested additional information from NJDEPE on other site remediation issues including the development of the Risk Assessment document, health evaluations, construction of chemical processing plants as part of the cleanup process, and proposed ground water cleanup standards. NJDEPE responded in a September 8, 1992 letter. NJDEPE held a formal public comment period on the SSRRA from September 17, 1992 through October 16, 1992, no additional comments on the SSRRA were received during this period.

Representatives of NJDEPE and USEPA visited the site with Congressman Robert Franks, Township officials and members of CRISIS on April 16, 1993. In response to concerns raised about remedial activities at the site by CRISIS representatives during this visit, NJDEPE and USEPA offered, in an April 20, 1993 letter, to meet again with Bridgewater and CRISIS officials to address these concerns.

C. SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND AGENCY RESPONSES

During the August 5th Public Meeting, representatives of CRISIS expressed serious concerns that the proposed remedy would not adequately treat organic contaminants and that as a result these organics would degrade the Impoundment 8 facility liner releasing contaminants to the environment. CRISIS also questioned the effectiveness of the ongoing bedrock pumping of contaminated ground water. NJDEPE prepared an extensive response to these concerns and met with representatives of CRISIS and Bridgewater Township in Bridgewater on August 24, 1993 for further discussion. Most of the items at issue were resolved at the August 24th meeting. Concerns raised during the American Cyanamid Company Superfund Site Public Meeting held on August 5, 1993, at the August 24, 1993 working meeting, and written comments received during the comment period which extended from June 30, 1993 through September 12, 1993 are summarized below. Comments received on the Draft Modified HSWA permit will be addressed in the Final Modified HSWA permit.

1. **Comment:** The technical consultant for CRISIS stated that impoundment 19 appears to contain significantly greater levels of organic contaminants than impoundments 11, 20 and 24 and recommended that the biological treatment followed by solidification option be chosen for impoundment 19. He indicated that since the organic containing material is present in a discrete layer it should be possible to minimize the amount of material treated.

Response: Chemical analysis of the Impoundment 19 material detected only two human carcinogenic organic compounds (benzene at 370 parts per million (ppm)-maximum concentration, and methylene chloride at 51 ppm-maximum concentration). Impoundment 19 has a total organic contaminants concentration of 18,824 ppm (8.7% of total contaminants) and a total inorganic contaminants concentration of 198,247 ppm (91.3% of total contaminants). The ratio of inorganics: organics is 11:1. Detected human carcinogenic organic compounds in Impoundment 19 represent only 0.19% (total concentration 421 ppm) of the total contaminants (217,071 ppm).

The Impoundment 19 contents consist of sludge, fill, tar, natural soil and lime. The discussion in site study reports which indicated that the two types of material were present in discrete layers may have been misleading. The tar and lime pockets are interspaced throughout the impoundment and the entire impoundment contents would need to be treated to remediate the organic portion.

A treatability study for the biotreatment of Impoundment 19 determined that it was necessary to dilute the material with water. A 30% slurry (7 parts water to 3 parts Impoundment 19 material) was determined to be the highest concentration which could be treated. In addition, nutrients (nitrogen and phosphorus) had to be added to support and sustain biodegradative activity. Due to the dilution requirement, the overall volume of the treated materials increased significantly.

Additional cost for biotreatment of the material in Impoundment 19 would be \$ 4,293,000. Base on the points discussed above, biotreatment for Impoundment 19 is not practical. Spending over \$ 4.3 M in additional cost, for the biotreatment of Impoundment 19, compared to solidification, is not practical and cost effective.

2. **Comment:** Various representatives of CRISIS expressed fears that untreated volatile organics would escape the solidification process, pool on the bottom of the Impoundment 8 Facility, degrade the liner and escape into the environment. Speakers felt that rainfall would magnify these problems.

Response: The solidification technology proposed in the preferred alternative will bind both inorganic and organic contaminants in a solid matrix which will minimize leaching of contaminants. A final cap will be placed over the Impoundment 8 Facility which will prevent formation of leachate by eliminating rain water percolating through the Impoundment 8 contents. A temporary fabric covering is placed over open areas of the impoundment when filling operations are not in progress to minimize rainfall entering the facility. A six inch layer of stone is placed over the 80-mil high density polyethylene liner before any material is placed into the impoundment to prevent fill material from coming into direct contact with the primary liner. A system of pipes for the collection and removal of leachate is built into this stone layer. Chemical compatibility testing for the liner included immersion in leachate. Should any leachate pass through the primary liner, a leachate detection system consisting of another series of collection pipes would capture it before it reaches the final liner system. This system is being monitored on a monthly basis and repairs would be initiated if leachate is present. NJDEPE believes that all these safeguards will insure that the preferred alternative of solidification and placement in the Impoundment 8 facility will be protective of human health and the environment.

3. **Comment:** A speaker at the August 5th meeting suggested that bentonite blankets be considered for placement under the final storage facility to give added protection to the liner. The same speaker stated that the exposed liner would be subject to ultraviolet degradation from sunlight.

Response: The first cell of the Impoundment 8 facility has already been closed in accordance with the approved RCRA permit, bentonite blankets will be considered for future units. The six inch stone layer over the open liner protects it from damage due to sunlight. Once the final cap is placed there will be no sunlight reaching the liner.

4. **Comment:** At the August 24th working meeting Council President D'Ascensio of Bridgewater suggested that the contents of the Group I Impoundments be treated, through a multi step process including ion exchange treatment, to recover the metals present for resale. He suggested that the organics could be treated in a corollary process and the rest of the treated material could then be utilized as clean fill.

Response: The total mass of the Group I Impoundments is 94,000 tons. Total mass of inorganics in the Group I Impoundments is 6,917 tons while the total mass of carcinogenic inorganics is 127.8 tons. Total inorganics are 7.4% and total carcinogenic inorganics are 0.14% of the total mass of the Group I Impoundments. Based on the results of test pit samples (Impoundment Characterization Report, August 1990), the greater portion of the material in the Group I Impoundments consists of lime, silt, clay, native organic soil and debris.

At the suggestion of the Council President, NJDEPE contacted representatives of companies with experience in ion exchange technology to discuss the process. Due to the high percentage of solids (about 60%) and low percentage of recoverable materials in the impoundments, the material would require a two or three step pretreatment process prior to ion exchange and a significant amount of dilution which would greatly increase the amount of material to be treated. The entire volume of the Group I impoundment would have to be treated because the materials are practically non-separable. The application of ion exchange or any other chemical treatment would require the processing of large volumes of waste in order to "treat" a very small mass of inorganics. Solidification achieves overall protection of human health and the environment in a shorter time frame and is cost effective.

5. **Comment:** The Council President expressed concern that the reaction of lime with the cement like material used in the solidification process would generate excess heat.

Response: The findings presented in the July 1991 Technology Evaluation Work Plan indicated that there was essentially no reactivity remaining in the lime. In order to be conservative, a bench scale plough mixer will be used to conduct exotherm (heat release) evaluations with several successful solidification formulations before field application.

6. **Comment:** A Bridgewater resident wrote asking where the new Impoundment 8 will be located and commenting that the last impoundment created by American Cyanamid is on Polhemus Lane very close to residences. The writer requested that any new impoundment be located close to the plant.

Response: The "new" Impoundment 8 discussed in the Proposed Plan is the one that has already been located. Wastes from the "old" Impoundment 8, along with Impoundments 6 and 7, are currently being processed into the new Impoundment 8 according to the terms of the RCRA permit for this facility. There are no current plans to construct additional impoundments at this site.

7. **Comment:** The Township of Bridgewater submitted written comments requesting that adequate air pollution control measures including the use of a carbon absorber be implemented during the removal and solidification processes to insure that activities are in conformance with

National Air Quality Standards and the Federal Clean Air Act. The township asked for a review of the facility at least every three years instead of five and quarterly monitoring of groundwater monitoring wells around the Impound 8 facility. The township also requested review of plans involving the Impound 8 facility and that a thicket of thorny shrubs be maintained along the fence line of this facility to serve as a natural buffer.

Response: Excavation, solidification and consolidation activities for the material in the Group I Impoundments will be carried out in compliance with applicable state and federal regulatory standards. Volatile emissions from the solidification process will be collected with a blower and treated in a carbon absorber, if necessary. This requirement will be evaluated in detail during the Remedial Design which will include a health and safety plan. NJDEPE will provide Bridgewater Township with the opportunity to review these plans before implementation. The five year review process is consistent with the CERCLA/NCP requirement and applies to the overall remedy selected for the Group I Impoundments. Leachate control systems and ground water monitoring wells are currently being monitored on a monthly and quarterly basis respectively. Site conditions have been and will be monitored on a regular basis as part of the ongoing design and remediation of this area and other areas of the site. A thicket of thorny shrubs will be maintained along the fence line of the Impoundment 8 facility.

8. **Comment:** Various comments were made on the perceived inadequacy of flood control measures and flood information on the site. Speakers stated that they could recall when all the site impoundments were flooded and expressed concerns that floods could carry river contaminants upstream in the Raritan River past the Elizabethtown Water Company intakes.

Response: The area of the Impoundment 8 facility is clearly outside the 500 year flood plain. The Elizabethtown Water Company Intakes are located approximately 1700 feet upriver and approximately 2,200 feet upriver of the American Cyanamid site. Based on the regular analysis performed by the Elizabethtown Water Company, the water intakes are not contaminated. The entire site will be evaluated for 500-year flood plain hazards and the impact of the site on the Raritan River as part of a site-wide natural resources assessment. The work plan for this study has been forwarded to CRISIS for review. NJDEPE's objective is to remove the threat of potential contamination to the river from flooding or ground water impacts by remediating the impoundments that are the source of potential contaminants beginning with the Group I Impoundments as addressed in this Record of Decision. A fact sheet on the Raritan River and Cuckhold's Brook flood plain, including a flood events history, is attached.

9. **Comment:** CRISIS representatives noted that the preferred remedy will not attain ground water quality standards and asked that the Record of

Decision contain a statement that final site remediation will meet ARARS.

Response: A statement to this effect appears as the last paragraph of the Declaration Statement of this Record of Decision (page 2.) The remediation of the Group I Impoundments represents only the first step of a many phased cleanup of the American Cyanamid Site. Effective final remediation of contaminated ground water can only be achieved after the sources of continuing contamination, in site impoundments and soils, have been addressed.

10. Comment: A speaker asked who was responsible for quality assurance/quality control (QA/QC) for remedial work at the American Cyanamid Site.

Response: QA/QC on all remedial work conducted by American Cyanamid has been performed by NJDEPE.

Certain other concerns were raised at the August 5th Public Meeting which do not bear directly on the remediation of the Group I Impoundments. These concerns included comments that the Somerset Raritan Valley Sewage Authority (SRVSA) plant was not equipped to treat organic compounds in the recovered ground water from the American Cyanamid plant and that the monitoring system and analysis of the bedrock ground water was insufficient. NJDEPE's responses to these issues are included in the packet of materials prepared for and revised after the August 24th working meeting. These materials and all written comments submitted during the public comment period are attached to this Responsiveness Summary.

D. COMMUNITY RELATIONS ACTIVITIES AT THE AMERICAN CYANAMID COMPANY SITE

NJDEPE established information repositories at the following locations:

Bridgewater Town Hall
700 Garretson Road
Bridgewater, NJ 08807 Phone # (908) 725-6300

Somerset County/Bridgewater Library
North Bridge Street & Vogt Drive
Bridgewater, NJ 08807 Phone # (908) 526-4016

New Jersey Department of Environmental Protection And Energy
Bureau of Community Relations
401 East State Street, CN 413
Trenton, NJ 08625 Phone # (609) 984-3081
Contact: George Tamaccio

NJDEPE held a briefing for public officials and concerned citizens in Bridgewater to discuss the corrective action portion of the 1988

Administrative Consent Order (ACO) and the initiation of the Remedial Investigation/Feasibility Study (RI/FS) (January 1989),

NJDEPE held a public meeting in Bridgewater to discuss the RI/FS (February 21, 1989).

NJDEPE prepared a Community Relations Plan (February 1989).

NJDEPE forwarded information requested at the February 21, 1989 meeting to those attending (April 20, 1989).

NJDEPE held a public meeting in Bridgewater to update the RI/FS progress (March 11, 1991).

NJDEPE issued a Superfund Site Update fact sheet in response to concerns raised at the March 11, 1991 meeting (June 1991).

NJDEPE met in Bridgewater with township officials to discuss concerns raised by Bridgewater regarding ongoing site activities (November 27, 1991).

NJDEPE held a briefing in Bridgewater for officials and CRISIS representatives to discuss initiation of the Surface Soils Remedial/Removal Action (SSRRA) (August 4, 1992).

NJDEPE held a public comment period on the SSRRA from September 17, 1992 through October 16, 1992.

NJDEPE held a public comment period from June 30, 1993 through September 12, 1993 and a public meeting in Bridgewater on August 5, 1993 to discuss the Proposed Plan for Remediation of the Group I Impoundments and Modification of the Hazardous and Solid Waste Amendments Permit.

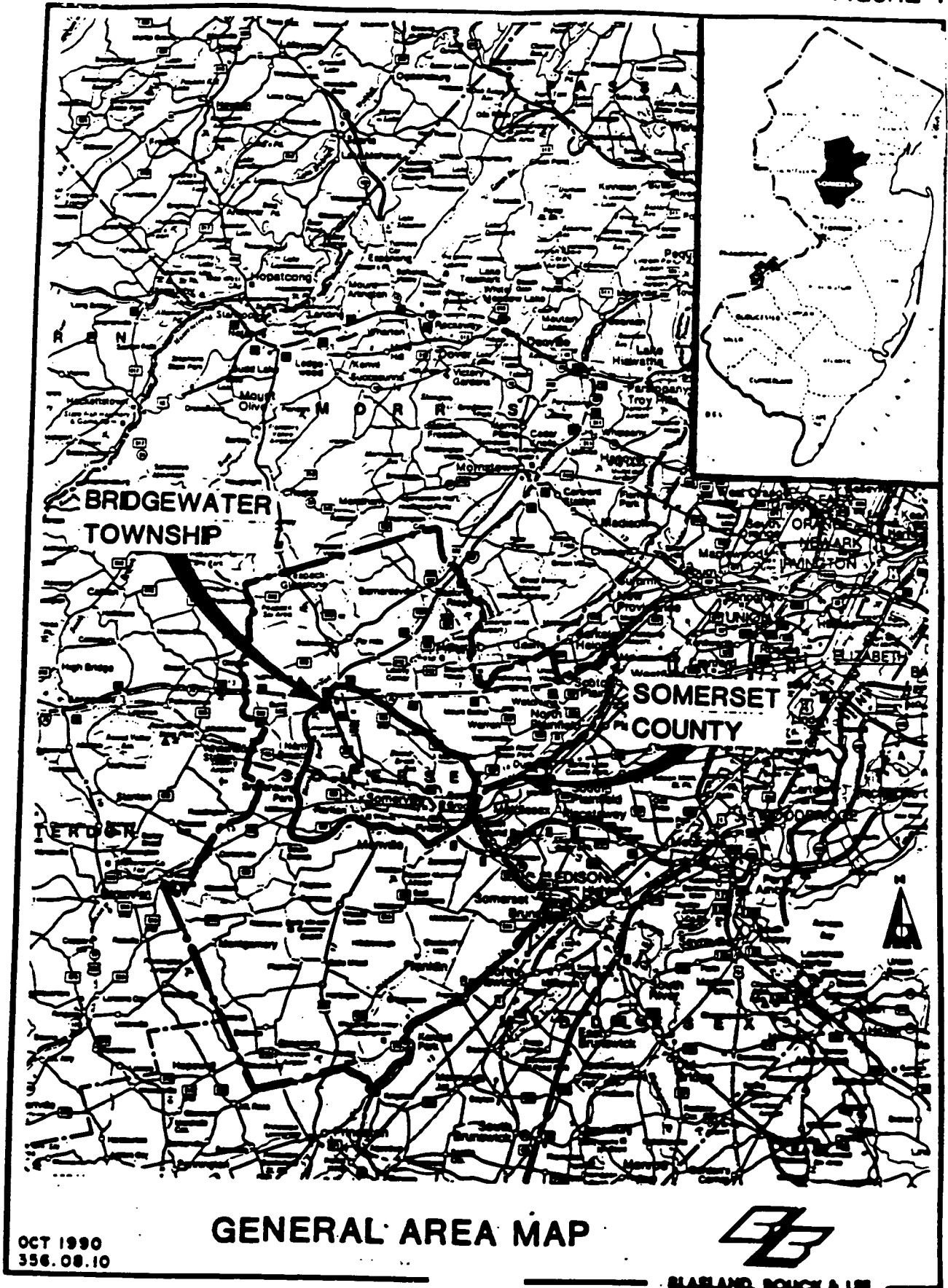
SUPERFUND RECORD OF DECISION
AMERICAN CYANAMID SITE
BRIDGEWATER TOWNSHIP
SOMERSET COUNTY
NEW JERSEY

GROUP I IMPOUNDMENTS (11, 13, 19 AND 24)

ATTACHMENT 1 - FIGURES





FIGURE 1

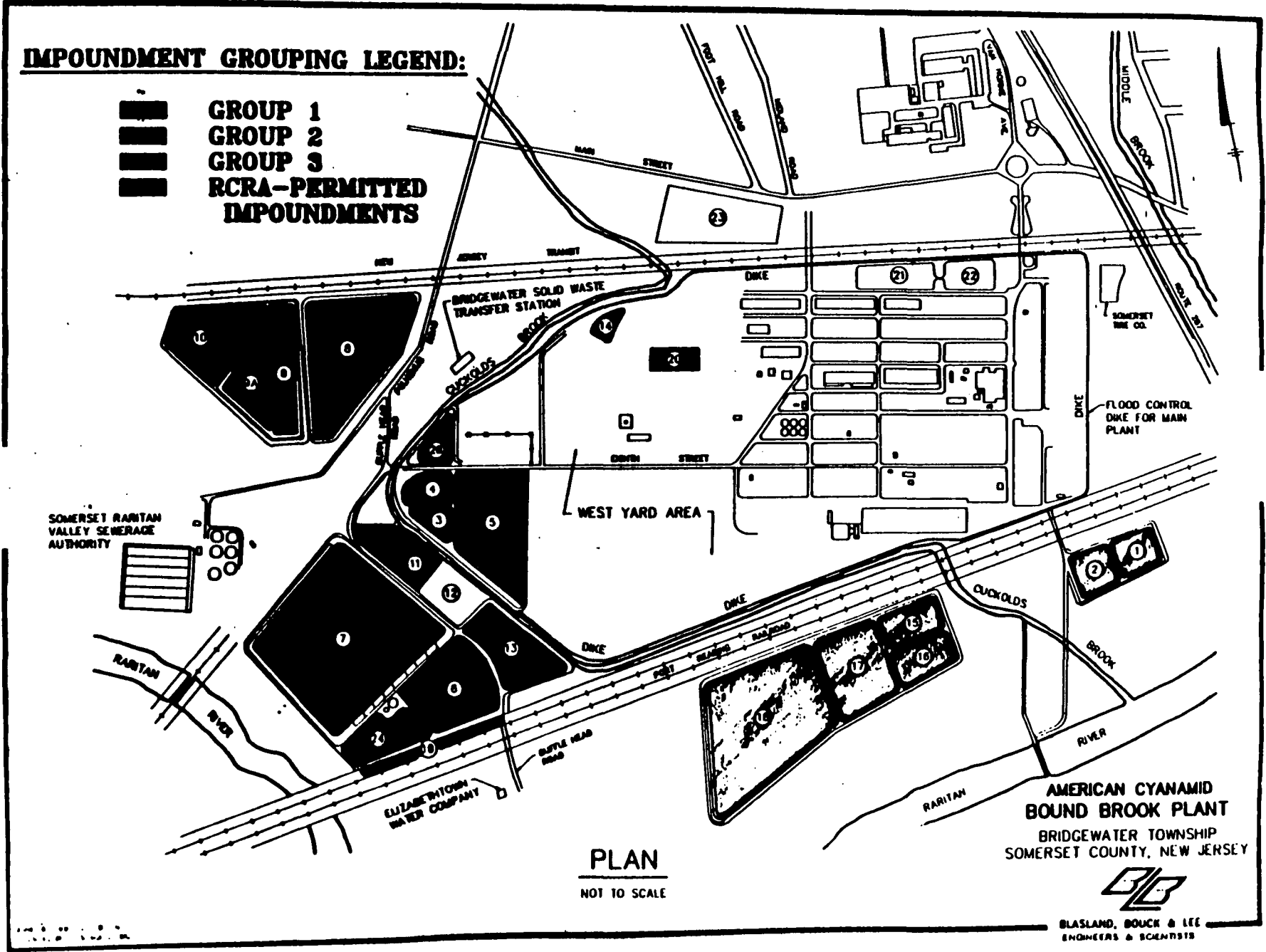
FIGURE 1



POOR QUALITY ORIGINAL

IMPOUNDMENT GROUPING LEGEND:

-  **GROUP 1**
-  **GROUP 2**
-  **GROUP 3**
-  **RCRA-PERMITTED
IMPOUNDMENTS**



PLAN
NOT TO SCALE

**AMERICAN CYANAMID
BOUND BROOK PLANT**
BRIDGEWATER TOWNSHIP
SOMERSET COUNTY, NEW JERSEY

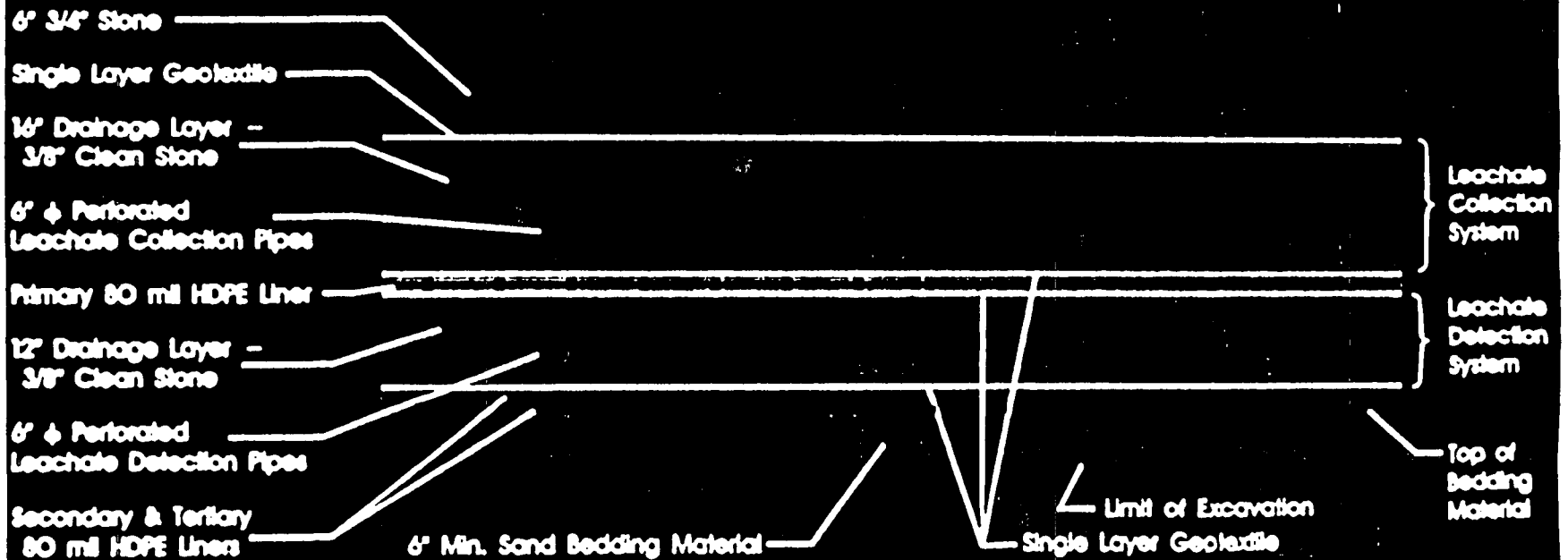


BLASLAND, BOUCK & LEE
ENGINEERS & SCIENTISTS

FIGURE 2

Impoundment Bottom Triple Liner System

FIGURE 3



SUPERFUND RECORD OF DECISION
AMERICAN CYANAMID SITE
BRIDGEWATER TOWNSHIP
SOMERSET COUNTY
NEW JERSEY

GROUP I IMPOUNDMENTS (11, 13, 19 AND 24)

ATTACHMENT 2 - TABLES

Table 1
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 Page 1 of 3.

~~TABLE 3~~
 DATABASE SUMMARY FOR CONTAMINAN
 AMERICAN CYANAMID, BOUN

	IMPOUNDMENT 11				IMPOUNDMENT 13			
	AVG. CONC.	MAX. CONC.	MIN. CONC.	NO. OF DETECTS	AVG. CONC.	MAX. CONC.	MIN. CONC.	NO. OF DETECTS
TCL ORGANICS (mg/kg)								
<u>Potentially Carcinogenic TCL Volatiles</u>								
Benzene	6.62	22	<1	3	1.62	4.60	<1	2
Methylene Chloride	0.77	2.40	<1	3	1.04	1.90	<1	2
<u>Other TCL Volatiles</u>								
1,1,2,2-Tetrachloroethane	-	-	-	-	-	-	-	-
4-Methyl-2-pentanone	-	-	-	-	-	-	-	-
Acetone	3.60	11	<1	6	0.64	1	<1	1
Chlorobenzene	16.61	38	<1	6	16.63	38	3.30	4
Chloroethane	-	-	-	-	14.60	16	13	2
Ethylbenzene	4.66	14	<1	6	2.98	6.20	1.30	4
Tetrachloroethylene	-	-	-	-	1.30	1.30	1.30	1
Toluene	17.47	73	<1	6	3.46	8.60	<1	4
Xylenes (total)	39.23	140	<1	7	21.06	66	4.80	4
<u>Potentially Carcinogenic TCL Semivolatiles</u>								
1,4-Dichlorobenzene	16.84	34	4.10	6	14.71	11	<1	2
Bis(2-ethyl hexyl)phthalate	26.60	81	6.80	8	6.67	8.90	3.40	3
Chrysene	18.05	36	6.80	6	6.20	6.20	6.20	1
Hexachlorobenzene	-	-	-	-	0.27	<1	<1	0
N-nitrosodiphenylamine	110.33	180	41	3	204	610	22	5
PCB-1248	-	-	-	-	3.10	3.40	2.60	2
PCB-1254	-	-	-	-	6.90	7.60	6.20	2

Table 1
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Page 1 of 3

IMPOUNDMENT 19				IMPOUNDMENT 20				IMPOUNDMENT 24			
AVG. CONC.	MAX. CONC.	MIN. CONC.	NO. OF DETECTS	AVG. CONC.	MAX. CONC.	MIN. CONC.	NO. OF DETECTS	AVG. CONC.	MAX. CONC.	MIN. CONC.	NO. OF DETECTS
88.63	370	<1	3	4650	5600	3600	2	1.36	3.30	<1	1
12.64	51	<1	2	135	160	110	2	18.90	92.00	<1	6
-	-	-	-	-	-	-	-	11	11	11	1
-	-	-	-	-	-	-	-	0.07	<1	<1	0
60.30	100	<1	1	-	-	-	-	37.87	120	<1	3
627.95	2300	<1	3	2150	3000	1300	2	95.86	460	<1	3
-	-	-	-	-	-	-	-	-	-	-	-
27.31	68	<1	2	490	680	300	2	45	45	45	1
-	-	-	-	-	-	-	-	-	-	-	-
163.26	470	<1	2	-	-	-	-	28.16	120	<1	5
132.34	490	<1	2	2150	2900	1400	2	27.08	70	1.50	5
250	250	250	1	-	-	-	-	119.60	500	11	5
21.75	30	17	4	-	-	-	-	45.66	120	4.70	5
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
4389.21	17000	<1	3	-	-	-	-	377.33	1200	94	6
-	-	-	-	-	-	-	-	-	-	-	-
8.30	8.30	8.30	1	-	-	-	-	9.80	9.80	9.80	1

Table 1
 First half of the page.
 Page 2 of 3

TABLE 3 (CONT.)
 DATABASE SUMMARY FOR CONTAMINANTS
 AMERICAN CYANAMID, B...

	IMPOUNDMENT 11				IMPOUNDMENT 13			
	AVG. CONC.	MAX. CONC.	MIN. CONC.	NO. OF DETECTS	AVG. CONC.	MAX. CONC.	MIN. CONC.	NO. OF DETECTS
<u>Other TCL Semivolatiles</u>								
1,2,4-Trichlorobenzene	-	-	-	-	101.60	310	4.60	6
1,2-Dichlorobenzene	50.42	180	6.70	9	49.10	99	2.60	6
1,3-Dichlorobenzene	4.70	6.20	3.20	2	1.62	2.10	<1	1
2,4,6-Trichlorophenol	-	-	-	-	57	57	57	1
2,4-Dimethylphenol	-	-	-	-	-	-	-	-
2,4-Dinitrophenol	-	-	-	-	230	420	70	3
2-Chloronaphthalene	-	-	-	-	409.68	1600	<1	3
2-Chlorophenol	-	-	-	-	-	-	-	-
2-Methylnaphthalene	1876.40	8100	44	10	257.40	870	11	6
2-Methylphenol	-	-	-	-	-	-	-	-
2-Nitrophenol	-	-	-	-	-	-	-	-
4-Methylphenol	-	-	-	-	21	21	21	1
Acenaphthene	296.33	720	87	9	15	17	13	2
Acenaphthylene	14.98	25	7.70	8	1.61	2.90	<1	1
Anthracene	99.66	230	34	9	31.70	83	7.60	6
Benzo(a)anthracene	116.90	220	17	10	76.60	170	16	4
Benzo(b)fluoranthene	21	21	21	1	-	-	-	-
Benzo(k)fluoranthene	27	27	27	1	6.75	8.70	4.80	2
Butyl benzyl phthalate	-	-	-	-	-	-	-	-
Di-n-butyl phthalate	-	-	-	-	0.13	<1	<1	0
Di-n-octyl phthalate	-	-	-	-	-	-	-	-
Dibenzofuran	211.49	620	3.40	9	115.64	390	5.30	6
Fluorenone	68.64	120	6.90	9	13.48	24	7.70	4
Fluorene	268.40	660	5	10	74.24	210	3.60	6
Hexachlorocyclopentadiene	-	-	-	-	-	-	-	-
Isophorone	129.60	230	29	2	-	-	-	-
Naphthalene	7976.11	41000	96	9	2649.25	9300	47	4
Nitrobenzene	320	320	320	1	23.83	63	6.60	3
Phenanthrene	262.77	690	7.70	10	109.40	340	21	6
Phenol	-	-	-	-	11	11	11	1
Pyrene	66.64	120	4.80	9	13.67	21	8.70	3
TOTAL POTENTIALLY CARCINOGENIC TCL ORGANICS	176.21				244.61			
TOTAL TCL ORGANICS	12076.42				4574.27			

Table 1
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IMPOUNDMENT 19				IMPOUNDMENT 20				IMPOUNDMENT 24			
AVG. CONC.	MAX. CONC.	MIN. CONC.	NO. OF DETECTS	AVG. CONC.	MAX. CONC.	MIN. CONC.	NO. OF DETECTS	AVG. CONC.	MAX. CONC.	MIN. CONC.	NO. OF DETECTS
1003.59	2600	<1	2	-	-	-	-	31.80	60 ⁰	3.20	2
143.36	260	<1	2	-	-	-	-	2000.47	13000	4.30	7
-	-	-	-	-	-	-	-	33.40	58	8.80	2
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	200	200	200	1
-	-	-	-	-	-	-	-	-	-	-	-
3309.60	9800	8.80	3	-	-	-	-	634	2900	11	6
0.03	<1	<1	0	-	-	-	-	-	-	-	-
383.89	1200	<1	3	-	-	-	-	203.60	660	13	6
-	-	-	-	-	-	-	-	66	66	66	1
0.02	<1	<1	0	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	72.10	200	7.40	3
131.48	350	<1	2	-	-	-	-	78.24	200	6.20	6
4.31	8.60	<1	1	-	-	-	-	6.85	7.80	6.10	2
43.60	64	33	2	-	-	-	-	19.20	33	6.60	3
109.17	240	<1	2	-	-	-	-	-	-	-	-
13	13	13	1	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
7.60	7.60	7.60	1	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	66	66	66	1
25	25	25	1	-	-	-	-	-	-	-	-
346.76	740	<1	2	-	-	-	-	95.46	440	3.30	7
17.05	37	<1	2	-	-	-	-	20	20	20	1
513.42	1200	<1	2	-	-	-	-	86.60	320	16	6
-	-	-	-	-	-	-	-	0.09	<1	<1	0
-	-	-	-	-	-	-	-	-	-	-	-
4013.62	11000	2.90	6	-	-	-	-	2646.67	8800	120	8
2866.69	8200	<1	2	-	-	-	-	110.86	360	67	7
97.44	210	<1	2	-	-	-	-	66.80	180	14	6
-	-	-	-	-	-	-	-	-	-	-	-
22.45	41	<1	2	-	-	-	-	-	-	-	-
4770.63				4785.00				672.65			
18823.66				9576.00				7232.63			

Table 1
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~~TABLE 3 (CONT)~~
 DATABASE SUMMARY FOR CONTAMINANTS
 AMERICAN CYANAMID, B.C.

	IMPOUNDMENT 11				IMPOUNDMENT 13			
	AVG. CONC.	MAX. CONC.	MIN. CONC.	NO. OF DETECTS	AVG. CONC.	MAX. CONC.	MIN. CONC.	NO. OF DETECTS
TAL INORGANICS (mg/kg)								
<u>Potentially Carcinogenic TAL Inorganics</u>								
Arsenic	92.93	185	30.10	10	32.48	58.10	12.80	6
Beryllium	-	-	-	-	-	-	-	-
Cadmium	15.58	31.30	6.80	10	10.65	24.50	<1	3
Chromium	1876	2280	1380	10	582.90	978	248	6
Lead	2153	3480	1140	10	3327.80	13100	585	6
Nickel	131.23	284	51.80	10	196.90	303	117	6
<u>Other TAL Inorganics</u>								
Aluminum	62340	105000	10500	10	7070	13300	2550	6
Antimony	15.31	20.70	8.10	10	19.51	42.60	2.47	6
Barium	3255.70	8920	271	10	2559.80	8010	419	6
Calcium	1735.80	3830	824	10	231.82	34600	3910	6
Cobalt	11.97	24.50	4.20	10	18.82	27.20	13.70	6
Copper	2140	3500	1500	10	2074	3520	1330	6
Cyanide	23.90	39.90	12.80	10	12.22	26.20	4.30	6
Iron	60510	131000	28300	10	91780	168000	43200	6
Magnesium	3835	7160	2200	10	4733.60	10500	909	6
Manganese	230.79	487	97.9	10	585.20	718	456	6
Mercury	151.02	284	41.80	10	38.38	54.60	15.20	6
Potassium	525	858	402	10	810.20	1370	524	6
Selenium	0.98	2.40	<1	3	1.70	2.78	<1	4
Silver	3.76	5.20	2.70	10	-	-	-	-
Sodium	462.10	1000	184	10	586.40	873	152	6
Thallium	-	-	-	-	-	-	-	-
Vanadium	40.67	47.30	28.90	10	25.52	46.40	7.31	6
Zinc	2213.30	5590	821	10	1292.40	2440	121	6
TOTAL POTENTIALLY CARCINOGENIC TAL INORGANICS	4298.74				4149.93			
TOTAL TAL INORGANICS	141794.02				138940.88			

- NOTES:
1. Data from amended and approved 1990 Impoundment Characterization Program Final Report (ICPFR) and August 1991 IEA Analytical Report.
 2. "Max. Conc." indicates the maximum concentration of contaminants detected in all samples of sludge.
 3. "Min. Conc." indicates the minimum concentration of contaminants detected in all samples of sludge.
 4. "No. of Detects" indicates the number of samples in which the contaminant concentration exceeded 1 ppm.
 5. "-" indicates a non detect.

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NT CONCENTRATIONS
IND BROOK

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IMPOUNDMENT 19				IMPOUNDMENT 20				IMPOUNDMENT 24			
AVG. CONC.	MAX. CONC.	MIN. CONC.	NO. OF DETECTS	AVG. CONC.	MAX. CONC.	MIN. CONC.	NO. OF DETECTS	AVG. CONC.	MAX. CONC.	MIN. CONC.	NO. OF DETECTS
25.38	96.90	3.30	6	7.33	8.40	6.26	2	72.05	169	6.78	7
-	-	-	-	1.33	1.36	1.30	2	-	-	-	-
1.10	3	<1	1	1.77	2.03	1.60	2	-	-	-	-
229.68	698	<1	4	60300	68400	42200	2	296.14	671	33	7
423.86	864	10.30	6	1720	1880	1560	2	677.67	1270	33.70	7
79.72	238	8.60	6	448	462	434	2	141.66	276	27.30	7
7984	20200	1280	6	3275	3420	3130	2	7050	14600	2020	7
13.36	19.70	8.10	6	673	663	483	2	12.30	66.60	2.32	7
2618.60	9120	17	6	39.65	40.60	38.60	2	1133	2060	251	7
115631.80	301000	469	6	62000	66900	47100	2	27277.14	60000	8640	7
9.62	24.90	2.40	6	24.65	27.60	21.60	2	13.87	22.60	4.46	7
743.40	2160	10.70	6	7806	8270	7340	2	2293.96	2820	37.70	7
2.42	4.90	1.20	6	2.66	2.72	2.60	2	32.20	171	1.20	7
39070	121000	4450	6	49050	63600	44600	2	64728.57	126000	22600	7
29634.20	118000	366	6	4545	4840	4260	2	3730	11900	1260	7
844.20	2109	190	6	387	412	362	2	1385	3160	824	7
26.02	84	<1	4	1.16	1.18	1.11	2	6.65	19.30	<1	6
313.20	627	237	6	1200	1230	1170	2	1009.86	2070	172	7
0.72	2.10	<1	1	1.33	1.36	1.30	2	3.40	14	<1	3
-	-	-	-	2.66	2.72	2.60	2	-	-	-	-
300.40	401	162	6	10000	10800	9200	2	660.29	1090	187	7
-	-	-	-	2.44	2.72	2.16	2	2.23	6.71	1.16	7
26.74	47.70	3.80	6	103.60	107	100	2	101.14	166	27.90	7
269.22	836	43.60	6	80900	148000	13800	2	637.29	1970	76	7
769.74				62478.43				1186.62			
198246.64				262391.27				111263.42			

TABLE 1

DATABASE SUMMARY FOR CONTAMINANT CONCENTRATIONS
 AMERICAN CYANAMID, BOUND BROOK

TCL ORGANICS (mg/kg)	IMPOUNDMENT 11				IMPOUNDMENT 13				IMPOUNDMENT 18				IMPOUNDMENT 24			
	AVG	MAX	MIN	NO.	AVG	MAX	MIN	NO.	AVG	MAX	MIN	NO.	AVG	MAX	MIN	NO.
	CONC.	CONC.	CONC.	OF	CONC.	CONC.	CONC.	OF	CONC.	CONC.	CONC.	OF	CONC.	CONC.	CONC.	OF
TCL ORGANICS (mg/kg)																
<u>Potentially Carcinogenic TCL Volatiles</u>																
Benzene	6.62	22	<1	3	1.62	4.60	<1	2	88.63	370	<1	3	1.36	3.30	<1	1
Methylene Chloride	6.77	2.40	<1	3	1.04	1.80	<1	2	12.84	51	<1	2	18.90	92.00	<1	6
<u>Other TCL Volatiles</u>																
1,1,2,2-Tetrachloroethane	-	-	-	-	-	-	-	-	-	-	-	-	11	11	11	1
4-Methyl-2-pentanone	-	-	-	-	-	-	-	-	-	-	-	-	0.07	<1	<1	0
Acetone	3.60	11	<1	6	0.64	1	<1	1	60.30	100	<1	1	37.67	120	<1	3
Chlorobenzene	16.64	36	<1	6	16.63	36	3.30	4	627.95	2300	<1	3	66.86	480	<1	3
Chloroethane	-	-	-	-	14.60	16	13	2	-	-	-	-	-	-	-	-
Ethylbenzene	4.66	14	<1	6	2.98	6.20	1.30	4	27.31	88	<1	2	45	45	45	1
Tetrachloroethylene	-	-	-	-	1.30	1.30	1.30	1	-	-	-	-	-	-	-	-
Toluene	17.47	79	<1	6	3.46	6.60	<1	4	163.26	470	<1	2	28.16	120	<1	6
Xylenes (total)	38.23	140	<1	7	21.05	56	4.60	4	132.34	490	<1	2	27.08	70	1.60	6
<u>Potentially Carcinogenic TCL Semivolatiles</u>																
1,4-Dichlorobenzene	16.94	34	<10	6	14.71	11	<1	2	250	250	250	1	119.60	600	11	6
Bis(2-ethylhexyl)phthalate	25.60	61	6.60	6	6.67	6.60	3.40	3	21.75	30	17	4	46.66	120	4.70	6
Chrysene	16.05	36	6.60	6	6.20	6.20	6.20	1	-	-	-	-	-	-	-	-
Hexachlorobenzene	-	-	-	-	0.27	<1	<1	0	-	-	-	-	-	-	-	-
Nitroodiphenylamine	110.33	160	41	3	204	610	22	6	4369.21	17000	<1	3	377.33	1200	94	6
PCB-1246	-	-	-	-	3.10	3.40	2.60	2	-	-	-	-	-	-	-	-
PCB-1254	-	-	-	-	6.60	7.60	6.20	2	6.30	6.30	6.30	1	9.60	9.60	9.60	1

TABLE 1 (CONTD)

DATABASE SUMMARY FOR CONTAMINANT CONCENTRATIONS

AMERICAN CYANAMID, BOUND BROOK

	IMPOUNDMENT 11				IMPOUNDMENT 13				IMPOUNDMENT 18				IMPOUNDMENT 24			
	AVG. CONC.	MAX. CONC.	MIN. CONC.	NO. OF DETECTS	AVG. CONC.	MAX. CONC.	MIN. CONC.	NO. OF DETECTS	AVG. CONC.	MAX. CONC.	MIN. CONC.	NO. OF DETECTS	AVG. CONC.	MAX. CONC.	MIN. CONC.	NO. OF DETECTS
Other TCL Semivolatiles																
1,2,4-Trichlorobenzene	-	-	-	-	101.80	310	4.60	6	1003.69	2600	<1	2	31.80	80	3.20	2
1,2-Dichlorobenzene	80.42	180	6.70	8	49.10	88	2.60	6	143.38	280	<1	2	2000.47	13000	4.30	7
1,3-Dichlorobenzene	4.70	6.30	3.30	2	1.62	2.10	<1	1	-	-	-	-	33.40	68	8.80	2
2,4,6-Trichlorophenol	-	-	-	-	67	67	67	1	-	-	-	-	-	-	-	-
2,4-Dimethylphenol	-	-	-	-	-	-	-	-	-	-	-	-	200	200	200	1
2,4-Dinitrophenol	-	-	-	-	220	420	70	3	-	-	-	-	-	-	-	-
2-Chloronitrophenol	-	-	-	-	409.68	1800	<1	3	3309.80	9800	8.80	3	834	2900	11	6
2-Chlorophenol	-	-	-	-	-	-	-	-	0.03	<1	<1	0	-	-	-	-
2-Methylnitrophenol	1875.40	8100	44	10	267.40	670	11	6	283.89	1200	<1	3	203.60	860	13	6
2-Methylphenol	-	-	-	-	-	-	-	-	-	-	-	-	68	66	66	1
2-Nitrophenol	-	-	-	-	-	-	-	-	0.02	<1	<1	0	-	-	-	-
4-Methylphenol	-	-	-	-	21	21	21	1	-	-	-	-	72.10	200	7.40	3
Acenaphthene	296.39	720	87	8	16	17	13	2	131.48	360	<1	2	78.24	200	8.20	6
Acenaphthylene	14.88	26	7.70	8	1.81	2.80	<1	1	4.31	8.80	<1	1	8.66	7.80	8.10	2
Anthracene	88.68	230	34	8	31.70	89	7.60	6	43.80	64	33	2	19.20	33	8.60	3
Benzo(a)anthracene	118.80	220	17	10	76.60	170	16	4	109.17	240	<1	2	-	-	-	-
Benzo(b)fluoranthene	21	21	21	1	-	-	-	-	13	13	13	1	-	-	-	-
Benzo(k)fluoranthene	27	27	27	1	6.76	8.70	4.80	2	-	-	-	-	-	-	-	-
Butyl benzyl phthalate	-	-	-	-	-	-	-	-	7.80	7.80	7.80	1	-	-	-	-
Di-n-butyl phthalate	-	-	-	-	0.13	<1	<1	0	-	-	-	-	66	66	66	1
Di-n-octyl phthalate	-	-	-	-	-	-	-	-	26	26	26	1	-	-	-	-
Dibenzofuran	211.48	620	3.40	8	116.64	380	6.30	6	348.76	740	<1	2	96.46	440	3.30	7
Fluorenone	88.64	120	6.80	8	13.48	24	7.70	4	17.06	37	<1	2	20	20	20	1
Fluorene	288.40	880	6	10	74.34	210	3.60	6	613.42	1200	<1	2	88.80	320	16	6
Hexachlorocyclopentadiene	-	-	-	-	-	-	-	-	-	-	-	-	0.09	<1	<1	0
Isophthalic acid	128.80	230	28	2	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	7876.11	41000	86	8	2649.26	6300	47	4	4013.82	11000	2.90	6	2646.67	8800	120	6
Nitrobenzene	320	320	320	1	23.89	63	6.60	3	2888.88	6200	<1	2	110.86	360	67	7
Phenanthrene	282.77	880	7.70	10	109.40	340	21	6	87.44	210	<1	2	66.80	180	14	6
Phenol	-	-	-	-	11	11	11	1	-	-	-	-	-	-	-	-
Pyrene	66.64	120	4.80	8	13.67	21	8.70	3	22.46	41	<1	2	-	-	-	-
TOTAL POTENTIALLY CARCINOGENIC TCL ORGANICS	178.21				244.61				4770.63				672.66			
TOTAL TCL ORGANICS	12076.42				4674.27				18823.66				7232.63			

TABLE 1 (CONTD)

DATABASE SUMMARY FOR CONTAMINANT CONCENTRATIONS
AMERICAN CYANAMID, BOUND BROOK

	IMPONDMENT 11				IMPONDMENT 13				IMPONDMENT 19				IMPONDMENT 24			
	AVG CONC	MAX CONC	MIN CONC	NO OF DETECTS	AVG CONC	MAX CONC	MIN CONC	NO OF DETECTS	AVG CONC	MAX CONC	MIN CONC	NO OF DETECTS	AVG CONC	MAX CONC	MIN CONC	NO OF DETECTS
TAL INORGANICS (mg/kg)																
Potentially Carcinogenic TAL Inorganics																
Arsenic	82.89	166	20.10	10	32.48	68.10	12.80	6	26.38	86.90	3.30	6	72.05	169	6.78	7
Barium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	16.88	31.30	8.80	10	10.85	24.60	<1	3	1.10	3	<1	1	-	-	-	-
Chromium	1878	2280	1380	10	682.80	878	248	8	229.88	688	<1	4	296.14	871	33	7
Lead	2183	3480	1140	10	3327.80	13100	886	8	423.88	864	10.30	6	877.67	1270	33.70	7
Nickel	131.23	284	61.80	10	186.80	303	117	6	78.72	228	8.60	6	141.86	278	27.30	7
Other TAL Inorganics																
Aluminum	62340	108000	10800	10	7070	13300	2660	6	7884	20200	1280	6	7060	14600	2020	7
Antimony	16.31	20.70	8.10	10	18.61	42.80	2.47	6	13.36	19.70	8.10	6	12.30	86.80	2.32	7
Boron	3264.70	8920	271	10	2668.80	8010	418	6	2818.80	8120	17	6	11.33	2060	261	7
Calcium	1736.80	2830	624	10	231.82	34800	3910	6	118631.80	301000	469	6	27277.14	80000	8640	7
Cobalt	11.87	24.80	4.20	10	18.82	27.20	13.70	6	8.62	24.80	2.40	6	13.87	22.60	4.46	7
Copper	21.40	3600	1600	10	2074	3620	1330	6	743.40	2180	10.70	6	2283.96	2920	37.70	7
Cyanide	23.80	38.80	12.80	10	12.22	28.20	4.30	6	2.42	4.80	1.20	6	32.20	171	1.20	7
Iron	80610	131000	28300	10	81780	188000	43200	6	38070	121000	4460	6	64728.67	126000	22600	7
Magnesium	3836	7180	2200	10	4733.80	10800	808	6	29634.20	118000	366	6	3730	11900	1260	7
Manganese	230.78	487	87.8	10	686.20	718	468	6	844.20	2188	180	6	1386	3160	624	7
Mercury	161.02	284	41.80	10	38.38	64.80	16.20	6	26.02	84	<1	4	6.66	19.30	<1	6
Potassium	626	868	402	10	810.20	1370	624	6	313.20	627	237	6	1008.86	2070	172	7
Selenium	0.88	2.40	<1	3	1.70	2.78	<1	4	0.72	2.10	<1	1	3.40	14	<1	3
Silver	3.78	6.20	2.70	10	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	48210	1000	184	10	686.40	873	162	6	300.40	401	162	6	660.28	1080	187	7
Thallium	-	-	-	-	-	-	-	-	-	-	-	-	2.23	6.71	1.16	7
Vanadium	40.87	47.30	28.80	10	26.62	46.40	7.31	6	28.74	47.70	3.80	6	101.14	166	27.80	7
Zinc	2213.30	6680	621	10	1282.40	2440	121	6	288.22	806	43.60	6	637.28	1970	76	7
TOTAL POTENTIALLY CARCINOGENIC TAL INORGANICS	4288.74				4149.83				768.74				1186.62			
TOTAL TAL INORGANICS	141784.02				138940.88				188246.64				111263.42			

- NOTES
- 1 Data from amended and approved 1990 Impoundment Characterization Program Final Report (ICPFR) and August 1991 IEA Analytical Report
 - 2 "Max. Conc." indicates the maximum concentration of contaminants detected in all samples of sludge
 - 3 "Min. Conc." indicates the minimum concentration of contaminants detected in all samples of sludge
 - 4 "No. of Detects" indicates the number of samples in which the contaminant concentration exceeded 1 ppm
 - 5 "-" indicates a non detect

TABLE 2**SUMMARY OF TOTAL CONTAMINANT CONCENTRATIONS IN GROUP I IMPOUNDMENTS¹**

<u>Contaminants</u>	<u>Impoundment 11</u>	<u>Impoundment 13</u>	<u>Impoundment 19</u>	<u>Impoundment 24</u>
Total Organics	12,075	4,574	18,824	7,233
Potentially Carcinogenic Organics	176	245	4,770	573
Total Inorganics	141,794	138,941	198,247	111,253
Potentially Carcinogenic Inorganics	4,299	4,150	760	1,187
<u>Contaminant Ratios²</u>				
Inorganics:Organics	12:1	30:1	11:1	15:1
Noncarcinogens:Carcinogens	34:1	33:1	39:1	67:1

1. All concentrations reported in milligrams per kilogram (mg/kg) dry weight.
2. Contaminant ratios are calculated by dividing one contaminant group by another (e.g. for Impoundment 11: $141,794 \div 12,075 = 12:1$)

TABLE 3
LIST OF ARARs AND TBCs

Chemical-Specific ARARs

- a. RCRA Maximum Concentration Limits (MCLs)
- b. A-280 Regulations
- c. New Jersey Ground-Water Quality Standards
- d. Federal Water Pollution Control Act as amended by the Clean Water Act
- e. Clean Air Act, as amended
- f. New Jersey Air Pollution Control Regulations (NJAC 7:27)

Location-specific ARARs

- a. Floodplains Standards in 40 CFR 264.18
- b. Floodplain Management - Executive Order Number 11988
- c. Protection of Wetlands - Executive Order Number 11990
- d. Flood Hazard Area Control Regulations
- e. New Jersey Freshwater Wetlands Protection Act Rules in N.J.A.C. 7:7A
- f. Endangered Species Act in USC Sec. 1531
- g. Cultural Resource/Archaeological Resource Protection Requirements

Action-specific ARARs

- a. RCRA Hazardous Waste Facility Requirements (40 CFR 260-264)
- b. NJDEPE Hazardous Waste Regulations (NJAC 7:26)
- c. Land Disposal Restrictions (LDRs)
- d. Water Quality Permit Requirements
- e. Air Quality Permit Requirements
- f. New Jersey Soil Erosion and Sediment Control Act Requirements

TABLE 4
AMERICAN CYANAMID COMPANY
BOUND BROOK, NEW JERSEY

**PRELIMINARY COST ESTIMATE: SOLIDIFICATION AND CONSOLIDATION IN
ON-SITE RCRA FACILITY (IMPOUNDMENTS 11, 13, AND 19)***

<u>Description</u>	<u>Estimated Quantity</u>	<u>Unit</u>	<u>Unit Price Material and Labor</u>	<u>Estimated Amount</u>
Mobilization/Demobilization	70,500	cu. yd.	\$ 3	\$ 211,500
Excavation/Transportation	70,500	cu. yd.	25	1,762,500
Solidification Installation/Process ⁽¹⁾	70,500	cu. yd.	35	2,467,500
Consolidation in RCRA Facility ⁽²⁾	77,550	cu. yd.	15	1,163,250
Restoration ⁽³⁾	8.8	acres	37,000	325,600
Site Controls (Air Monitoring) ⁽⁴⁾	—	lump sum	20,000	<u>20,000</u>
			Subtotal	\$5,950,350
			Engineering, Legal, Adm (20%)	<u>1,190,070</u>
			Subtotal	\$7,140,420
			Contingencies (15%)	<u>1,071,063</u>
			TOTAL	\$8,211,483
			ROUNDED TO	\$8,200,000

Notes:

1. Assumes no dewatering required/no water to be added.
 2. Assumes 10 percent increase in solids due to bulking and addition of solidification materials.
 3. Assumes a six-inch cover of top soil at \$1.50 per cu. ft. and seeding at \$0.10 per sq. ft.
 4. These costs do not include air permits.
- * This cost estimate is considered an order of magnitude estimate with an accuracy of +50 percent to -30 percent.

TABLE 4 (CONTD)
AMERICAN CYANAMID COMPANY
BOUND BROOK, NEW JERSEY

PRELIMINARY COST ESTIMATE: BIOTREATMENT (SLURRY-PHASE)*
IMPOUNDMENTS 11, 13, AND 19

<u>Description</u>	<u>Estimated Quantity</u>	<u>Unit</u>	<u>Unit Price Material and Labor</u>	<u>Estimated Amount</u>
Excavation/Transportation Slurry-Phase Biotreatment with Solidification	70,500	cu. yd.	\$ 25	\$ 1,762,500
Analytical	70,500	cu. yd.	265	18,330,000
Consolidation in RCRA Facility ⁽¹⁾	79,000	cu. yd.	30	2,370,000
Restoration ⁽²⁾	87,000	cu. yd.	15	1,305,000
Site Controls (Air Monitoring) ⁽³⁾	8.8	acres	37,000	325,600
	--	lump sum	87,000	<u>87,000</u>
			Subtotal	\$24,180,100
			Engineering, Legal, Adm. (20%)	<u>4,836,020</u>
			Subtotal	\$29,016,120
			Contingencies (15%)	<u>4,352,418</u>
			TOTAL	\$33,368,538
			ROUNDED TO	\$33,400,000

1. Assumes a 10 percent increase in solids due to bulking and addition of solidification material.
 2. Assumes a six-inch cover of top soil at \$1.50 per cu. ft. and seeding at \$0.10 per sq. ft.
 3. Costs do not include air permits.
- * This cost estimate is considered an order of magnitude estimate with an accuracy of +50 percent to -30 percent.

TABLE 4 (CONTD)

AMERICAN CYANAMID COMPANY
BOUND BROOK, NEW JERSEY

PRELIMINARY COST ESTIMATE: SOLIDIFICATION AND CONSOLIDATION IN ON-SITE RCRA FACILITY (IMPOUNDMENT 24)*

<u>Description</u>	<u>Estimated Quantity</u>	<u>Unit</u>	<u>Unit Price Material and Labor</u>	<u>Estimated Amount</u>
Mobilization/Demobilization	37,500	cu. yd.	\$ 3	\$ 112,500
Excavation/Transportation	37,500	cu. yd.	25	937,500
Solidification Installation/Process ⁽¹⁾	37,500	cu. yd.	35	1,312,500
Consolidation in RCRA Facility ⁽²⁾	41,250	cu. yd.	15	618,750
Restoration ⁽³⁾	3.2	acres	37,000	118,400
Site Controls (Air Monitoring) ⁽⁴⁾	—	lump sum	12,000	<u>12,000</u>
			Subtotal	\$3,111,650
			Engineering, Legal, Adm (20%)	<u>622,330</u>
			Subtotal	\$3,733,980
			Contingencies (15%)	<u>560,097</u>
			TOTAL	\$4,294,077
			ROUNDED TO	\$4,300,000

Notes:

1. Assumes no dewatering required/no water to be added.
 2. Assumes 10 percent increase in solids due to bulking and addition of solidification material.
 3. Assumes a six-inch cover of top soil at 1.50 per cu. ft. and seeding at \$0.10 per sq. ft.
 4. These costs do not include air permits.
- * This cost estimate is considered an order of magnitude estimate with an accuracy of +50 percent to -30 percent.

TABLE 4 (CONTD)
AMERICAN CYANAMID COMPANY
BOUND BROOK, NEW JERSEY

PRELIMINARY COST ESTIMATE: MODERATE TEMPERATURE THERMAL TREATMENT*
(IMPOUNDMENTS 11, 13, AND 19)

<u>Description</u>	<u>Estimated Quantity</u>	<u>Unit</u>	<u>Unit Price Material and Labor</u>	<u>Estimated Amount</u>
Site Preparation	42,592	sq. yd.	\$ 2	\$ 85,184
Mobilization/Demobilization	—	lump sum	400,000	400,000
Material Handling	70,500	cu. yd.	25	1,762,500
Thermal Processing ⁽¹⁾	70,500	cu. yd.	250	17,625,000
Solidification of Residual Solids	48,600	cu. yd.	35	1,701,000
Analytical	48,600	cu. yd.	30	1,458,000
Consolidation in RCRA Facility ⁽²⁾	53,460	cu. yd.	15	801,900
Restoration ⁽³⁾	8.8	acres	37,000	325,600
Site Controls (Air Monitoring) ⁽⁴⁾	—	lump sum	65,000	<u>65,000</u>
			Subtotal	\$24,224,184
			Engineering, Legal, Adm (20%)	<u>4,844,837</u>
			Subtotal	\$29,069,021
			Contingencies (15%)	<u>4,360,353</u>
			TOTAL	\$33,429,374
			ROUNDED TO	\$33,400,000

Notes:

1. Prices obtained from Canonic Draft Thermal Treatment Evaluation and includes post treatment of the aq. phase.
2. Assumes 10 percent increase in solids due to bulking and addition of solidification material.
3. Assumes a six-inch cover of top soil at \$1.50 per cu. ft. and seeding at \$0.10 per sq. ft.
4. Costs do not include air permits.
- * This cost estimate is considered an order of magnitude estimate with an accuracy of +50 percent to -30 percent.

TABLE 4 (CONTD)
AMERICAN CYANAMID COMPANY
BOUND BROOK, NEW JERSEY

PRELIMINARY COST ESTIMATE: MODERATE TEMPERATURE THERMAL TREATMENT*
(IMPOUNDMENT 24)

<u>Description</u>	<u>Estimated Quantity</u>	<u>Unit</u>	<u>Unit Price Material and Labor</u>	<u>Estimated Amount</u>
Site Preparation	15,488	sq. yd.	\$ 2	\$ 30,976
Mobilization/Demobilization	---	lump sum	400,000	400,000
Material Handling	37,500	cu. yd.	25	937,500
Thermal Processing ⁽¹⁾	37,000	cu. yd.	250	9,375,000
Solidification of Residual Solids	27,000	cu. yd.	35	945,000
Analytical	27,000	cu. yd.	30	810,000
Consolidation in RCRA Facility ⁽²⁾	29,700	cu. yd.	15	45,500
Restoration ⁽³⁾	3.2	acres	3700	118,400
Site Controls (Air Monitoring) ⁽⁴⁾	—	lump sum	40,000	<u>40,000</u>
			Subtotal	\$13,102,376
			Engineering, Legal, Adm (20%)	<u>2,620,475</u>
			Subtotal	\$15,722,851
			Contingencies (15%)	<u>2,358,428</u>
			TOTAL	\$18,081,279
			ROUNDED TO	\$18,100,000

Notes:

1. Prices obtained from Canonic Draft Thermal Treatment Evaluation and includes post treatment of the aq. phase.
 2. Assumes 10 percent increase in solids due to bulking and addition of solidification material.
 3. Assumes a six-inch cover of top soil at \$1.50 per cu. ft. and seeding at \$0.10 per sq. ft.
 4. Costs do not include air permits.
- * This cost estimate is considered an order of magnitude estimate with an accuracy of +50 percent to -30 percent.

TABLE 4 (CONTD)
AMERICAN CYANAMID COMPANY
BOUND BROOK, NEW JERSEY

SUMMARY OF PRELIMINARY COST ESTIMATES FOR ALTERNATIVES*

<u>Alternatives</u>	<u>Impoundments</u>			<u>Total Costs</u>
	<u>11, 13, and 19</u>	<u>20</u>	<u>24</u>	
1. No Action	\$ 100,000	\$ 20,000	\$ 0	\$ 120,000
2. In-Place Containment	\$ 4,300,000	\$1,600,000	\$ 1,600,000	\$ 7,500,000
3. Solidification	\$ 8,200,000	\$1,100,000	\$ 4,300,000	\$13,600,000
4. Biological Treatment	\$33,400,000	—	—	\$33,400,000
5. Moderate Temperature Thermal Treatment	\$33,400,000	—	\$18,100,000	\$51,500,000

* This cost estimate is considered an order of magnitude estimate with an accuracy of +50 percent to -30 percent.