DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA750)
Migration of Contaminated Groundwater Under Control

Facility Name: **American Home Products Corporation (formerly American Cyanamid)**
Facility Address: **East Main Street, Bridgewater, New Jersey 08807**
Facility EPA ID#: **NJD002173276**

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EIs developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While final remedies remain the long-term objectives of the RCRA Corrective Action program, the EIs are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993 (GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated groundwater and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determination status codes should remain in the RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

Facility Information

The American Home Products Corporation (AHP) facility (formerly known as the American Cyanamid Bound Brook facility) encompasses approximately 575 acres in north central New Jersey. The facility is

located within the Bridgewater Township, Somerset County, and is bounded to the north by Route 28, to the south and west by the Raritan River and Foothill Road, and to the east by Interstate 287 and the Somerset Tire Service property. The surrounding area is predominantly farmland, with a significant amount of wetlands drained by intermittent low-flow streams. The area is sparsely populated, however residential homes and farmhouses can be found as close as 100 feet from the facility's property line. The facility borders the north bank of the Raritan River for nearly 1.5 miles, approximately 20 miles upstream of the river's discharge into the Atlantic Ocean.

Manufacturing operations began at the site in 1915 and continue to date. Numerous organic and inorganic chemicals and raw materials were used at the former American Cyanamid facility to produce thousands of chemical products, including dyes, pigments, elastomers (rubber-like products), pharmaceuticals, chemical intermediaries, and petroleum-based products. Only pharmaceuticals are currently being manufactured at the facility. In December 1994, AHP purchased the facility from American Cyanamid and assumed full responsibility for environmental remediation as required under an Administrative Consent Order (ACO) with the New Jersey Department of Environmental Protection (NJDEP). The facility is currently permitted under RCRA for waste consolidation and disposal operations at the recently constructed Impoundment 8 Facility.

Environmental investigation and remediation has been in progress at the site since 1981. NJDEP has determined that most of the historical operations, and associated contamination sources, were confined to the Main Plant Production Area and West Yard. This area is bounded by railroad tracks to the north and south, Cuckolds Brook to the west, and the facility property line to the east. NJDEP has also determined that the Hill Property (north of and physically separated from the Main Plant Area but still a part of the overall facility) has largely remained free of production operations, waste disposal, and unique contamination sources. Twenty-seven on-site impoundments have been identified throughout the Main Plant Area for storage of waste byproducts, general plant waste, and demolition debris. The impoundments were constructed in native materials and are generally unlined, although some are underlain by natural clay layers. Sixteen impoundments (Impoundments 1, 2, 3, 4, 5, 11, 13, 14, 15, 16, 17, 18, 19, 20, 24, and 26) are being addressed under CERCLA to eliminate potential contributions to observed groundwater contamination. Four impoundments (Impoundments 6, 7, 8, and 9A) are subject to closure and post-closure requirements under RCRA. The remaining seven impoundments were never used, contained only river silt from the facility's former river water treatment plant, contained only emergency fire water, or have already been closed with NJDEP approval.

A New Jersey Pollutant Discharge Elimination System-Discharge to Groundwater (NJPDES-DGW) permit was issued to the facility on September 30, 1987. Among other things, this permit requires groundwater monitoring on a quarterly basis, as well as continuous pumping from bedrock extraction wells at the main plant to contain groundwater contamination within the facility boundaries. In May 1988, the facility and NJDEP entered into an ACO requiring investigation and remedial action for the sixteen CERCLA impoundments, site-wide contaminated soil, and groundwater. Groundwater extraction and monitoring requirements were incorporated into an Amendment to the ACO in May 1994. In November 1988, USEPA issued a Hazardous and Solid Waste Amendments (HSWA) Permit to the facility. This permit, in conjunction with the NJPDES-DGW operating permit issued by NJDEP in 1988, serves as the facility's RCRA permit. Through coordination between USEPA and NJDEP, these permits and orders provide consistent direction to AHP for investigation, remediation, and closure of the RCRA and CERCLA impoundments, as well as the Impoundment 8 Facility.

Impoundment closure activities are currently in progress. CERCLA Records of Decision (RODs) have been signed for active remediation of each of the impoundment groups, and a separate ROD was signed in July 1996 for no action at the Hill Property (except groundwater monitoring). In the ROD for Impoundment Group III, Impoundment 8 was designated as a Corrective Action Management Unit. This designation allows for placement of residual waste from the Group III impoundments into the Impoundment 8 Facility after appropriate treatment (e.g., solidification). The RODs for Groups I and II impoundments also involve placement of waste in the Impoundment 8 Facility, and appropriate treatment standards for these wastes will need to be determined. The Impoundment 8 Facility remains operational to date.

The bedrock groundwater extraction system also remains operational, and recovered groundwater is used as non-contact cooling water on site before being discharged to the Somerset-Raritan Valley Sewerage Authority (SRVSA) wastewater facility for treatment. Site-wide groundwater monitoring is also ongoing, with approved data available through the second calendar quarter of 2000. Hydrogeological data show that extraction pumping has altered groundwater flow direction in both the overburden and bedrock aquifers, drawing a large majority of contaminated groundwater toward the center of the site. According to recent documentation, the current system is believed to contain virtually 100 percent of site-related contamination in the bedrock aquifer beneath the AHP site. The system is also believed to contain up to 90 percent of site-related contamination in overburden groundwater within the Main Plant Area. Overburden groundwater beneath the southernmost portions of the property does not appear to be influenced by the extraction well pumping system and, instead, flows toward the Raritan River. A limited number of river water and sediment samples were collected in the early 1990s, and the facility concluded that there were no significant site-related impacts to surface water quality. To confirm these findings, AHP has completed a supplemental surface water, sediment, and wetlands sampling effort in the Raritan River and Cuckolds Brook, but data generated from this study has not yet been evaluated by NJDEP or USEPA.

A groundwater Classification Exception Area (CEA) and Well Restriction Area (WRA) has also been established for the site. These restrictions are intended to limit groundwater use within the facility boundaries and to provide public notification that residual contamination in groundwater remains above applicable groundwater quality criteria (GWQC) for Class IIA aquifers. The CEA and WRA will remain in place until contaminant concentrations fall below relevant NJDEP groundwater standards in two consecutive monitoring quarters.

Final remediation of site-wide soil and groundwater impacts will be addressed separately upon completion of planned surface impoundment source removal actions.

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

   _X_ If yes - check here and continue with #2 below.

   ___ If no - re-evaluate existing data, or

   ___ If data are not available, skip to #8 and enter "IN" (more information needed) status code.

Summary of Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs): As stated previously, 27 surface impoundments have been identified at the AHP site. These SWMUs are listed in Table 1 below, and a SWMU map is provided as Attachment 1. Environmental activity at the AHP site is being conducted under both the RCRA and CERCLA programs. The following SWMU discussion is also separated out according to jurisdictional program. To further facilitate environmental action at AHP, the CERCLA surface impoundments have been separated into several groups according to waste type, nature of contaminants, and geographical location on the property. These groups are also noted in the discussion below.

Surface Impoundments Under RCRA Jurisdiction (SWMUs 6, 7, 8, and 9A): These four impoundments at the AHP site have been classified as RCRA RUs. RCRA closure and post-closure requirements for these SWMUs are being implemented in accordance with the May 1994 ACO. Closure of Impoundments 6, 7, and 8 is being accomplished using the Impoundment 8 Facility as an appropriate on-site waste disposal location. Cell 1 of the disposal facility was constructed in May 1991. This portion of the unit was designed with a triple liner and leachate detection and collection system. Between August 1991 and November 1994, sludge from Impoundment 7 and old Impoundment 8 was removed, dewatered, solidified, and consolidated in Cell 1. Construction of Cell 2 was completed in August 1996. This cell was designed with a double composite liner and leachate detection and collection system. Waste from Impoundment 6 has been solidified and consolidated in Cell 2. Additional cells are currently being constructed for management of additional remediation wastes. A closure certification report was submitted for Impoundment 6 on September 16, 1999, and was approved by NJDEP on January 27, 2000 (Ref. 11). Certification of closure documentation has also been submitted for Impoundments 7 and 8, but the record file does not appear to contain information on NJDEP approval for these closures (Refs. 4, 6). Impoundment 9A has been closed in place by installing a double synthetic liner capping system (Ref. 1, p. 3).

Surface Impoundments Under CERCLA Jurisdiction: As stated previously, the CERCLA surface impoundments have been separated into three groups for environmental investigation and remediation. Remedial actions have been selected for each of the CERCLA impoundments to eliminate migration of constituents into air, soil, groundwater, and surface water at the site. These impoundment groups and chosen remedies were discussed in detail in the Five-Year Review Report from September 1999 (Ref. 8), and are summarized in the following paragraphs.

Table 1 – Current SWMU Listing for the AHP Site
(Ref. 2, Pages 31 and 32)

Impoundment	Acreage	Contents / Usage	Group / Status
1	2.1	Coal Tar Still Bottoms	CERCLA Group III
2	1.7	Coal Tar Still Bottoms	CERCLA Group III
3	1.0	Organic Residuals, General Plant Debris, Soil	CERCLA Group III
4	1.7	Organic Residuals, General Plant Debris	CERCLA Group III
5	7.0	Organic Residuals, General Plant Debris, Soil	CERCLA Group III
6	4.0	Compositing Basin for Plant Effluent Sludge	RCRA Group
7	17.0	Settling Lagoon for Plant Effluent Sludge	RCRA Group
8	8.0	Primary Sludge Lagoon with Single Liner	RCRA Group
9	4.0	Never Used	No Action
9A	4.1	Plant Effluent Sludge	RCRA Group
10	3.6	Never Used	No Action
11	2.8	Powerhouse Fly Ash	CERCLA Group I
12	2.0	Never Used	No Action
13	3.9	Lime and Secondary Sludge	CERCLA Group I
14	0.8	Organic Residuals	CERCLA Group III
15	2.6	Iron Oxide	CERCLA Group II
16	2.8	Iron Oxide	CERCLA Group II
17	6.0	Plant Effluent Sludge	CERCLA Group II
18	15.2	Plant Effluent Sludge	CERCLA Group II
19	1.8	Lime, Plant Effluent Sludge	CERCLA Group I
20	0.9	Plant Effluent Sludge	CERCLA Group III
21	2.1	Emergency Fire Water from River	No Action
22	1.6	River Silt from Former River Water Treatment Plant (filled to grade with clean soil)	No Action
23	3.9	River Silt Dredged from Impoundments 21 and 22	No Action
24	3.0	Lime and General Plant Debris	CERCLA Group I

25	0.2	Effluent Collection Basin for Plant Effluent (sludge removed and closed in 1988 with NJDEP approval)	No Further Action
26	0.9	Organic Residuals	CERCLA Group III

Group I Impoundments (SWMUs 11, 13, 19, and 24): A ROD was signed for these four on-site surface impoundments on September 28, 1993. Major components of the selected remedy include:

- Excavation of waste from the impoundments
- On-site solidification of excavated material
- Consolidation (disposal) of the solidified material in the RCRA-permitted Impoundment 8 Facility
- Groundwater monitoring to assess potential influences from Impoundments 19 and 24 on Raritan River water quality.

These actions are intended to eliminate migration of constituents from the impoundments into air, soil, groundwater, and surface water at the site. To date, remedial activities have been completed at Impoundments 11 and 19. Solidified sludge from Impoundment 19 was placed in Cell 1, and solidified sludge from Impoundment 11 was placed in Cell 2 of the Impoundment 8 Facility. Work at Impoundments 13 and 24 will be initiated after remediation of the Group II and III impoundments.

Group II Impoundments (SWMUs 15, 16, 17, and 18): The ROD for these four surface impoundments was signed on July 12, 1996. Major components of the remedy included:

- Excavation of waste material from Impoundment 16 and consolidation (disposal) in Impoundment 15
- Placement of a synthetically lined cap over Impoundment 15
- Excavation/solidification of waste from Impoundment 17 and consolidation (disposal) at the Impoundment 8 Facility
- Construction of a security fence and berm improvements, and maintenance of natural vegetation at Impoundment 18
- Groundwater monitoring at Impoundments 15 and 18.

An Explanation of Significant Differences issued in November 1998 modified the remedy to include recycling of iron oxide material in both impoundments. Recycling began in Spring 2000, and is expected to continue for a period of 20 years. Closure activities at Impoundment 18 have also been completed. Remediation of Impoundment 17 is expected to begin in 2008, after completion of work at the higher priority Group III Impoundments. These actions are intended to eliminate migration of constituents from the impoundments into air, soil, groundwater, and surface water at the site.

Group III Impoundments (SWMUs 1, 2, 3, 4, 5, 14, 20, and 26): The ROD for these eight surface impoundments was signed on September 28, 1998. These SWMUs are the most

contaminated and complex at the site. The Group III remedy addresses five different types of waste material found in the subject impoundments. Major components of the remedy include:

- Low temperature thermal treatment of high-BTU tar material in Impoundments 1 and 2, as well as remaining tar material in Impoundment 3
- Biotreatment of low-BTU tar in Impoundments 4, 5, 14, and 20
- Consolidation (disposal) of treated material at the Impoundment 8 Facility
- Excavation of nonhazardous waste in Impoundments 5 and 26, followed by placement in the Impoundment 8 Facility
- Excavation of general plant debris from Impoundments 3, 4, 5, 14, and 20, followed by consolidation (disposal) in the Impoundment 8 Facility.

Remedial design and pilot study efforts are currently in progress for the Group III impoundments.

Surface Impoundments Requiring No Further Action (SWMUs 9, 10, 12, 21, 22, 23, and 25): As stated previously, these remaining seven impoundments at the AHP site will require no further action. NJDEP has determined that the impoundments were never used, contained only river silt from the facility's former river water treatment plant, contained only emergency fire water, or have already been closed with regulatory approval.

Previously Identified SWMUs: Environmental activities at the AHP site have focused on the surface impoundments noted above, but the facility's HSWA permit identified several additional SWMUs at the former Cyanamid facility. Although identified as SWMUs in the 1988 HSWA permit, these units do not appear in the subsequent 1994 ACO Amendment SWMU listing. Nevertheless, to provide a comprehensive picture of site conditions, these previously identified SWMUs are presented in Table 2. The record file contained only limited documentation on these SWMUs, and much of the information in Table 2 is based on handwritten notes from NJDEP. Nevertheless, this portion of the CA750 (and the SWMU map in Attachment 1) should be expanded with greater detail should updated or more complete information become available.

Table 2 – Previously Identified SWMUs at the AHP Site
(Ref. 1, Page III-5)

SWMU	Description	Status
28	Five Existing Underground Storage Tanks (N15T2, W16T10, W16T12, W16T13, and W16T4)	Removed and Closed in 1991-1992
29	Two Existing Container Storage Areas (Site 109.3)	Closed and certified in April 2000
30	Tank Trucks Storage Area	In Service
31	23 Former Hazardous Waste Storage Tanks	All Closed; Six Transferred to SRVSA

32	Secondary Sludge Incinerator	Transferred to SRVSA in January 1985; Closed in May 1985
33	Waste Piles from Sewer Cleaning	Removed
34	Three Former Container Storage Areas	Closed

References:

1. RCRA Hazardous Waste Permit, Module II, American Cyanamid Company, Bound Brook, New Jersey. Prepared by USEPA, pursuant to the Hazardous and Solid Waste Amendments (HSWA). Dated November 1988.
2. Impoundment Characterization Program Final Report, Bound Brook, New Jersey. Prepared by Blasland, Bouck & Lee. Dated January 1990 and Amended August 1990
3. Underground Storage Tank Closure Report for Tanks West of Building 102, American Cyanamid Company, Bound Brook, New Jersey. Prepared by Blasland, Bouck & Lee. Dated January 1992.
4. Letter from Joel Jerome, American Cyanamid, to Irene Kropp, NJDEP. Re: Lagoon 7 Dredge Plan. Dated May 22, 1992.
5. Administrative Consent Order Amendment issued to the American Cyanamid Company, Bound Brook, New Jersey. Prepared by NJDEP. Dated May 5, 1994.
6. Letter from Patricia McDonald, AHP, to Haiyesh Shah, NJDEP. Re: Lagoon 8 Closure Certification Report. Dated April 10, 1995.
7. Superfund Record of Decision for Group III Impoundments, American Cyanamid Site, American Home Products Corporation, Bridgewater Township, New Jersey. Prepared by NJDEP. Dated October 1998.
8. **Five-Year Review Report, American Cyanamid Superfund Site, Bridgewater Township, New Jersey. Prepared by USEPA Region 2. Dated September 1999.**
9. Superfund Site Update, American Cyanamid Site, Bridgewater Township, New Jersey. Prepared by NJDEP. Dated September 1999.
10. Letter from Jeff Catanarita, USEPA, to Haiyesh Shah, NJDEP. Re: USEPA's Comments on American Cyanamid Certification Report on the Lagoon No. 6 Closure Program. Dated October 28, 1999.
11. Letter from Haiyesh Shah, NJDEP, to Thomas Donohue, AHP. Re: American Cyanamid Site. Dated January 27, 2000.
12. Letter from Anthony Fontana, NJDEP, to Charles Neal, American Cyanamid Company. Re: Closure of Hazardous Waste Container Storage Site 109.3. Dated April 5, 2000.

2. Is **groundwater** known or reasonably suspected to be "**contaminated**"[1] above appropriately protective "levels" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

_X_ If yes - continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.

___ If no - skip to #8 and enter "YE" status code, after citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated."

___ If unknown - skip to #8 and enter "IN" status code.

Rationale:

Since initiation of monitoring activities in 1982, a number of organic and inorganic constituents have been detected in overburden and bedrock groundwater beneath the AHP site. The Baseline Site-Wide Endangerment Assessment from 1990 to 1992 and selected 38 chemicals of interest for groundwater beneath the site based on elevated concentrations and regulatory agency request (Ref. 2, pp. 3-10 and 3-11). Several of these constituents no longer present a concern for the AHP site because their concentrations have dropped below relevant screening criteria. Nevertheless, numerous constituents were found to exceed applicable GWQC in samples collected during the year 2000. These constituents included volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and inorganics. The maximum contaminant concentrations observed in October 2000 (Ref. 13) are indicated below with respect to overburden wells (Table 3), bedrock wells (Table 4), and wells associated with the Impoundment 8 Facility (Table 5). Applicable GWQC are also noted in each table for reference. Referenced monitoring well locations are shown on the site maps provided as Attachments 2 through 4.

Table 3 – Maximum Concentrations in Overburden Groundwater

Well	Location	Constituent	Concentration (µg/L)	GWQC (µg/L)
MW-2	Impoundments 3, 4, and 5	Benzene	1,480	1
TFP-94-1R	Downgradient of Lagoon 6/7	Chlorobenzene	2,390	4
38-R	Upgradient of Lagoon 6/7	Total Xylene	733	40
38-R	Upgradient of Lagoon 6/7	Chloroform	7.8	6
19-R	Impoundment 14 Area	2,4-Dimethylphenol	304	100

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate "levels" (appropriate for the protection of the groundwater resource and its beneficial uses).

38-R	Upgradient of Lagoon 6/7	N-Nitrosodiphenylamine	174	20
MW-2	Impoundments 3, 4, and 5	Bis(2-ethylhexyl)phthalate	37.5	30
TFP-94-1R	Downgradient of Lagoon 6/7	1,2-Dichlorobenzene	600	1,800
TFP-94-1R	Downgradient of Lagoon 6/7	1,4-Dichlorobenzene	75	236
38-R	Upgradient of Lagoon 6/7	1,2,4-Trichlorobenzene	99.1	9
TFP-94-1R	Downgradient of Lagoon 6/7	Arsenic	116	8
AAA	Group II Area	Aluminum	275	200
AAA	Group II Area	Iron	57,000	300
AAA	Group II Area	Manganese	11,800	50
CCC-R	Group II Area	Sodium	71,300	50,000

Table 4 – Maximum Concentrations in Bedrock Groundwater

Well	Location	Constituent	Concentration (µg/L)	GWQC (µg/L)
TT	Perimeter Bedrock	cis-1,2-dichloroethene	81.2	10
TT	Perimeter Bedrock	Tetrachloroethene	34.3	1
TT	Perimeter Bedrock	Trichloroethene	13.4	1
PW-2	Extraction Well	Benzene	1,620	1
PW-2	Extraction Well	Chlorobenzene	1,650	4
PW-3	Extraction Well	1,2,4-Trichlorobenzene	229	9
PW-3	Extraction Well	Nitrobenzene	47.4	10

Table 5 – Maximum Concentrations in Bedrock Groundwater at the Impoundment 8 Facility

Well	Location	Constituent	Concentration (µg/L)	GWQC (µg/L)
RCRA D-15	Upgradient of Site	1,1-Dichloroethene	6.2	2
RCRA D-15	Upgradient of Site	Trichloroethene	4.8	1
RCRA D-15	Upgradient of Site	Tetrachloroethene	25.1	1
RCRA D-15	Upgradient of Site	Carbon Tetrachloride	11.1	2
RCRA D-6	Upgradient of Site	Aluminum	964	200
RCRA D-9	Downgradient to SW	Iron	1,930	300
RCRA D-9	Downgradient to SW	Manganese	3,020	50
RCRA D-7	Downgradient to SW	Sodium	89,800	50,000

There is a strong correlation between compounds identified in various surface impoundments and chemicals used in past production activities (Ref. 2, p. 3-4), and local groundwater has been impacted by a similar list of compounds. Consequently, the on-site, largely unlined surface impoundments are considered probable sources for most of the observed contamination in groundwater. The Soils Remedial Investigation Report specifically indicates that, although specific sources cannot be identified, it is likely that both the on-site impoundments and the contaminated soils are contributing to contamination in the groundwater (Ref. 1, p. 5-79). Recent documentation, however, also suggests that elevated levels of certain contaminants (specifically, tetrachloroethene (PCE), trichloroethene (TCE), and arsenic beneath certain portions of the AHP property) are unrelated to site operations and waste management practices.

The PCE and TCE anomalies are discussed in a January 1998 letter to NJDEP (Ref. 5). Prior to March 1994, many site-related constituents (including benzene and chlorobenzene) were elevated in the Hill Property wells. When the extraction wells were relocated from the Hill Property to the Main Plant, the northward groundwater flow direction was reversed, contamination was drawn back southward toward the Main Plant Area, and observed contaminant concentrations in the Hill Property wells began to decline. The letter to NJDEP suggests that wells on the Hill Property (and one nearby off-site private well) monitor background groundwater quality conditions. Prior to March 1994, TCE in Hill Property groundwater ranged from non-detect to 8 µg/L. Historic concentrations of PCE at the off-site private well ranged from non-detect to 6 µg/L. The letter further suggests that, instead of being site-related, this contamination originates at an upgradient off-site source, and is being drawn onto the Hill Property from adjacent sites due to pumping at the Main Plant. Up to 18 known contaminated sites and other potential contamination sources are located within one mile of the AHP site, including several north of the Hill Property (Ref. 6, pp. 19 and 20). Other sites impacted by VOCs in this area include, but are not limited to, Phoenix Steel, Tube Manufacturing Company, North Franklin Township Wells, Dynamit Nobel-Harte, and Inmont Chemical (Ref. 3, Table 2). On February 18, 1998, the NJDEP Bureau of Federal Case Management requested that the NJDEP Bureau of Field Operations further investigation possible off-site upgradient sources of TCE and PCE groundwater contamination at the Hill Property (Ref. 7, p. 2).

In the Summer of 1997, AHP initiated investigation of a former aniline spill area on the eastern site boundary (as discussed in Ref. 4 and shown on Attachment 5). In the first three rounds of sampling, aniline and arsenic were reported above their respective GWQC. In a letter to the facility from December 1998 (Ref. 8), NJDEP concurred that observed arsenic contamination beneath this portion of the AHP site is not unlikely to be site-related. The letter suggests that elevated arsenic concentrations are migrating to the site from the Somerset Tire Services property (also shown on Attachment 5 and located immediately upgradient of the spill area). NJDEP has indicated that AHP will not be responsible for remediation of this area of arsenic contamination, but will be held responsible for continued monitoring and communication with the SRVSA regarding arsenic concentrations in influent groundwater (Ref. 8).

References:

1. Soils Remedial Investigation Report and Feasibility Study Work Plan (including the Hydrogeological Investigation Program Report as Attachment 3), American Cyanamid Company, Bound Brook, New Jersey. Prepared by Blasland, Bouck & Lee. Dated October 1990 and Amended May 1992.
2. Baseline Site-Wide Endangerment Assessment, American Cyanamid Company, Bound Brook, New Jersey. Prepared by Blasland, Bouck & Lee. Dated December 1990 and Amended March 1992.

3. **Relocation of Production (Extraction) Well Pump Test Report, American Cyanamid Company, Bound Brook, New Jersey. Prepared by Camp, Dresser & McKee Inc. Dated June 1992.**
4. Letter from Thomas Donohue, AHP, to Haiyesh Shah, NJDEP. Re: Historic Aniline Spill Area Assessment. Dated July 15, 1997.
5. Letter from Angelo Caracciolo, O'Brien & Gere Engineers, to Haiyesh Shah, NJDEP. Re: Hill Property Groundwater Quality Assessment. Dated January 7, 1998.
6. Revised Environmental Site Reconnaissance and Technical Document Report, Target Store Site, Bridgewater Township, New Jersey. Prepared by Paulus, Sokolowski & Sartor Consulting Engineers and Environmental Planners. Dated February 1998 and Revised March 1998.
7. Letter from Angelo Caracciolo, O'Brien & Gere Engineers, to Haiyesh Shah, NJDEP. Re: Response to NJDEP 2/18/98 Correspondence. Dated March 17, 1998.
8. Letter from Haiyesh Shah, NJDEP, to Patricia McDonald, AHP. Re: American Cyanamid Site. Dated December 16, 1998.
9. Letter from Angelo Caracciolo, O'Brien & Gere Engineers, to Haiyesh Shah, NJDEP. Re: Historic Aniline Spill Assessment. Dated January 26, 1999.
10. Quarterly Groundwater Monitoring Report for the Second Quarter 1999, AHP Corporation, Bound Brook, New Jersey. Prepared by O'Brien & Gere Engineers, Inc. Dated July 1999.
11. Quarterly Groundwater Monitoring Report for the Second Quarter 2000, AHP Corporation, Bound Brook, New Jersey. Prepared by O'Brien & Gere Engineers, Inc. Dated July 2000.
12. Quarterly Groundwater Monitoring Report for the Third Quarter 2000 (unapproved), AHP Corporation, Bound Brook, New Jersey. Prepared by O'Brien & Gere Engineers, Inc. Dated October 2000.
13. Quarterly Groundwater Monitoring Report for the Fourth Quarter 2000 (unapproved), AHP Corporation, Bound Brook, New Jersey. Prepared by O'Brien & Gere Engineers, Inc. Dated January 2001.

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"[2] as defined by the monitoring locations designated at the time of this determination)?

   _X_ If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[2].

   ____ If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"[2]) - skip to #8 and enter "NO" status code, after providing an explanation.

   ____ If unknown - skip to #8 and enter "IN" status code.

Rationale:

Local Geology

The stratigraphy of the site is relatively simple with a thin layer of unconsolidated sediments, ranging from 5 to 30 feet (thickest in the southern portion of the site and thinnest to the north), overlying sedimentary bedrock units. At the ground surface across most of the site is a layer of fill and disturbed soil consisting of sand, silt, gravel, demolition debris, and waste material in some areas. This layer is as thin as 1 foot to the north of the site and as thick as 18 feet in the southern portion of the site. In the Main Plant Area, there is a 2 to 4 foot thick layer of man-made fill and construction rubble. Alluvial deposits of silt and clay are generally found beneath the fill and disturbed soil layer, ranging from 1 to 4 feet in thickness, although this layer is generally absent in the Main Plant Area. Beneath this unit are alluvial deposits of sand and gravel, with varying amounts of silt. This unit typically ranges from 3 to 15 feet in thickness and is the location of the major overburden aquifer in the area. A silt and clay layer is occasionally present at the base of this unit, believed to be derived from erosion of a thin local layer of weathered shale. Residual shale fragments are also found locally. Where present, this clay and fractured shale layer acts as a low permeability boundary between the overburden aquifer and an underlying bedrock aquifer. Beneath these deposits lies a series of reddish-brown shale, siltstone, and fine-grained sandstone known as the Passaic Formation bedrock. The maximum estimated thickness of bedrock in the Passaic Formation reaches approximately four miles. Extensive jointing of the formation has been observed, with three predominant transmissive zones in the area of the AHP property. The bedrock surface exhibits little relief in the area, but a bedrock high is present in the western portion of the site. The bedrock surface under the Main Plant Area is eroded and forms a valley toward the Raritan River in the southeastern corner of the site.

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[2] "existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

Local Hydrology and Groundwater Flow

As indicated above, two aquifer systems have been identified beneath the AHP site: a shallow overburden aquifer and a deeper semi-confined bedrock aquifer. Each is discussed in detail below.

Overburden Aquifer Flow in Main Site Area

The overburden aquifer system is comprised of two water transmitting units: the man-made fill and the more significant underlying sand and gravel unit. Groundwater in the fill occurs approximately 6 to 18 inches below the ground surface. Groundwater in the overburden is first encountered between 5 and 15 feet below the ground surface across most of the site, and slightly deeper (up to 20 feet below grade in the area of Lagoons 6 and 7) (Ref. 17, Table 3-2). A downward vertical hydraulic gradient, averaging 0.034 feet per foot, has been observed from the overburden to the shallow bedrock in the multi-level bedrock wells (Ref. 16, p. 4). NJDEP and AHP have concluded that continuous pumping of the two extraction wells in the Main Plant Area contribute to the overall downward flow of groundwater in the northern portion of the site. South of a line paralleling the Lehigh-Reading Railroad tracks (formerly owned by the Port Reading Railroad), bedrock pumping does not appear to influence overburden groundwater (Ref. 20, p. 8), and flow is southeastward toward the Raritan River at an average horizontal hydraulic gradient 0.004 feet per foot (Ref. 16, p. 3). Tidal influences are not observed in the vicinity of the site (Ref. 1, p. 2-23).

Before the groundwater extraction wells were relocated to the Main Plant Area, overburden groundwater was being pulled downward and northward to the Hill Property extraction wells. At that time, the line dividing northward and southward groundwater flow in the overburden was located farther north beneath the Main Plant Area. A current groundwater flow map for the overburden aquifer across the entire site was not located in the record file for submission with this report, but would show overburden groundwater flow toward the on-site extraction wells, except in the southernmost portion of the site where overburden groundwater flows toward the Raritan River.

Bedrock Aquifer Flow in Main Site Area and at the Hill Property

Groundwater within the Passaic Formation is first encountered at depths ranging approximately from 20 to 65 feet below grade (Ref. 17, Table 3-3). Depth to bedrock groundwater in the extraction wells is approximately 65 feet. At the Hill Property, bedrock groundwater is encountered at approximately 38 feet below grade. Further north, the bedrock aquifer is first encountered in the MJ private well at about 28 feet below grade. Adjacent to the Raritan River, the bedrock aquifer is located at much shallower depths.

Groundwater in the Passaic Formation predominantly flows through joints and fractures in the bedrock. Two extensive zones of joints and fractures have been identified beneath the site, and have been designated as the highly and moderately transmissive zones on **Attachment 6**. These two transmissive zones are separated by zones of more competent (less permeable) bedrock. A third zone, the "SS transmissive zone," has been identified adjacent to the Raritan River and is also shown on **Attachment 6**. According to the Relocation of Production Well Groundwater Modeling Report from October 1992 (Ref.

4, p. 2-1), the SS transmissive zone is significantly deeper than, and does not appear to be hydraulically connected to, the highly and moderately transmissive zones. Permeability of the transmissive units average 10^{-4} feet per minute, while the low permeability zone ranges between 10^{-5} and 10^{-6} feet per minute (Ref. 2, pp. 2-34 and 2-35).

Site-related groundwater contamination has been observed in wells advanced into the highly and moderately transmissive zones beneath the Main Plant Area. The two on-site extraction wells, for example, intersect these zones and contain the highest current levels of site-related contaminants, as shown in Table 4 above. The SS transmissive zone, on the other hand, does not appear to have been impacted by site activities. Deep monitoring wells IIII and JJJJ, installed to evaluate water quality in this zone, generally indicate no significant contamination. This finding supports the conclusion that, despite their proximity beneath the AHP site, the two highly and moderately transmissive zones appear to be hydrogeologically isolated from the SS transmissive zone.

For the past 60 years, groundwater in the Passaic Formation (bedrock) has been withdrawn in the AHP site area for use as non-contact cooling water in production operations. Long term pumping within the bedrock aquifer has pulled contamination originally present in the overburden aquifer deeper, until the bedrock aquifer was also appreciably impacted. The extraction wells were formerly located at the Hill Property, and pumping from this area caused an overall northward flow of contaminated groundwater away from the Main Plant Area, as shown on **Attachment 7**. In the early 1990s, NJDEP and AHP determined that, to prevent flow of contaminants into as yet unimpacted areas beneath the Hill Property (and potentially off site), the bedrock groundwater extraction wells should be relocated to the Main Plant Area. These replacement extraction wells went into service on March 23, 1994, and still continue to withdraw an average of 650,000 gallons of water per day.

Since 1994, bedrock groundwater flow in the northern half of the site has been moving inward from the site perimeter toward the two extraction wells, as indicated by the groundwater contour map presented in **Attachment 8**. Groundwater flow between the Main Plant Area and the Hill Property has been reversed and now moves south-southwestward toward the new extraction wells (Ref. 5, pp. 4-20). Pump tests have shown significant hydraulic connection between these two zones and Main Plant extraction wells PW-2 and PW-3 (Ref. 20, p. 8). The zone of influence created by extraction well pumping encompasses the Main Plant portion of the site and is elongated to the east and west based on the presence and orientation of the highly and moderately transmissive zones. Areas of bedrock groundwater that are influenced by pumping activities exhibit obvious downward vertical flow gradients, ranging from 0.094 to 0.01 feet per foot (Ref. 20, p. 9 and Ref. 2, p. 2-36). According to several studies performed at the AHP site, and approved by NJDEP, the current groundwater pumping system maintains hydraulic control over the majority of impacted bedrock groundwater and ninety percent of impacted overburden groundwater (Ref. 10, p.1, and Ref. 15, p. 1).

Bedrock Aquifer Flow South of the Railroad Tracks

Groundwater south of the railroad tracks in the southeastern corner of the site, where the SS transmissive zone has been identified, is not affected by extraction well pumping from wells PW-2 and PW-3, nor was it influenced by pumping at the Hill Property (Ref. 5, p. 5-1). Groundwater in this area flows to the Raritan River, a regional groundwater discharge zone. Areas indicative of discharge to the river are generally characterized by a natural upward hydraulic gradient (Ref. 20, p. 9). As stated previously, the

overall lack of contamination in deep monitoring points IIII and JJJJ supports the assessment that the bedrock aquifer south of the railroad tracks (in the SS transmissive zone) is hydrogeologically isolated from site-related contaminant sources currently impacting the highly and moderately transmissive zones beneath the Main Plant Area (Ref. 20, pp. 9 and 10).

Overburden Aquifer Control and Bedrock Aquifer Flow at the Impoundment 8 Facility

Hydrogeological characteristics beneath the Impoundment 8 Facility differ significantly from the overburden and bedrock aquifer descriptions presented above.

A groundwater interceptor trench and cut-off wall system has been constructed as part of the unit to control overburden groundwater flow in the immediate area. The effectiveness of this system is evidenced by the fact that overburden wells hydraulically downgradient of the system are consistently dry or nearly dry (Ref. 20, p. 23).

Rather than moving toward the Main Plant extraction wells, bedrock groundwater beneath the Impoundment 8 Facility flows southwest toward the Raritan River under natural conditions. However, a divergent flow pattern is observed in the immediate area when bedrock groundwater is pumped from a well located approximately 300 feet northeast of the Impoundment 8 Facility at the Phillips Concrete Incorporated site (formerly the Mensing Cement Company site). The influence of this extraction well causes a reversal of bedrock groundwater flow under the northern portion of the Impoundment 8 Facility toward the northeast (Ref. 20, pp. 10 and 36). Although this divergent flow pattern is not seen during every monitoring round, a dual set of downgradient wells is currently used to monitor for any leakage from the Impoundment 8 Facility under both flow patterns. The potential for dynamic influence and divergent flow is expected to remain until the Phillips/Mensing well is permanently shut down.

Groundwater Classification Exception Area

In addition to active pumping of contaminated groundwater, the facility has established a CEA and WRA for groundwater in the site area (Ref. 19). The CEA and WRA specifically address Passaic (bedrock) groundwater to a depth of 80 feet beneath the Main Plant and West Yard areas and the Hill Property, as shown in Attachment 9. Contaminants subject to the CEA are noted in Table 6 below.

Table 6 – Constituents Subject to the 1996 CEA and WRA

Contaminant	Concentration in 1996	GWQC
1,2,4-Trichlorobenzene	83.9 ppb	9.0 ppb
PCE	10.2 ppb	1.0 ppb

The restrictions were established in July 1996 and will remain in effect until residual groundwater contamination has been sufficiently recovered by pumping at the Main Plant and/or naturally degrades to concentrations below applicable standards, projected to extend through a period of seven years. Because groundwater is now being recovered in the primary contaminant source areas, the rate of contaminant reduction may be accelerated, and there is the possibility that the CEA duration may be shortened in the future (Ref. 14, pp. 22 and 23).

It should be noted that contaminants other than those identified in the table above have been identified in groundwater beneath the AHP site, including chlorobenzene, benzene, and arsenic. Because they have not been formally included in the CEA and WRA, it is possible that current restrictions may be lifted prior to complete remediation of groundwater to protective concentrations (e.g., applicable GWQC).

A well survey conducted in November 1989 searched for an inventory of wells within two miles of the site. A number of wells were identified, most for domestic use with relatively low yields. Industrial wells and a locally owned public water supply well field were also identified. Although the report notes that many of the wells were installed in the 1950s and 1960s and may no longer be in use, data on actual usage status of private wells in the AHP site area were not collected at that time. However, in completing pump tests for the relocation of the on-site extraction wells, AHP determined that many of the wells were hydraulically isolated from contaminants at the site (Ref. 3, pp. 4-2 and 4-4). Furthermore, according to an internal NJDEP letter dated September 22, 1994, the only two domestic wells in the vicinity of the site were being monitored in 1994, with no detected groundwater contamination (Ref. 6). The letter also noted that the local community is being served by a public water supply which withdraws water from the Raritan River upstream of the AHP site. The well survey and 1992 pump tests also indicated that most of the industrial and local government wells maintained pumping rates considered negligible as far as impacting groundwater flow and containment at the facility. The one known exception to this latter finding is the Mensing well which has obvious impacts on flow beneath the Impoundment 8 Facility when in operation. Regardless, no private wells have been identified within the CEA boundaries and, therefore, well withdrawal of impacted groundwater is under control.

Continuing Contaminant Migration

Groundwater issues at the AHP site are fairly complex due to the presence of multiple contamination source areas; the observed interaction between the overburden and bedrock aquifers; the presence of high, moderate, and low transmissive zones in the bedrock; ongoing pumping from the Main Plant extraction wells and at nearby off-site locations; the groundwater interceptor trench and cut-off wall around the Impoundment 8 Facility; and interaction with local surface water bodies. As a result, a number of issues need to be addressed in evaluating whether contaminant migration has been stabilized within the CEA at the AHP site; these issues are discussed in detail below.

<u>Overburden Aquifer Trends</u>

Contaminant concentrations in the overburden aquifer are monitored semi-annually at several locations across the site, including the areas occupied by:

- Impoundments 3, 4, and 5
- Impoundment 14
- Impoundments 15, 16, 17, and 18
- Lagoons 6 and 7, and Impoundments 19 and 24.

Each area is addressed by a specific well grouping and is discussed separately in groundwater monitoring reports for the site.

A review of groundwater monitoring data from the past four years (1996 to 2000) show that, while a number of constituents remain above GWQC, overall overburden groundwater contamination appears to be stable and/or decreasing. Nevertheless, a few exceptions have been noted in these trends and have yet to be satisfactorily explained by the facility. As indicated in an NJDEP letter dated September 21, 2000 (Ref. 21), questionable trends and all consistent GWQC exceedences should be monitored to identify any changes in the nature or extent of contamination, to determine if additional source investigation or remediation efforts should be undertaken, and to evaluate potential impacts to local surface water bodies. Overburden groundwater around Impoundment 3, 4, and 5 has been impacted by a variety of organic and inorganic constituents including benzene, chlorobenzene, and arsenic. Contaminant concentrations in this area appear to be stabilizing with a general downward trend. For example, between the second quarter of 1996 and the fourth quarter of 2000, benzene concentrations in well 28R have dropped from 4,210 to 1.2 µg/L, the lowest concentration of this constituent ever observed in the well. Similarly, the concentration of chlorobenzene in well MW-2 has dropped from 295 to 90.5 µg/L in the past four years. Several organic constituents such as toluene, once detected in the Impoundment 3, 4, and 5 wells, have now dropped below the relevant GWQC. Furthermore, while concentrations of some constituents (i.e., arsenic and n-nitrosodiphenylamine) have shown recent increases, the monitoring report indicates that these concentrations remain within the range of historic fluctuations. One new concern for groundwater in this area related to the detection of bis(2-ethylhexyl)phthalate (BEHP) at 37.5 µg/L in well MW-2 for the first time above the GWQC of 30 µg/L during the fourth quarter of 2000; this anomaly will be further evaluated during subsequent groundwater sampling events.

In the area of Impoundment 14, overburden groundwater has been impacted by VOCs and SVOCs, but overall downward concentration trends are evident. Levels of benzene and chlorobenzene in well 21-R have dropped very close to or below their GWQC from levels of 16 and 23 µg/L, respectively, in 1996. The concentration of 2,4-dimethylphenol in well 19-R increased from 491 µg/L in 1996 to 1,010 µg/L in the second quarter of 2000, but decreased again to a concentration of 304 µg/L by the fourth quarter of 2000.

Beneath the Group II Impoundments, overburden groundwater has been impacted by benzene, chlorobenzene, arsenic, and other inorganics. Trends observed in this area show consistent decreases in VOC contamination and stable metals levels. By the second quarter of 2000, benzene concentrations in all wells monitoring this area dropped below the GWQC of 1 µg/L. Inorganic contaminant levels have not changed significantly over the past four years. The fourth quarter 2000 monitoring report indicates that, although arsenic concentrations at wells AAA and 16MW-2 have shown slight increases since the second quarter of 2000, the increases appear to reflect normal fluctuations in the wells (Ref. 23, p. 17).

In the area of Lagoons 6 and 7 and Impoundments 19 and 24, overburden groundwater has been impacted by VOCs, SVOCs, and arsenic. Volatile organic concentrations have dropped below GWQC in many of the wells monitoring this area, but problematic findings remain. Concentrations of chlorobenzene in upgradient monitoring well 32-R have been increasing since the fourth quarter of 1998; the detection of 50.3 µg/L detected during the fourth quarter of 2000 is the highest concentration to date. Concentrations of 1,2,4-trichlorobenzene and n-nitrosodiphenylamine reported at well 38-R during the fourth quarter of 2000 are also the highest detected to date in that well (99.1 and 174 µg/L, respectively) and well above the applicable GWQC of 9 and 20 µg/L, respectively. Furthermore, there has been a slight upward trend in n-nitrosodiphenylamine concentrations in well TFP-94-1R since the fourth quarter of 1999. If these concentrations continue to rise, and adequate explanations cannot be provided, additional source

investigation may be necessary, and this EI determination may need to be revisited. Impacts in this area are of particular concern since overburden groundwater here discharges directly to the Raritan River; for this reason, contaminant concentration trends should be closely monitored.

Other overburden wells in the area of Lagoons 6 and 7 and Impoundments 19 and 24 indicate stable or decreasing concentration trends. VOCs in well 42-R have fluctuated within a fairly stable range since 1996, although benzene and chlorobenzene concentrations hovered around the upper end of that range at 137 and 1160 µg/L, respectively, as recently as the second quarter of 2000. VOC concentrations in well 38-R appear to be decreasing again, after significant increases between the second quarter of 1999 and the first quarter of 2000. Finally, arsenic concentrations in wells 42-R and 34-R appear to have stabilized around 20 µg/L; although this contamination does not appear to be increasing, the reported concentrations still remain above the GWQC of 8 µg/L. The recent detection of arsenic at 116 µg/L in well TFP-94-1R also continues a stabilizing trend in the area groundwater.

Recent data show mostly stable and downward concentration trends in overburden groundwater, but the most recent data from October 2000 highlight several remaining issues of concern. These concerns specifically relate to detections of:

- BEHP at 37.5 µg/L in MW-2, above its GWQC of 30 µg/L for the first time in this area
- Chlorobenzene in well 32-R at its highest concentration to date (50.3 µg/L)
- 1,2,4-trichlorobenzene in well 38-R at its highest concentration to date (99.1 µg/L)
- N-nitrosodiphenylamine in well 38-R at its highest concentration to date (174 µg/L)

Some of these concentration increases fall within the same order of magnitude as earlier observations and may reflect stable variations rather than significantly upward concentration trends, but this possibility must be evaluated further before the overburden groundwater impacts can be considered stable across the site. Additional monitoring should be completed as planned to continue monitoring of these four most significant concerns. It should also be noted that contamination in overburden groundwater may increase during planned periods of remediation for impoundments and site-wide soil, and expanded evaluation of groundwater conditions may be necessary at that time.

Bedrock Aquifer Trends

Water quality in the bedrock aquifer is being monitored around the site perimeter, at the Main Plant extraction wells, at the Hill Property, and in other off-site areas.

Around the site perimeter, groundwater samples from the bedrock wells exhibit evidence of contamination from the AHP site and from nearby properties. During the second quarter of 1996, benzene and chlorobenzene -- two site-related contaminants -- exceeded their respective GWQC of 1 and 4, respectively, in bedrock well SS. Quarterly monitoring reports from 1999 and 2000 (second quarters) show that these constituents have dropped to concentrations below the screening criteria in bedrock groundwater around the perimeter. Arsenic, previously detected in the bedrock perimeter wells, had also dropped to the GWQC of 8 µg/L by the second quarter of 1999 and has not been detected above the GWQC since the second quarter of 2000.

In addition to the site-related impacts discussed above, several VOCs are believed to be migrating from known contaminated sites in the surrounding area as a result of ongoing groundwater pumping. TCE and PCE have been reported in bedrock perimeter wells TT, WW, and YY over the past several years. The highest contaminant concentrations coming from off site are reported in well TT. VOC concentrations in this well began an upward trend in July 1998, reaching a maximum in the first quarter of 1999. In the third quarter of 2000, TCE was found at 14.3 µg/L, PCE at 32.3 µg/L (a significant jump upward from the previous quarters), and cis-1,2-dichloroethene at 67.6 µg/L. In the fourth quarter of 2000, TCE was found at 13.4 µg/L, PCE at 34.3 µg/L, and cis-1,2-dichloroethene at 81.2 µg/L. Although the presence of these contaminants in bedrock groundwater beneath the site is undesirable, it is indicative of the large zone of influence on the aquifer from groundwater extraction at the Main Plant. Furthermore, the perimeter well data indicate that migration of site-related contamination in the bedrock aquifer is limited to the existing area of contamination. At some point in the future however, it may necessary to reduce the pumping rate to minimize migration of contaminants to the site from the surrounding area. According to the 1994 ACO Amendment, AHP can propose a reduction in the minimum pumping rate requirement as long as available data demonstrate that the reduced rate will still maintain control over impacted groundwater.

Groundwater samples from the two Main Plant extraction wells exhibit consistently high VOC and SVOC concentrations, as would be expected in this area. Contaminants reported between 1996 and 2000 have primarily been limited to benzene, chlorobenzene, nitrobenzene, and 1,2,4-trichlorobenzene. Contaminant concentrations in both wells have largely remained stable, exhibiting normal fluctuations, or have begun to decline. Between the second quarter of 1996 and the second quarter of 2000, benzene in well PW-2 dropped from 3,070 to 1,290 µg/L. During the same period of time, the chlorobenzene concentration in well PW-2 dropped from 2,530 to 1,300 µg/L. The level of 1,2,4-trichlorobenzene grew from 226 to 476 µg/L in well PW-2 between the second and third quarters of 2000, but declined again during the fourth quarter of 2000. Despite these stabilizing trends, concentrations of n-nitrosodiphenylamine appear to be on the rise. Between 1996 and the fourth quarter of 2000, this constituent rose from 13 to 43.7 µg/L in well PW-2. Over the same period of time, the concentration in well PW-3 rose from 10 to 47.4 µg/L. These results should continue to be evaluated to determine why the concentrations are increasing; additional source investigation may be necessary if an adequate explanation cannot be provided.

When compared to lower levels of site-related contamination in perimeter bedrock wells, it is clear that impacted groundwater still remains in the Passaic Formation beneath the main portion of the AHP site. In the absence of major off-site pumping influences, continued groundwater extraction from the Main Plant Area should be able to maintain control of contaminant migration in the AHP area. Once the impoundment source areas have been remediated, barring the existence of any as-yet-unidentified sources, the size of the existing groundwater impact area should begin to shrink, and concentrations in the Main Plant extraction wells themselves should begin to fall.

Only one Hill Property well remains in use today, but contaminant concentrations in bedrock groundwater from this area have been monitored for many years. Wells PW-16, PW-17, and PW-18 had been used to pump production water from the bedrock aquifer in this area, but pumping was discontinued when it was determined that site-related contamination was being drawn northward into as-yet-unimpacted areas. Just before pumping was transferred to the Main Plant Area in March 1994, groundwater samples from the Hill Property wells exhibited concentrations in excess of applicable GWQC for a number of constituents, all but one of which have since fallen below the screening levels, as shown in Table 7 below.

Table 7 – Hill Property Well PW-16 Contaminant Concentrations in Excess of GWQC Since Relocation of Extraction Wells to the Main Plant Area

Contaminant	GWQC	1Qtr94	2Qtr94	3Qtr94	4Qtr94	2Qtr95	3Qtr95
Benzene	1	2,100	31	ND	ND	ND	ND
PCE	1	100	15	9	21	19	21
Chlorobenzene	4	1,800	48	below GWQC	ND	ND	ND
1,2,4-Trichlorobenzene	9	97	ND	2	ND	ND	ND
Manganese	50	1,520	410	181	59.2	55.5	59.4

Contaminant	GWQC	4Qtr95	1Qtr96	2Qtr96	2Qtr99	2Qtr00	4Qtr00
Benzene	1	ND	ND	ND	ND	ND	ND
PCE	1	16	**10.2**	7	13.4	17.7	11.7
Chlorobenzene	4	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	9	ND	**83.9**	ND	NA	NA	NA
Manganese	50	56.4	below GWQC	below GWQC	NA	NA	NA

ND – not detected; NA – not analyzed. Bolded results were used to establish the current CEA/WRA for the AHP site.

Based on these data, it is clear that, with the exception of PCE, pumping at the Main Plant has had a significant effort on decreasing contaminant concentrations in bedrock groundwater on the Hill Property. Benzene and chlorobenzene, found in the Hill Property well prior to 1994, have declined below applicable GWQC in this area but remain significantly elevated in the current hydraulic control wells (PW-2 and PW-3), supporting the contention that groundwater contamination is now flowing back toward the Main Plant Area. Also formerly detected in this area were SVOCs and metals, including 1,2,4-trichlorobenzene, one of the constituents upon which the CEA and WRA were established in 1996. SVOC and metals analyses for well PW-16 were discontinued after the fourth quarter of 1998 because several consecutive rounds of sampling indicated no such contamination. Table 7 shows that this constituent is no longer of concern in the Hill Property bedrock groundwater.

To further evaluate lingering concentrations of PCE in well PW-16, samples have been also been collected from a private bedrock aquifer well northeast of the site (well MJ). The concentration of PCE at the MJ well ranged from non-detect to 6 µg/L in the mid-1990s, similar to concentrations observed prior to 1994 (Ref. 12, p. 3). During the second quarter of 1996, the PCE concentration in this well was 4 µg/L. The consistent presence of PCE in this well under northward and southerly groundwater flow directions is indicative of an off-site contamination source. While NJDEP gives enough credence to this suggestion to investigate possible upgradient contaminant sources, NJDEP also clarifies that the CEA and

WRA will remain in place at the site until applicable GWQC have been met, regardless of the source of the contamination (Ref. 13, p. 2).

Unless TCE and PCE contamination observed in bedrock groundwater is shown to be site-related (rather than due to off-site sources in the area), and with the exception of n-nitrosodiphenylamine in the extraction wells, it appears that contamination in the bedrock aquifer has been stabilized within the existing impact area, with concentrations remaining steady and declining.

Groundwater Trends Beneath the Impoundment 8 Facility

Groundwater beneath the Impoundment 8 Facility is being monitored to gauge the effectiveness of the overburden groundwater interceptor trench and cut-off wall, and to monitor the shallow bedrock groundwater for potential releases from the site. As stated in the approved groundwater monitoring report from the second quarter of 2000 (Ref. 20, pp. 23 and 24), the consistent lack of groundwater in overburden wells hydraulically downgradient of the interceptor trench and cut-off wall shows that the system is effectively controlling overburden groundwater in this location.

With regard to water quality in the bedrock aquifer, the most significant VOC contamination reported was found in well RCRA D-15, located upgradient of both closed Lagoon 9A and the Impoundment 8 Facility, and close to the western property boundary. Groundwater samples from this well continue to show very consistent concentrations of 1,1-dichloroethene, carbon tetrachloride, TCE, and PCE, each in excess of the GWQC.

None of the on-site downgradient wells indicate similar organic contamination. Samples collected in 1994 from the nearby Phillips/Mensing well reported some organic contamination, but the specific constituents reported did not overlap. The Mensing well samples contained benzene at its GWQC of 1 µg/L (Ref. 7, p. 2), as well as chlorobenzene and 1,2-dichloroethane below the GWQC. By 1995, all three constituents in the Mensing well had dropped below their respective GWQC (Ref. 8, p. 2). More recent water quality data from this well was not found in the record file for use in determining if this downward trend has continued.

Manganese and other metals have also been reported in both upgradient and downgradient wells above the GWQC in the area of the Impoundment 8 facility. Data from the second quarter of 2000 indicated increased aluminum, iron, and manganese concentrations in wells RCRA D-1 and D-6, and chromium was reported in well RCRA D-6 for the first time since 1996. AHP suggested that these increases were due to elevated turbidity in the sample, even though the total dissolved solids concentrations appear to have remained fairly consistent with previous results (Ref. 20, pp. 27 and 28). Nevertheless, these concentrations had returned to lower or non-detected levels by the fourth quarter of 2000.

Recent sampling shows that at least one bedrock well in each downgradient direction (southwest and northeast based on the divergent flow scenario) has not yet been impacted. RCRA wells D-3, D-4, and D-11 will continue to be monitored to detect contaminant migration extending beyond the currently impacted area. The only remaining concern with regard to bedrock groundwater in this area focuses on inorganic contamination observed in the wells directly south of Cells 1 and 2, and specifically RCRA well D-9. Aluminum, iron, and manganese concentrations in this well increased significantly between the second and fourth quarters of 1999, and have continue to fluctuate since. These constituents should

continue to be closely monitored to ensure that any statistically significant increases are promptly identified. Furthermore, AHP should consider installation of additional bedrock wells between the Impoundment 8 Facility and the Raritan River to the east to ensure that groundwater contamination in this area is adequately monitored and controlled. There are no bedrock wells located further downgradient in the Impoundment 8 Facility area than RCRA wells D-7, D-8, and D-9, and consequently, no current way to monitor the full downgradient extent of contamination in this direction.

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2. **Baseline Site-Wide Endangerment Assessment, American Cyanamid Company, Bound Brook, New Jersey. Prepared by Blasland, Bouck & Lee. Dated December 1990 and Amended March 1992.**
3. Relocation of Production (Extraction) Well Pump Test Report, American Cyanamid Company, Bound Brook, New Jersey. Prepared by Camp, Dresser & McKee Inc. Dated June 1992.
4. Relocation of Production Well Groundwater Modeling Report American Cyanamid Company, Bound Brook, New Jersey. Prepared by Camp, Dresser & McKee Inc. Dated October 1992.
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7. Fax from Chris Poulson, Bridgewater Health Department, to Haiyesh Shah, NJDEP. Re: VOC Scan from Mensing Well. Dated October 19, 1994.
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10. Letter from Haiyesh Shah, NJDEP, to Patricia McDonald, AHP. Re: AHP/American Cyanamid Site. Dated July 15, 1996.
11. Site-Wide Groundwater Monitoring Report for the Second Quarter 1996, American Cyanamid Company, Bound Brook, New Jersey. Prepared by O'Brien & Gere Engineers, Inc. Dated July 1996.
12. Letter from Angelo Caracciolo, O'Brien & Gere Engineers, Inc., to Haiyesh Shah, NJDEP. Re: Hill Property Groundwater Quality Assessment. Dated January 7, 1998.
13. Letter from Haiyesh Shah, NJDEP, to Patricia McDonald, AHP. Re: American Cyanamid/AHP Site. Dated February 18, 1998.
14. Revised Environmental Site Reconnaissance and Technical Document Report, Target Store Site, Bridgewater Township, New Jersey. Prepared by Paulus, Sokolowski & Sartor Consulting Engineers and Environmental Planners. Dated February 1998 and Revised March 1998.
15. Letter from Steven Roland, O'Brien & Gere Engineers, Inc., to Anthony Matarazzo, Elizabethtown Water Company. Re: Raritan River Assessment. Dated May 22, 1998.
16. Letter from Angelo Caracciolo, O'Brien & Gere Engineers, to Haiyesh Shah, NJDEP. Re: Historic Aniline Spill Assessment. Dated January 26, 1999.

17. Quarterly Groundwater Monitoring Report for the Second Quarter 1999, AHP Corporation, Bound Brook, New Jersey. Prepared by O'Brien & Gere Engineers, Inc. Dated July 1999.
18. Superfund Site Update for the American Cyanamid Site, AHP, Bridgewater Township, New Jersey. Prepared by NJDEP. Dated September 1999.
19. Case Information Report on the CEA and WRA, AHP, Bound Brook, New Jersey. Prepared by NJDEP. Dated June 8, 2000.
20. Quarterly Groundwater Monitoring Report for the Second Quarter 2000, AHP Corporation, Bound Brook, New Jersey. Prepared by O'Brien & Gere Engineers, Inc. Dated July 2000.
21. Letter from Haiyesh Shah, NJDEP, to Thomas Donohue, AHP. Re: American Cyanamid Site and AHP. Dated September 21, 2000.
22. Quarterly Groundwater Monitoring Report for the Third Quarter 2000 (unapproved), AHP Corporation, Bound Brook, New Jersey. Prepared by O'Brien & Gere Engineers, Inc. Dated October 2000.
23. Quarterly Groundwater Monitoring Report for the Fourth Quarter 2000 (unapproved), AHP Corporation, Bound Brook, New Jersey. Prepared by O'Brien & Gere Engineers, Inc. Dated January 2001.

4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

_X_ If yes - continue after identifying potentially affected surface water bodies.

____ If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination"does not enter surface water bodies.

____ If unknown - skip to #8 and enter "IN" status code.

Rationale:

Surface water bodies in the vicinity of the AHP site include the Raritan River and its tributary, Cuckolds Brook. The Raritan River flows along the southern and western property boundaries, and Cuckolds Brook traverses the site on its way to the Raritan River. Cuckolds Brook discharges to the river in the vicinity of the Calco dispersion dam, and the outfall is maintained several feet above the static river water level. Both water bodies are classified as FW2-NT (Ref. 6, p. 20). Secondary effluent from the SRVSA enters the Brook immediately west of Impoundments 4 and 26. The course of Cuckolds Brook has been modified at least twice in the site's history to accommodate the needs of expanding manufacturing operations (Ref. 2, p. 2-31).

Raritan River Interaction

Several studies on the interaction between site groundwater and local surface water, and subsequent surface water quality, have been performed, but significant uncertainties remain. One effort, performed in 1983, was required to fulfill the obligations of a 1981 ACO with NJDEP. In November 1993, the American Cyanamid Company produced a Hydrogeologic Investigation Report, in part addressing this issue. Based on groundwater and river elevation data, the 1993 report concluded that the Raritan River is an influent stream adjacent to the subject site, receiving groundwater discharge from the overburden (Ref. 4, p. 3-15). The Baseline Site-Wide Endangerment Assessment estimated that the volume of overburden groundwater discharging into the river along the southern property boundary at 22,000 gallons per day in 1992 (Ref. 2, Appendix VI, Table 3).

It should be noted that, although located in the vicinity of the Raritan River, bedrock groundwater in the SS transmissive zone is not believed to be impacting surface water quality. As stated previously, this unit is located at significant depth and is highly unlikely to discharge to the river bed. Furthermore, significant contamination has not been observed in the unit, as evidenced by sample results from monitoring points IIII and JJJJ. For these reasons, any negative site-related impacts on the Raritan River should be associated with the overburden aquifer.

Cuckolds Brook Interaction

Based on groundwater flow patterns, hydraulic gradients, and water levels, the 1993 Hydrogeologic Investigation Report also concluded that Cuckolds Brook acts as an effluent stream as it passes through the site, discharging water into the overburden aquifer (Ref. 4, pp. 3-16 and 4-4). A 1989 Hydrogeologic

Investigation Program determined that the northern section of Cuckolds Brook is bedded in bedrock and behaves as a losing stream under pumping conditions (Ref. 1, Attachment 3, p. 17). A letter from NJDEP dated October 25, 1993 (Ref. 3), however, suggested the possibility that overburden groundwater may, in fact, be discharging to Cuckolds Brook.

Further Investigation

Additional evaluation of the interaction between local surface water and impacted overburden groundwater at the AHP site is in progress. Recent surface water and sediment investigation activities are discussed further in the response to Question 5, but the data and report from that effort have not yet been reviewed or approved by NJDEP and USEPA. This issue will need to be adequately addressed before contaminated groundwater beneath the AHP site can be considered fully under control.

References:

1. **Soils Remedial Investigation Report and Feasibility Study Work Plan (including the Hydrogeological Investigation Program Report as Attachment 3), American Cyanamid Company, Bound Brook, New Jersey. Prepared by Blasland, Bouck & Lee. Dated October 1990 and Amended May 1992.**
2. **Baseline Site-Wide Endangerment Assessment, American Cyanamid Company, Bound Brook, New Jersey. Prepared by Blasland, Bouck & Lee. Dated December 1990 and Amended March 1992.**
3. Letter from Haiyesh Shah, NJDEP, to Joel Jerome, American Cyanamid Company. Re: American Cyanamid Company Site. Dated October 25, 1993.
4. Hydrogeological Investigation Report for the Group II Impoundments, **American Cyanamid Company, Bound Brook, New Jersey. Prepared by Blasland, Bouck & Lee. Dated** November 1993 and Revised May 1994.
5. Natural Resource Assessment, **American Cyanamid Company, Bound Brook, New Jersey. P**repared by Blasland, Bouck & Lee, Inc. Dated April 1994.
6. Letter from James Schnitzer, Blasland, Bouck & Lee, Inc., to Haiyesh Shah, NJDEP. Re: Amended Section 4 of the Raritan River Assessment. Dated June 9, 1994.
7. Natural Resource Assessment Data Summary Report, AHP Corporation, Madison, New Jersey. Prepared by O'Brien & Gere Engineers, Inc. Dated January 1996.
8. Letter from Haiyesh Shah, NJDEP, to Thomas Donohue, AHP. Re: American Cyanamid Site. Dated September 21, 2000.

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or ecosystems at these concentrations)?

____ If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration[3] of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgement/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or ecosystem.

____ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration[3] of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations[3] greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

_X_ If unknown - enter "IN" status code in #8.

Rationale:

Several reports prepared for the AHP site have evaluated surface water and sediment quality in the Raritan River and Cuckolds Brook. The most recent complete and approved investigation of surface water and sediment was conducted in conjunction with the 1994 Natural Resource Assessment. During this effort, surface water and sediment samples were collected in December 1993 and January 1994. Seven sampling location were selected on the Raritan River, and three sampling locations were selected on Cuckolds Brook. The attempted sampling locations are shown on the map in Attachment 10.

Surface water and sediment samples were analyzed for 38 organic and inorganic constituents reflective of overburden groundwater beneath the AHP site. The results of this investigation are presented in the Natural Resources Assessment Report (Ref. 4, pp. 34 and 35) and summarized below.

Raritan River

[3] As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

- Only two VOCs detected in surface water – acetone in one sample and benzene in seven samples
- Six of the benzene results resemble the background sample collected upstream of the site
- Maximum benzene reported down river of Impoundments 1 and 2
- Nine of ten trace metals detected in a Raritan River sediment sample – all comparable to background concentrations.

Cuckolds Brook

- Three VOCs and two SVOCs detected in two of the three surface water samples – acetone, benzene, chloroform, nitrobenzene, and naphthalene
- Five of eleven trace metals reported in a sample downstream of the SRVSA discharge point – all comparable to background concentrations
- Water quality in Cuckolds Brook said to resemble wastewater effluent, with approximately 95 percent of flow in the brook coming from the SRVSA wastewater treatment plant (Ref. 4, p. 13)
- One VOC and four SVOCs reported in sediment below SRVSA discharge, including a byproduct of wastewater chlorination
- Ten of eleven trace metals detected in sediment sample downstream of the SRVSA discharge – only copper and zinc elevated above background.

Based on these results, the report concluded that impacted groundwater in the overburden was not having a negative impact on surface water or sediment quality, and indicated that no additional surface water investigation was necessary. However, as of August 21, 1997, the assessment was still considered a draft, pending approval from the Natural Resource Trustees (Ref. 8, p. 1). Furthermore, a letter from NJDEP dated September 21, 2000 requests that the facility evaluate impacts of groundwater exceedences on water quality in the Raritan River and Cuckolds Brook (Ref. 12, p. 1).

NJDEP is still in the process of gathering information on natural resource quality near the AHP site. A map showing historic on-site sampling locations for surface water, sediment, and wetland soil through February 2000 is provided as **Attachment 11**. Monitoring well 21-R continues to be sampled and tested for site-related contaminants specifically because its location is considered "ideal" for identifying any site-related impacts from overburden groundwater discharge to Cuckolds Brook (Refs. 7, 8). Uncertainties related to the interaction between overburden groundwater and local surface water, discussed in Question 4, have yet to be resolved.

Due to concerns presented by the NJDEP Office of Natural Resource Damages in June 1998, AHP was required to complete additional investigation of natural resources (Ref. 10). A map of the proposed additional natural resource sampling locations is provided as **Attachment 12**. Justification for each proposed sampling point was presented in a letter to NJDEP on May 3, 1999 (Ref. 9, Table 1). Although associated field work was conducted in May and June 2000, only a draft report has been provided to document the effort (Ref. 13), and the resultant data and conclusions have not yet been approved by NJDEP or USEPA. Nevertheless, a summary of the findings is presented below for informational purposes.

Halogenated methanes, including chloroform, were present at all surface water sampling points on Cuckolds Brook except CB99-10, upgradient of the SRVSA discharge at the point where the brook enters the AHP site. Commonly detected metals included aluminum, chromium, copper, iron, lead, manganese, and zinc. Surface water collected from sampling point CB99-1E, just before the eastern branch of the brook enters the Raritan River, was also found to contain elevated levels of benzene and mercury. No VOCs, polycyclic aromatic hydrocarbons (PAHs), or polychlorinated biphenyls (PCBs) were reported in Cuckolds Brook surface water. Most of the Cuckolds Brook sediment samples contained PAHs and metals.

Surface water and sediment samples were collected from five locations in the Raritan River. The Raritan River appears to be largely unaffected by organic contamination, but benzene and halogenated methanes were reported in sample RR99-3, located immediately downstream of the eastern branch of Cuckolds Brook. Several surface water samples from the river also contained elevated metals, including aluminum, chromium, iron, lead, manganese, and zinc. No VOCs or PCBs were reported in any of the river water samples. PAHs and metals were reported in several river sediment samples. Naphthalene and 2-methylnaphthalene were also detected in sample RR99-3, where the eastern branch of Cuckolds Brook discharges into the Raritan River.

As stated above, the results of this supplemental investigation have not yet been approved. Furthermore, the draft report draws no specific conclusions as to the source of observed contamination (e.g., specific impoundments, the SRVSA discharge, impacted groundwater), and does not compare observed contamination with concentrations found upgradient of the site (for metals) or present in the SRVSA discharge (for all constituents). Until these issues are considered and AHP has received approval for the current surface water and natural resources investigation, environmental impacts related to contaminated overburden groundwater at the site remain undefined. This issue must be resolved before groundwater contamination at the AHP site can be considered under control.

References:

1. **Baseline Site-Wide Endangerment Assessment, American Cyanamid Company, Bound Brook, New Jersey. Prepared by Blasland, Bouck & Lee. Dated December 1990 and Amended March 1992.**
2. Letter from Haiyesh Shah, NJDEP, to Joel Jerome, American Cyanamid Company. Re: American Cyanamid Company Site. Dated October 25, 1993.
3. Hydrogeological Investigation Report for the Group II Impoundments, **American Cyanamid Company, Bound Brook, New Jersey. Prepared by Blasland, Bouck & Lee. Dated** November 1993 and Revised May 1994.
4. Natural Resource Assessment, **American Cyanamid Company, Bound Brook, New Jersey. P**repared by Blasland, Bouck & Lee, Inc. Dated April 1994.
5. Letter from James Schnitzer, Blasland, Bouck & Lee, Inc., to Haiyesh Shah, NJDEP. Re: Amended Section 4 of the Raritan River Assessment. Dated June 9, 1994.
6. Natural Resource Assessment Data Summary Report, AHP Corporation, Madison, New Jersey. Prepared by O'Brien & Gere Engineers, Inc. Dated January 1996.
7. Letter from Chris Poulsen, Township of Bridgewater, to Haiyesh Shah, NJDEP. Re: Groundwater Monitoring Program Reduction Request. Dated August 19, 1997.

8. Letter from Haiyesh Shah, NJDEP, to Patricia McDonald, AHP. Re: AHP Site. Dated August 21, 1997.
9. Letter from Angelo Caracciolo, O'Brien & Gere Engineers, Inc., to Barbara Dietz, NJDEP. Re: Natural Resource Assessment. Dated May 3, 1999.
10. Letter from Barbara Dietz, NJDEP, to Thomas Donohue, AHP. Re: Surface Water and Sediment Assessment Work Plan. Dated November 10, 1999.
11. Letter from Steven Pernick, O'Brien & Gere Engineers, Inc., to Barbara Dietz, NJDEP. Re: Natural Resource Assessment. Dated March 13, 2000.
12. Letter from Haiyesh Shah, NJDEP, to Thomas Donohue, AHP. Re: American Cyanamid Site. Dated September 21, 2000.
13. Surface Water and Sediment Sampling Summary Report (draft), AHP Corporation, Madison, New Jersey. Prepared by O'Brien & Gere Engineers, Inc. Dated November 2000.

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable**" (i.e., not cause impacts to surface water, sediments or ecosystems that should not be allowed to continue until a final remedy decision can be made and implemented[4])?

____ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site's surface water, sediments, and ecosystems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment[5], appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialist, including an ecologist) adequately protective of receiving surface water, sediments, and ecosystems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

____ If no - (the discharge of "contaminated" groundwater can not be shown to be "**currently acceptable**") - skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or ecosystem.

____ If unknown - skip to 8 and enter "IN" status code.

Question not applicable. See response to Question #5.

[4] Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

[5] The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

____ If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

____ If no - enter "NO" status code in #8.

____ If unknown - enter "IN" status code in #8.

Question not applicable. See response to Question #5.

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

____ YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the American Home Products Corporation site (formerly American Cyanamid), EPA ID # NJD002173276, located on East Main Street, Bridgewater, New Jersey. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater" This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

____ NO - Unacceptable migration of contaminated groundwater is observed or expected.

_X_ IN - More information is needed to make a determination.

Completed by: _____ Date:_____

Michele Benchouk
Engineering Consultant
Booz·Allen & Hamilton

Reviewed by: _____ Date:_____

Pat Shanley
Geologist
Booz·Allen & Hamilton

Also reviewed by: _____ Date:_____

Agathe Nadai, RPM
RCRA Programs Branch
EPA Region 2

_____ Date:_____

Barry Tornick, Section Chief
RCRA Programs Branch
EPA Region 2

Approved by: Original signed by:_____ Date: 9/26/2003

Raymond Basso, Chief
RCRA Programs Branch
EPA Region 2

Locations where references may be found:

References reviewed to prepare this EI determination are identified after each response. Reference materials are available at the USEPA Region 2, RCRA Records Center, located at 290 Broadway, 15th Floor, New York, New York, and the New Jersey Department of Environmental Protection Office located at 401 East State Street, Records Center, 6th Floor, Trenton, New Jersey.

Contact telephone and e-mail numbers: Agathe Nadai, EPA RPM
(212) 637-4174
nadai.agathe@epa.gov

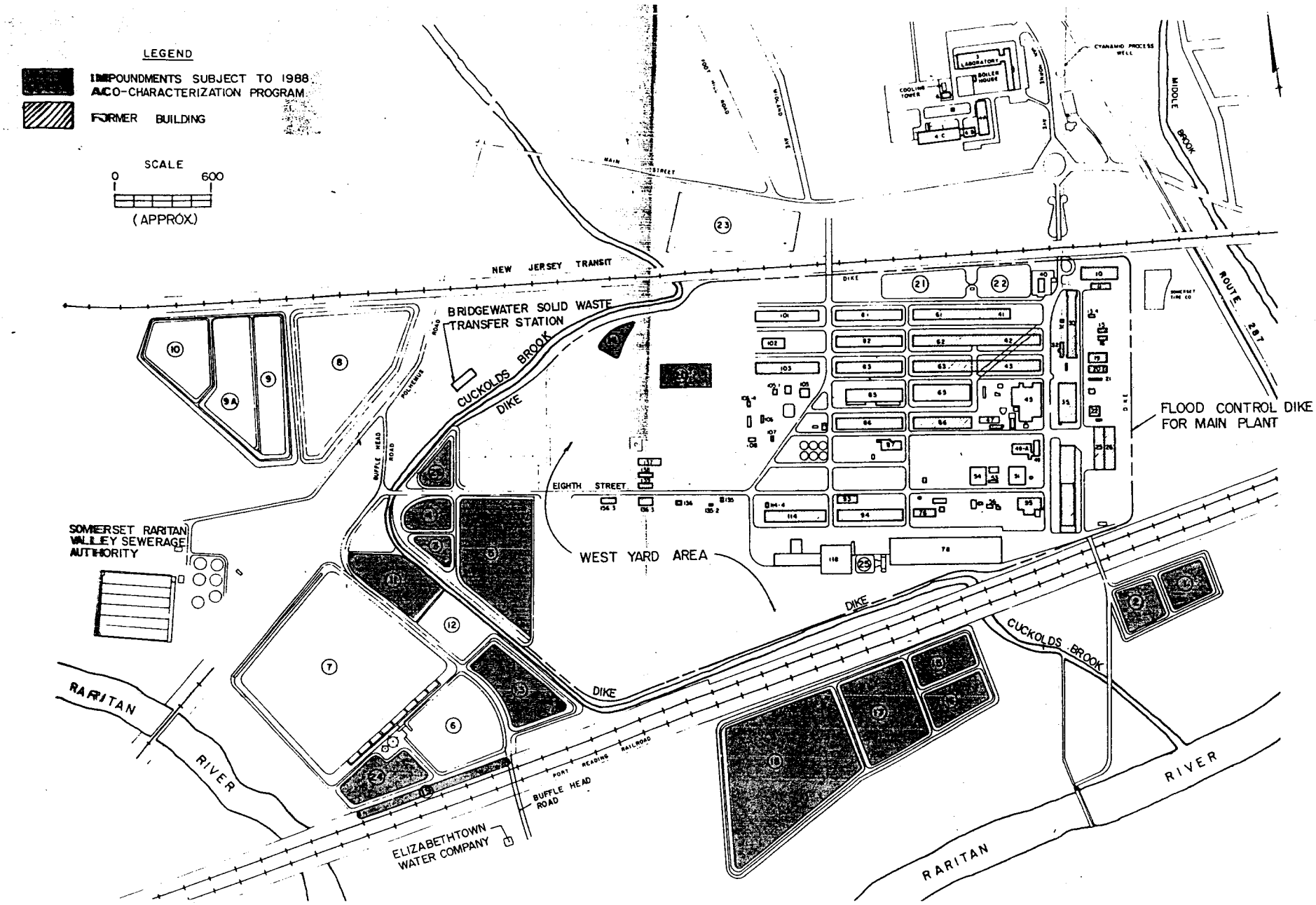
Attachments

The following attachments have been provided to support this EI determination.

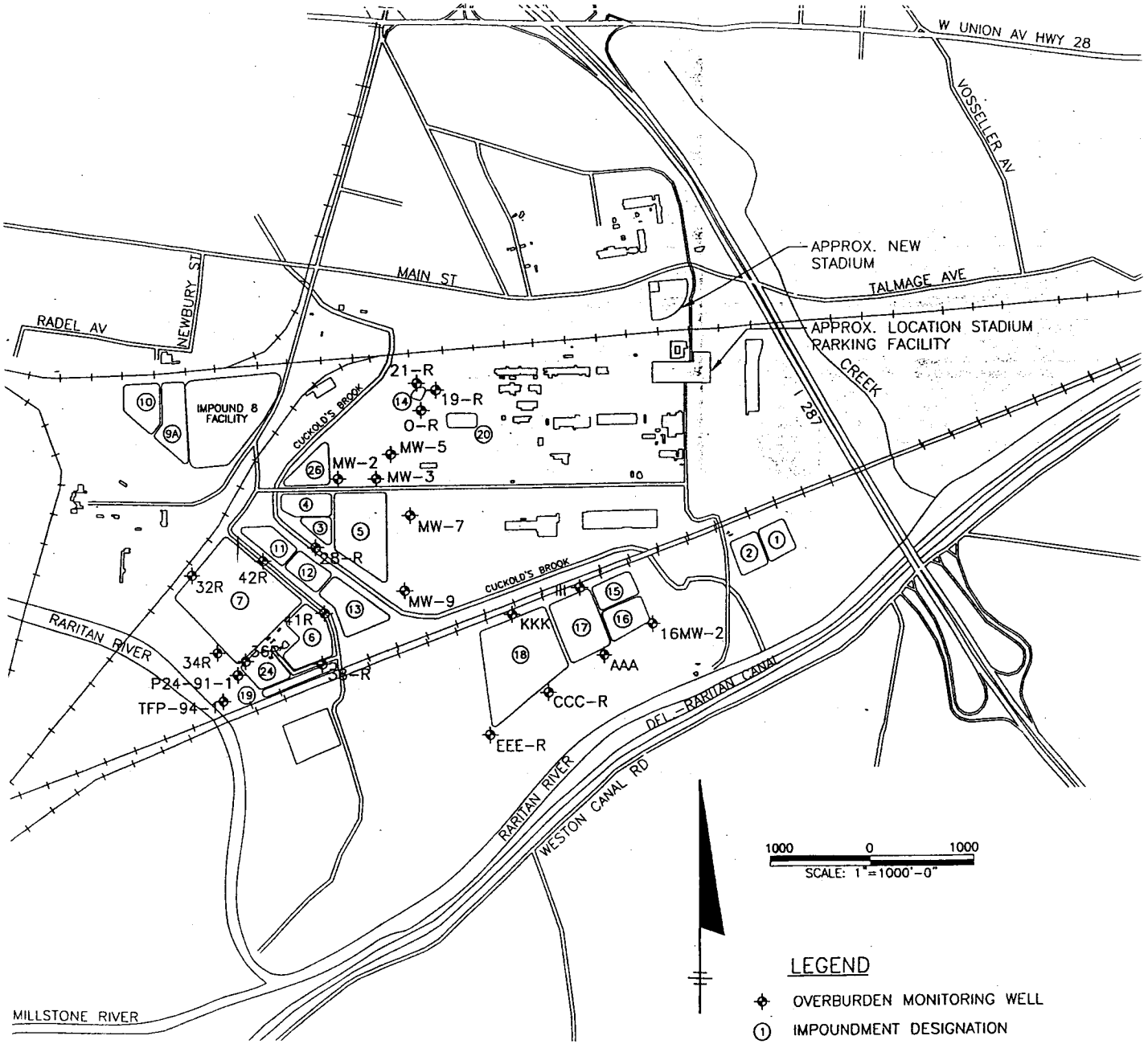
- Attachment 1 - Facility Site Plan and Surface Impoundment Map
- Attachment 2 - Overburden Monitoring Well Location Plan
- Attachment 3 - Bedrock Monitoring Well Location Plan
- Attachment 4 - Impoundment 8 Facility Monitoring Well Location Plan
- Attachment 5 - Location of Aniline Spill Area and Somerset Tire Services Property
- Attachment 6 - Bedrock Aquifer Transmissive Zones
- Attachment 7 - Generalized Bedrock Groundwater Flow Direction Prior to Pump Well Relocation
- Attachment 8 - Bedrock Groundwater Elevation Contours After Pump Well Relocation
- Attachment 9 - CEA and WRA Map
- Attachment 10 - Surface Water and Sediment Sampling Locations on the Raritan River and Cuckolds Brook (1993/1994)
- Attachment 11 - Historic On-Site Natural Resources Sampling Locations (through 2/2000)
- Attachment 12 - Proposed Additional On-Site Natural Resources Sampling Locations
- Attachment 13 - Summary of Media Impacts Table

Attachment 1 -Facility Site Plan and Surface Impoundment Map

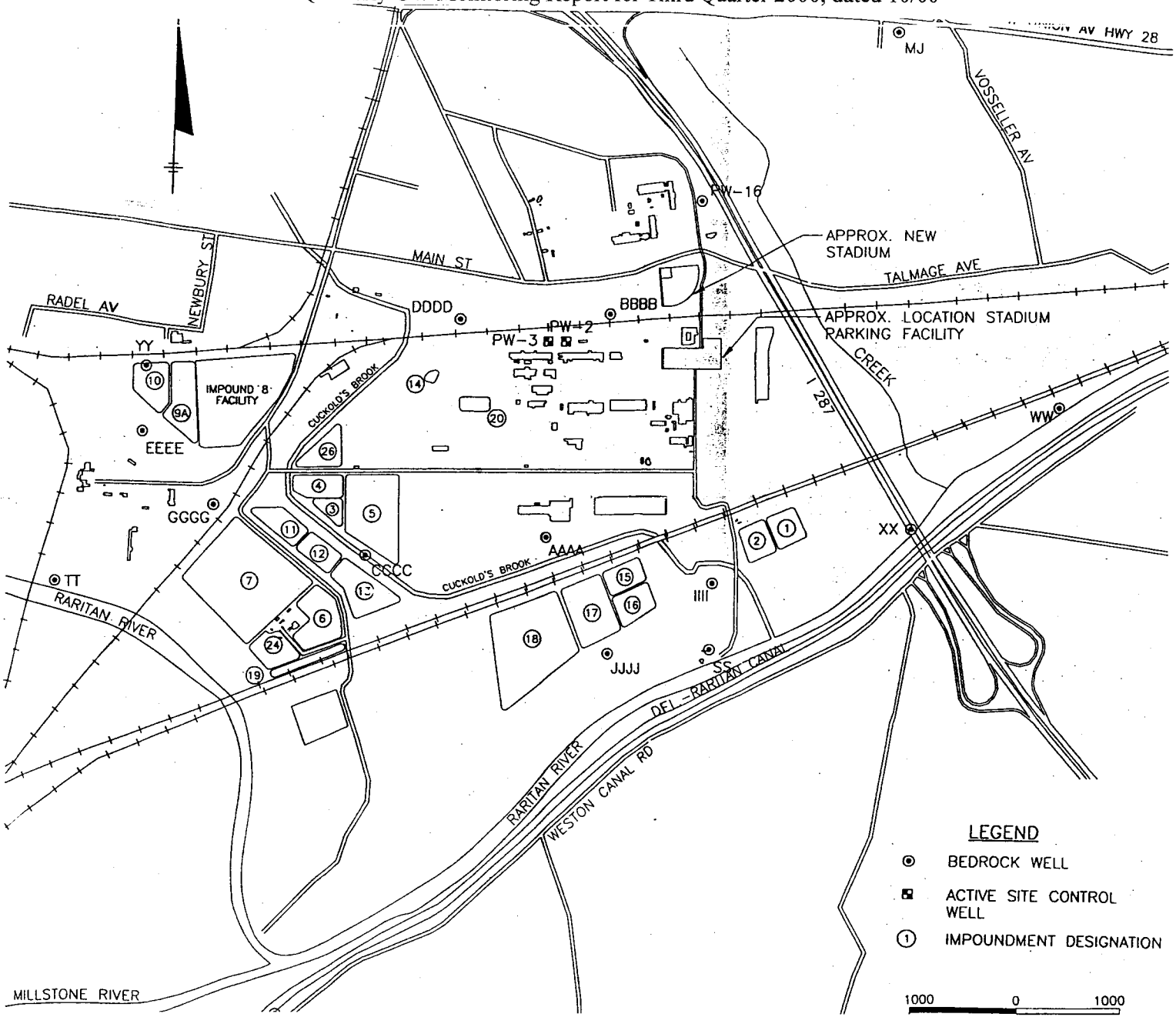
Source: Impoundment Characterization Program Final Report, dated 1/90 and amended 8/90



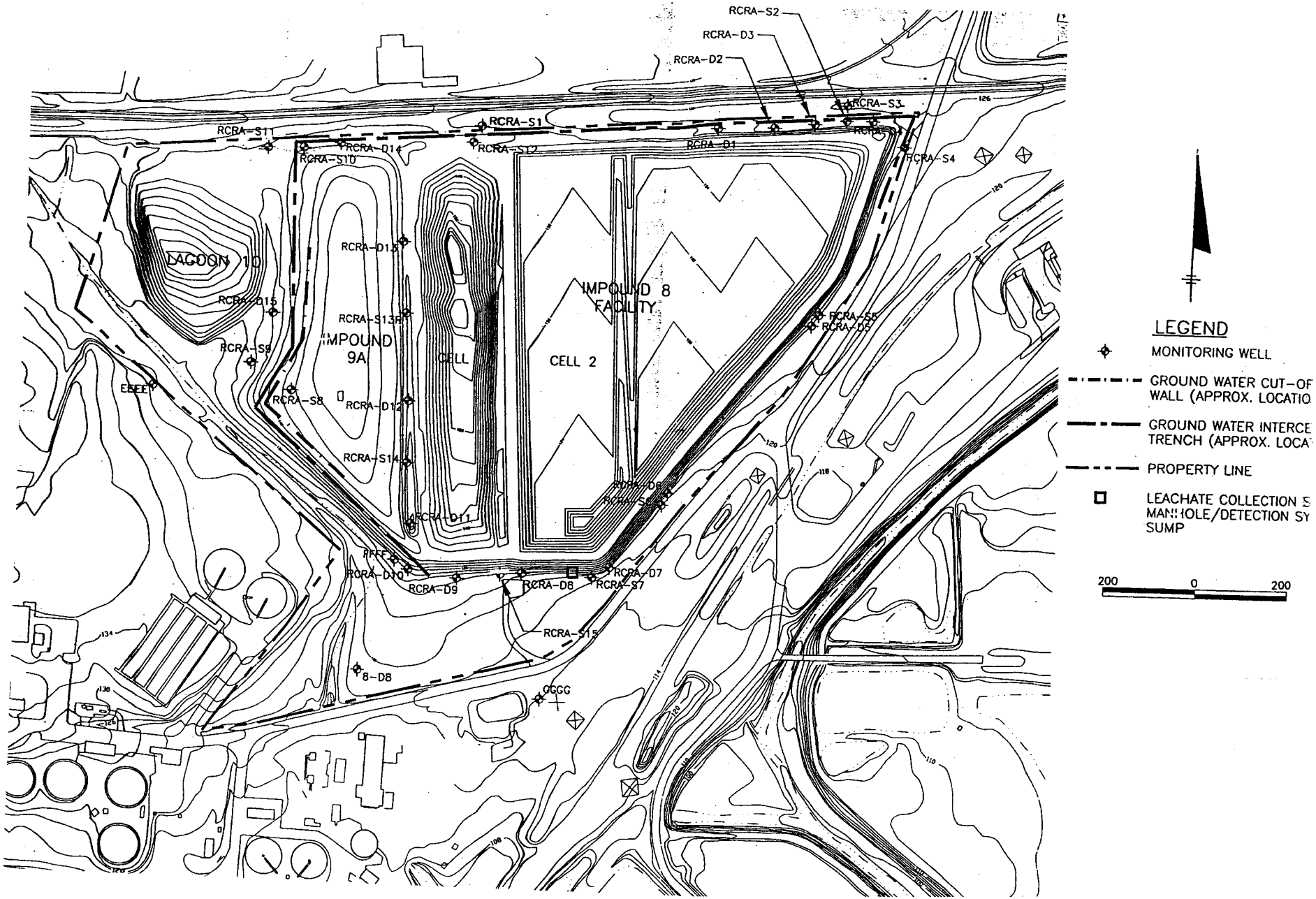
Attachment 2 - Overburden Monitoring Well Location Plan (June 2000)
Source: Quarterly GW Monitoring Report for Third Quarter 2000, dated 10/00



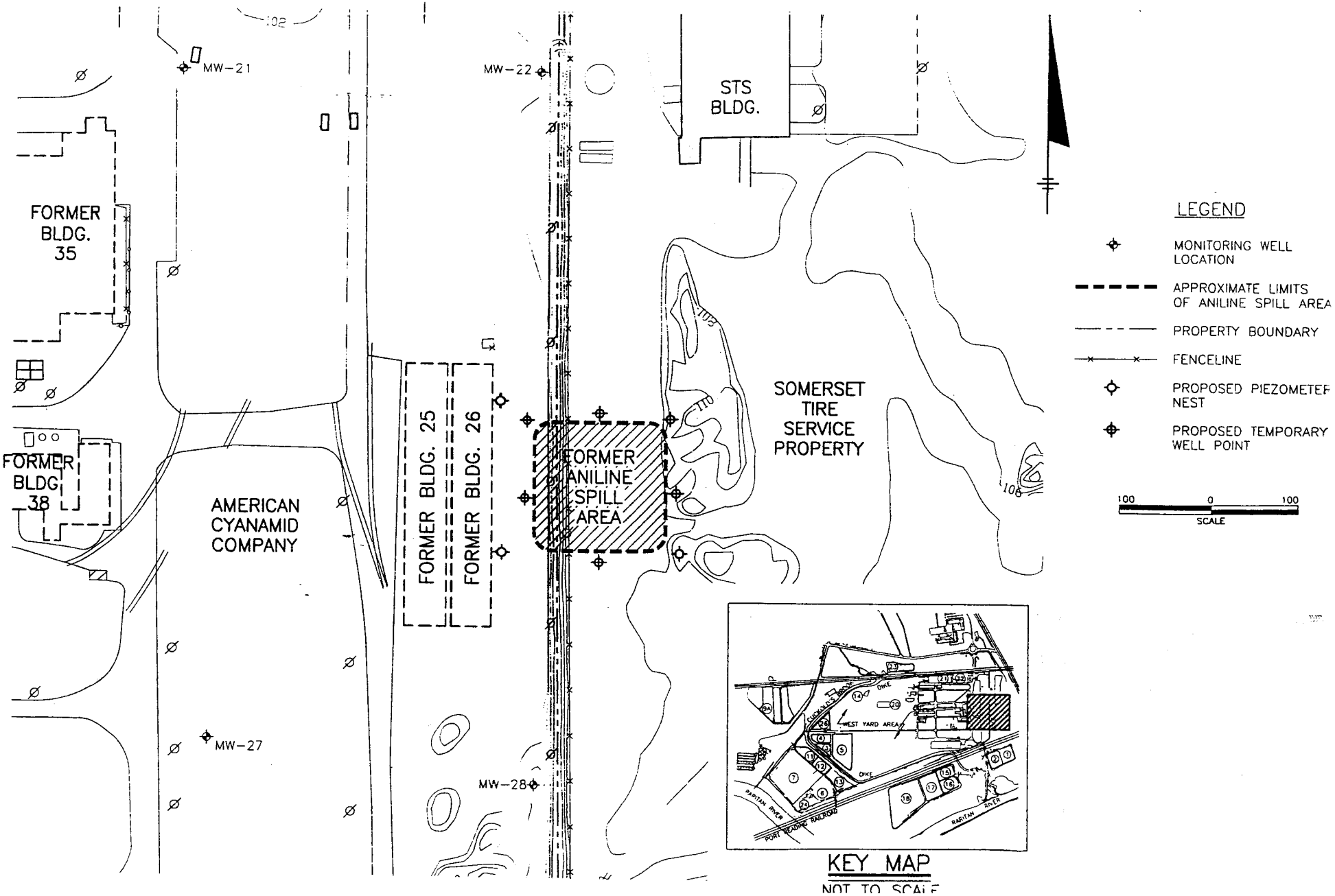
Attachment 3 - Bedrock Monitoring Well Location Plan
Source: Quarterly GW Monitoring Report for Third Quarter 2000, dated 10/00



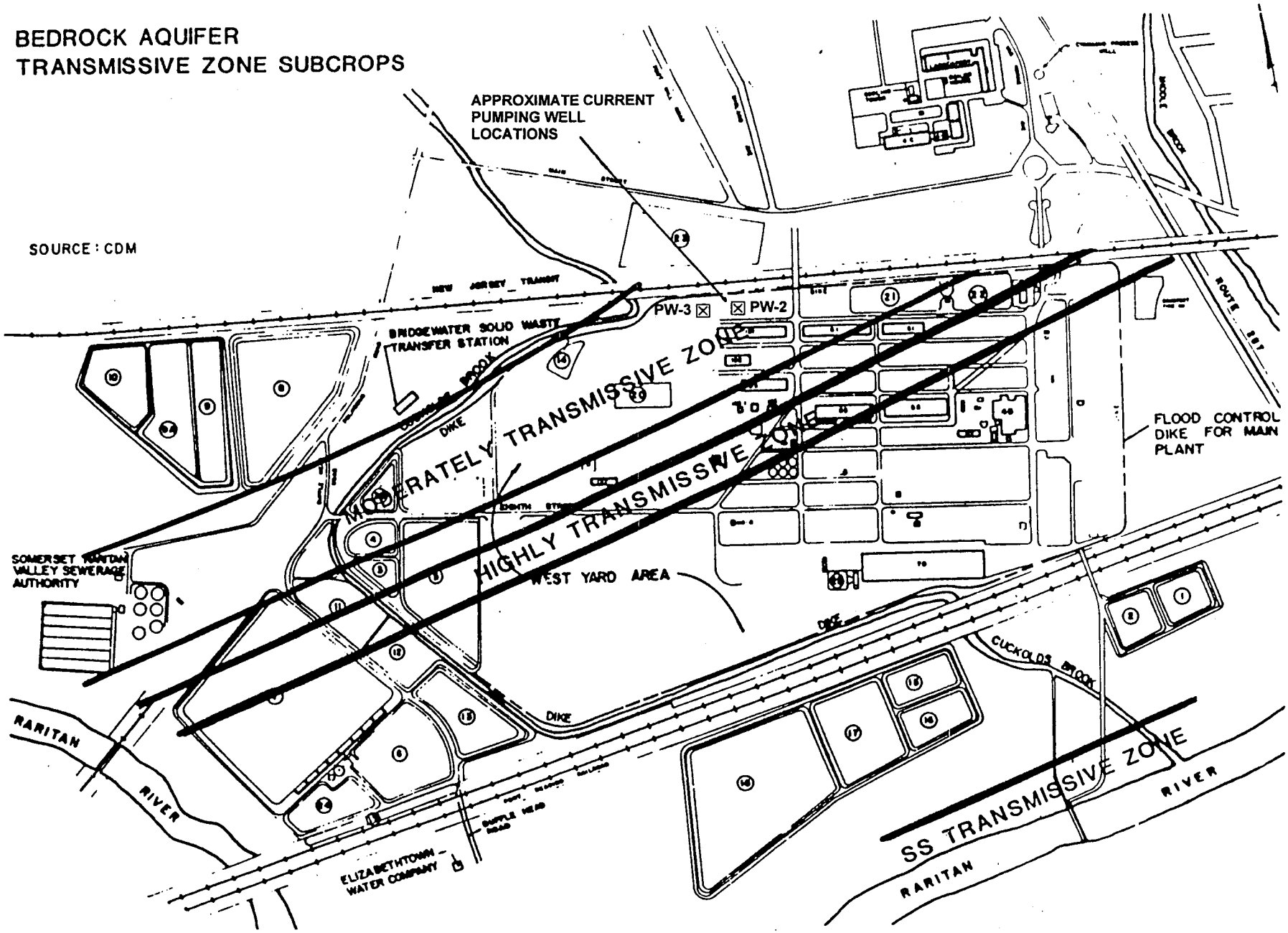
Attachment 4 - Impoundment 8 Facility Monitoring Well Location Plan
Source: Quarterly GW Monitoring Report for Third Quarter 2000, dated 10/00



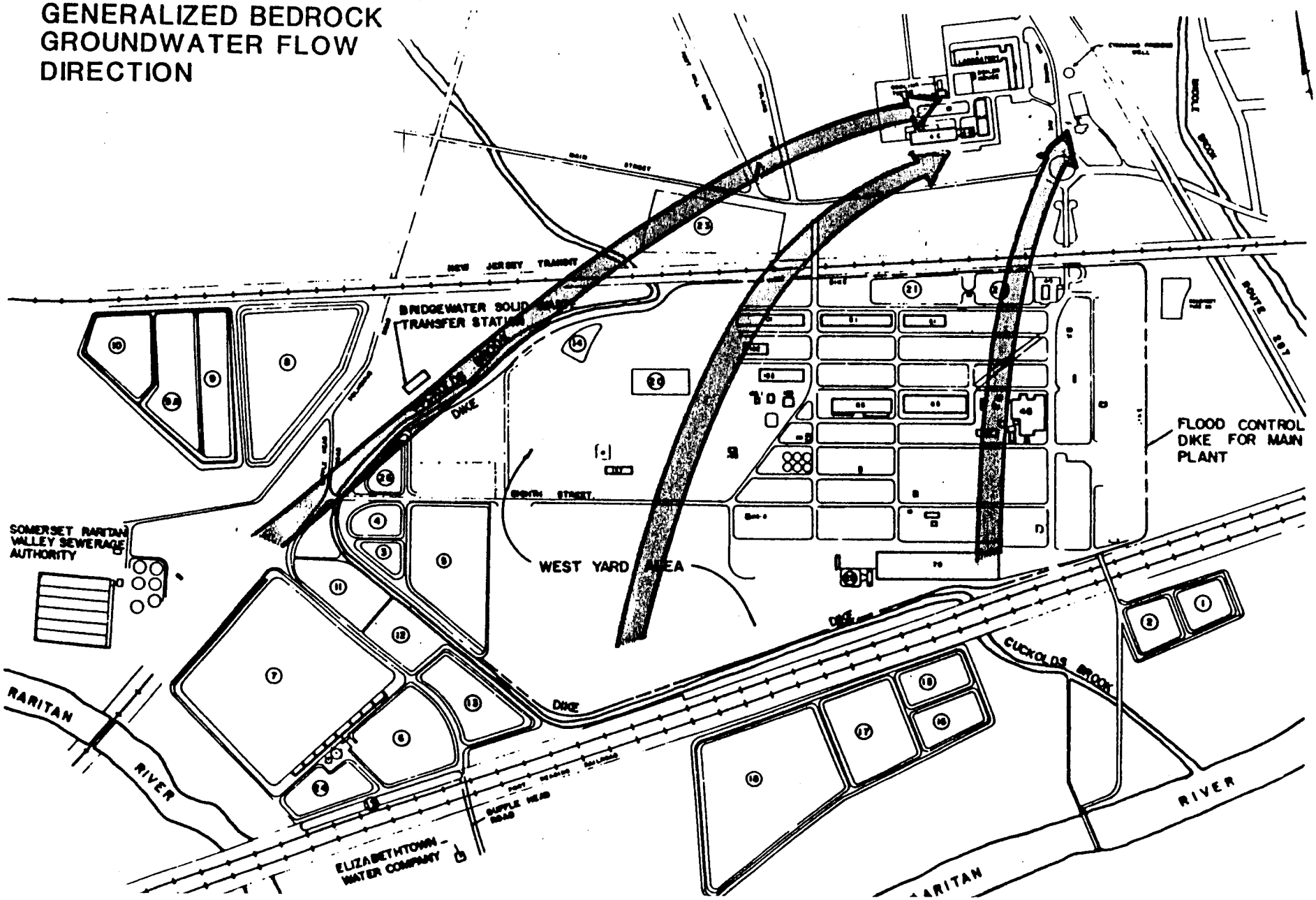
Attachment 5 - Location of Aniline Spill Area and Somerset Tire Services Property
Source: Letter from Thomas Donohue to Haiyesh Shah, dated 7/15/97



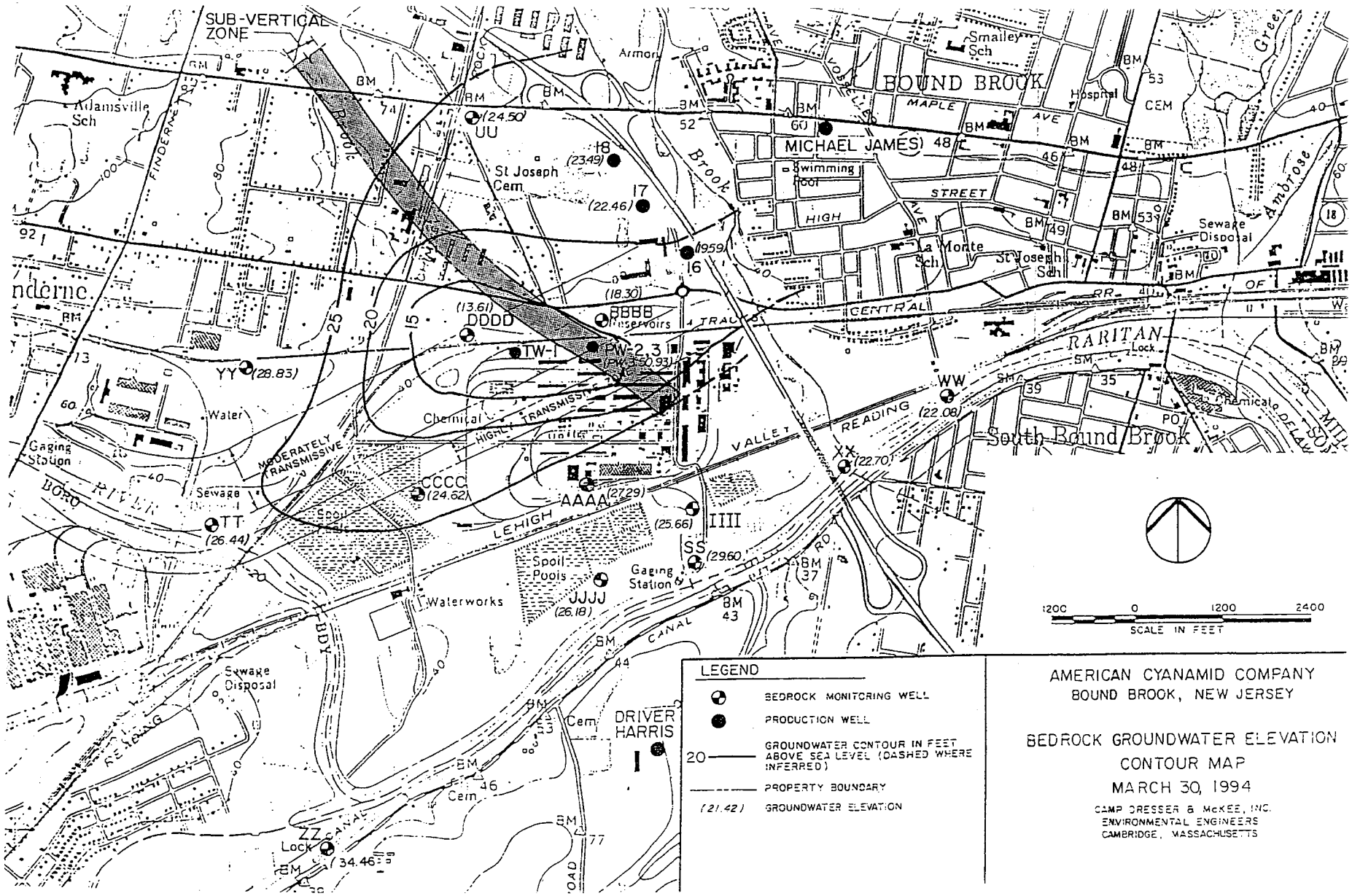
Attachment 6 - Bedrock Aquifer Transmissive Zones
Source: Baseline Site-Wide Endangerment Assessment, dated 12/90



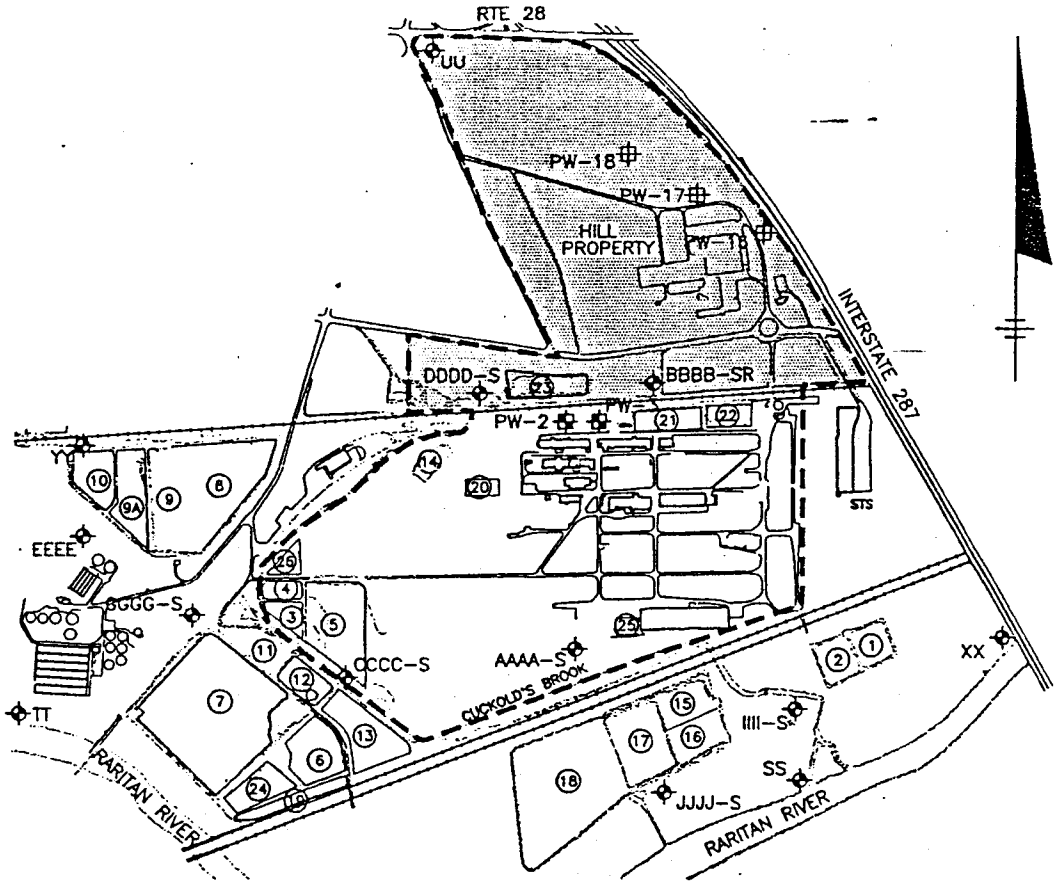
Attachment 7 - Generalized Bedrock Groundwater Flow Direction Prior to Pump Well Relocation
Source: Letter from Thomas Donohue to Haiyesh Shah, dated 7/15/97



Attachment 8 - Bedrock Groundwater Elevation Contours After Pump Well Relocation
Source: Summary Report on the Startup of Production Wells PW-23 and PW-3, dated 8/23/94

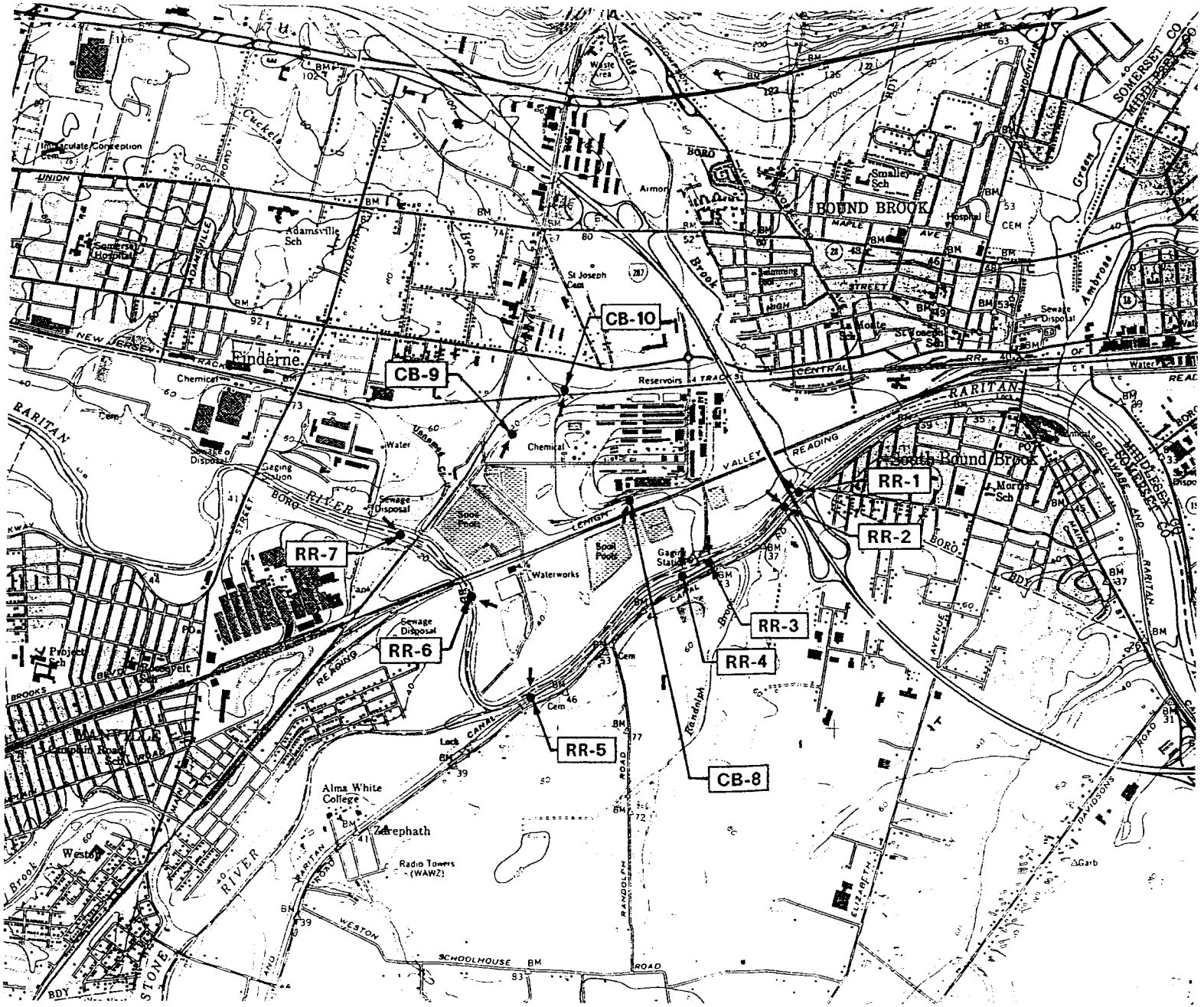


Attachment 9 - CEA and WRA Map
Source: Case Information Report on the AHP CEA and WRA, dated 6/8/00



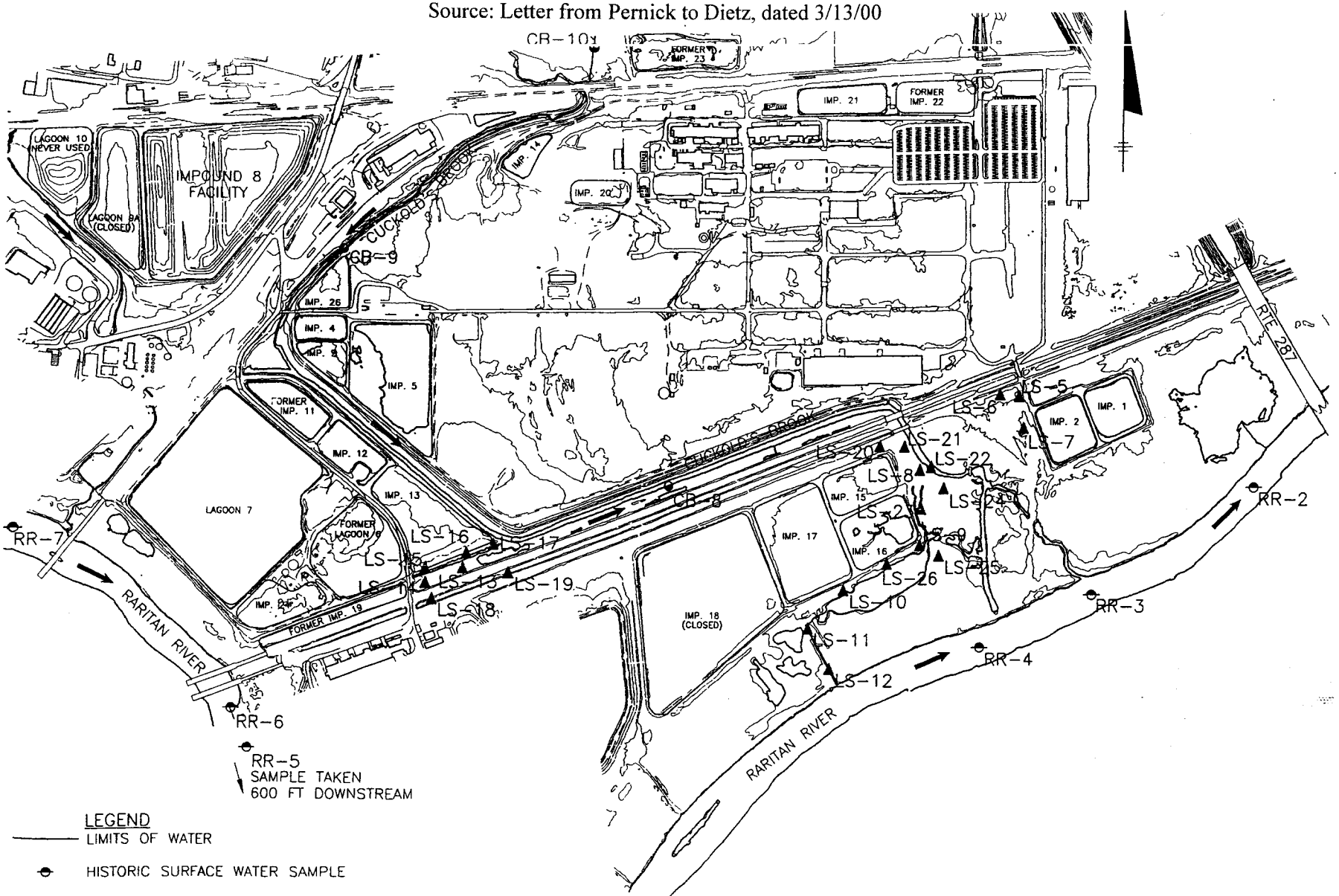
Attachment 10 - Surface Water and Sediment Sampling Locations on the Raritan River and Cuckolds Brook (1993/1994)

Source: Natural Resources Assessment, 4/94



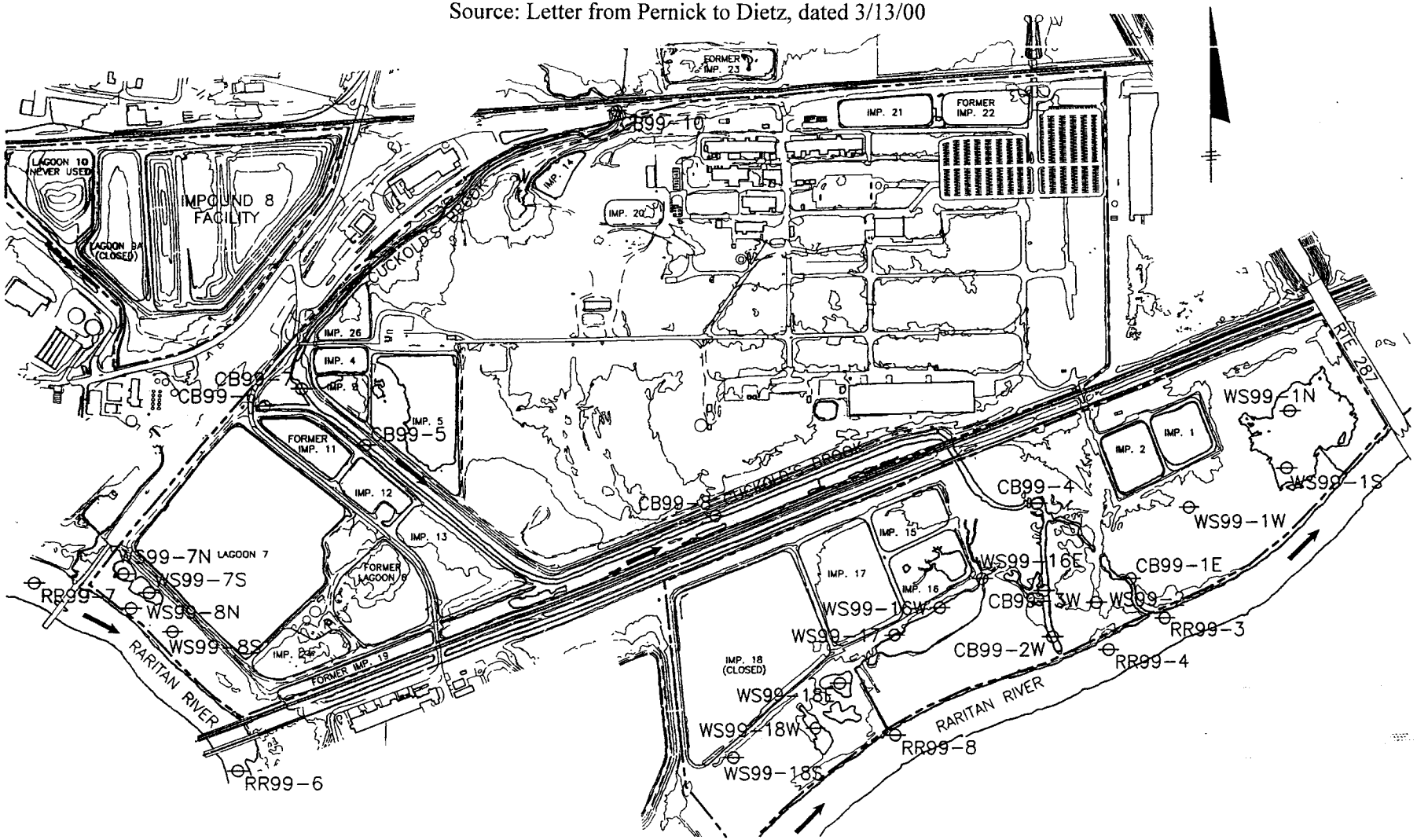
Attachment 11 - Historic On-Site Natural Resources Sampling Locations (through 2/2000)

Source: Letter from Pernick to Dietz, dated 3/13/00



Attachment 12 - Proposed Additional On-Site Natural Resources Sampling Locations

Source: Letter from Pernick to Dietz, dated 3/13/00



LEGEND

- PROPERTY LINE
- LIMITS OF WATER
- PROPOSED ON-SITE SURFACE WATER AND SEDIMENT SAMPLE
- SURFACE WATER FLOW DIRECTION

600 0 600

DRAWING NOTE:

1. TOPOGRAPHIC INFORMATION BASED ON SURVEY PROVIDED BY GEOD CORPORATION, APRIL 1998.
2. LIMITS OF WATER REPRESENT WATER PRESENT AT THE TIME

Attachment 13 - Summary of Media Impacts Table

American Home Products Corporation (formerly American Cyanamid)
Bridgewater, New Jersey

	GW	AIR (Indoors)	SURF SOIL	SURF WATER	SED	SUB SURF SOIL	AIR (Outdoors)	CORRECTIVE ACTION MEASURE	KEY CONTAMINANTS
Overburden Groundwater	Yes	NA	NA	NA	NA	NA	NA	• Active groundwater recovery within the bedrock aquifer controls contamination in overburden • Ongoing groundwater monitoring program in place • Interceptor trench and cutoff wall in place to control groundwater flow near the Impoundment 8 Facility • Source removal actions underway at specific impoundments	• Benzene • Chlorobenzene • 1,2,4-trichlorobenzene • Arsenic
Bedrock Groundwater	Yes	NA	NA	NA	NA	NA	NA	• CEA and WRA established in 1996 for the entire site and Hill Property; to remain in place until constituents have dropped below applicable GWQC (calculated as seven years) • Active groundwater recovery within the Main Plant Area since 1994 to contain impacted groundwater beneath the site • Ongoing quarterly groundwater monitoring program in place • Source removal actions underway at specific impoundments	• Benzene • Chlorobenzene • TCE • PCE • 1,2,4-trichlorobenzene • Arsenic • Manganese