

REMEDIATION INVESTIGATION REPORT

VOLUME A - SUMMARY

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KENVIL, NEW JERSEY**

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LIST OF ACRONYMS

2,4-DNT	2,4- Dinitrotoluene
2,6-DNT	2,6-Dinitrotoluene
2,4/2,6-DNT	2,4/2,6-Dinitrotoluene
2-A-DNT	2-Amino-4,6-Dinitrotoluene
4-A-DNT	4-Amino-2,6-Dinitrotoluene
Alliant	Alliant Techsystems
AN	Ammonia-Nitrate
ANFO	Ammonia Nitrate Fuel Oil
AOC	Area of concern
AQAPP	Analytical Quality Assurance Project Plan
AWQC	Ambient Water Quality Criteria Derivation Methodology
BIS2EHP	Bis(2-Ethylhexyl) Phthalate
BZAP	Benzo(a)pyrene
BZBF	Benzo(b)fluoranthene
BZD	Benzidine
C&D	Construction and Demolition
CEA	Classification Exception Area
CFR	Code of Federal Regulations
CPT	Cone penetrometer
DDNP	Diazodinitrophenol
DEPH	Diethyl Phthalate
DN46M	4,6-Dinitro-2-Methylphenol
DNAPL	Dense Non-Aqueous Phase Liquid
DNBP	Di-N-Butyl Phthalate
DOE PRGEE	Department of Energy Preliminary Remediation Goals for Ecological Endpoints
DPHY12	1,2-Diphenylhydrazine
DTW	Depth-to-water
DQOs	Data quality objectives
EDM	Electronic distance measurement
E&E	Explosive and energetic
Facility	Kenvil Works Facility
FECs	Frequent exceedance constituents
FQAPP	Field Quality Assurance Project Plan
FSPM	NJDEP Field Sampling Procedures Manual
FSSG	Freshwater Sediment Screening Guidelines
Ft.	Feet
Ft bgs	Feet below ground surface
FW2-NT(C1)	Fresh Water Class 2 – Non Trout Production Criteria
GC/MS	Gas chromatograph/mass spectrometer
GIS	Geographic Information System
GPM	Gallons per minute
GPS	Global positioning system
GW	Groundwater

LIST OF ACRONYMS (Continued)

GWQS	Groundwater Quality Standards
GW-SI	Groundwater Site Investigation
HAZWOPER	Hazardous Waste Operations and Emergency Response
Hercules	Hercules Incorporated
IAAP	Indiana Army Arsenal Procedure
IDW	Investigation-derived waste
IGWSCC	Impact to Groundwater Soil Cleanup Criteria
ISRA	Industrial Site Recovery Act
LCS	Laboratory control samples
LEL	Lowest Effects Level
LLI	Lancaster Laboratories, Inc.
LNAPL	Light Non-Aqueous Phase Liquid
LOI	Letter of Interpretation
LVFA	Lower Valley Fill Aquifer
MCMUA	Morris County Municipal Utilities Authority
MDL	Method detection limit
MS/MSD	Matrix spike/matrix spike duplicate
MSL	Mean sea level
MWH	MWH Americas, Inc.
NAPL	Non-Aqueous Phase Liquid
NAVD	North American Vertical Datum
N.J.A.C.	New Jersey Administrative Code
NC	Nitrocellulose
NG	Nitroglycerin
NJDEP	New Jersey Department of Environmental Protection
NJSCC	New Jersey Soil Cleanup Criteria
NNSM	N-Nitrosodimethylamine
NNSPH	N-Nitrosodiphenylamine
NRDCSCC	Non-Residential Direct Contact Soil Cleanup Criteria
OSHA	Occupational Safety and Health Administration
PAHs	Polynuclear aromatic hydrocarbons
PARCC	Precision, accuracy, representativeness, comparability and completeness
PCBs	Polychlorinated Biphenyls
PCE	Tetrachloroethylene
PETN	Pentaerythritol Tetranitrate
PHCs	Petroleum Hydrocarbons
PID	Photoionization detector
PPE	Personal Protective Equipment
PPL	Priority Pollutant List
PQL	Practical quantitation limit
QA/QC	Quality assurance / quality control
RA	Remedial Agreement
RAIS	Risk Assessment Information System

LIST OF ACRONYMS (Continued)

RASR	Remedial Action Selection Report
RBC	Risk Based Criteria
RDCSCC	Residential Direct Contact Soil Cleanup Criteria
RDX	Hexahydro-1,3,5-Trinitro-1,3,5-Triazine
RCRA	Resource Conservation and Recovery Act
RI	Remedial investigation
RIR	Kenvil Remedial Investigation Report
RIWP	Remedial Investigation Work Plan
SCC	Soil Cleanup Criteria
SD	Sediment
SDG	Sample delivery group
SEL	Severe Effects Level
SI	Site Investigation
SO	Soil
Soils – SI	Soils Site Investigation
SOPs	Standard Operating Procedures
SSB	Sediment Screening Benchmarks
SSHSP	Site Specific Health and Safety Plan
STL	Severn Trent Laboratories
SVOCs	Semi-Volatile Organic Constituents
SW	Surface water
SWQS	Surface Water Quality Standards
SW/SD-SI	Surface Water/Sediment Site Investigation Report
TCE	Trichloroethylene
TNT	2,4,6-Trinitrotoluene
TOC	Total Organic Carbon
TRSR	Technical Requirements for Site Remediation
US	United States
USEPA	United States Environmental Protection Agency
UVFA	Upper Valley Fill Aquifer
VOCs	Volatile Organic Constituents
WWTP	Waste water treatment plant
XRF	X-Ray fluorescence

EXECUTIVE SUMMARY

This Remedial Investigation Report is the culmination of two major field investigations spanning more than eight years including the analysis of over 4,400 samples of environmental media including soil, groundwater, sediment, and surface water. The principal findings of the investigations performed at the Hercules Incorporated Kenvil Works Facility are:

- The intent of the New Jersey Administrative Code (N.J.A.C.) 7:26E Technical Requirements for Site Remediation (TRSR) for remedial investigations [N.J.A.C. 7:26E – 4.1 through 4.8] and the site-specific objectives of the Remedial Investigation Work Plan were met with one exception. A portion of the energetics and explosives influenced groundwater plume identified in the southwest corner of the Facility in Area II requires additional delineation efforts. Focused field activities planned in 2007 will finalize definition of the nature and extent for this groundwater plume. There is no evidence of any other potential off-site contamination caused by site related constituents.
- Any additional delineation of the nature and extent of specific constituents or areas of the site that may be considered appropriate is minor and does not affect the site-wide characterization of environmental media. Any further delineation would most effectively be completed as remedy pre-design or remedial action activities with the benefit of the known future use of the Facility as guidance to the scope of the additional effort. The extensive data presented in this report provides a sound basis to perform a remedial alternatives analysis and begin the remedy selection process.
- Based on the site-wide characterization and conceptual site model, there is no unacceptable on-site human health risk. Additionally, there is no unacceptable off-site human health risk with the possible exception of the energetics and explosives influenced groundwater plume (the potential risk associated with this plume will be determined pending further delineation in 2007). Therefore, no containment or stabilization activities are necessary to prevent on-site exposure or off-site migration of site related constituents for soil, sediment or surface water.

1.0 REMEDIAL INVESTIGATION REPORT INTRODUCTION

Hercules Incorporated (Hercules) retained MWH Americas, Inc. (MWH) to conduct a Remedial Investigation (RI) at the Kenvil Works Facility (Facility), located in Kenvil, New Jersey (Figure A-1), as part of its obligation to execute a Remedial Agreement (RA) with the New Jersey Department of Environmental Protection (NJDEP). The RA was signed on March 10, 1995 and established the basis for conducting activities at the Facility under New Jersey's Industrial Site Recovery Act (ISRA).

This is Volume A of the Remedial Investigation Report (RIR). It presents a summary of key findings from the media-specific RIR volumes (Volume B – Soils, Volume C – Groundwater, Volume D – Sediment, and Volume E – Surface Water). This RIR expands on the NJDEP approved media-specific site investigation (SI) reports; Soils Site Investigation Report (Soils-SI, MWH, 2004), Final Groundwater Site Investigation Report (GW-SI, MWH, 2005), Surface Water/Sediment Site Investigation Report (SW/SD-SI, MWH, 2004), presented in Appendices A, B and C, respectively.

The approach and organization of this RIR complies with requested variances to the New Jersey Administrative Code (N.J.A.C.) 7:26E Technical Requirements for Site Remediation (TRSR), with concurrence of the NJDEP Case Management team through the use of the triad approach. Variances were discussed in routinely scheduled triad approach meetings and teleconferences held to discuss the development, submission, and subsequent review of the RIR. Triad approach meetings/teleconferences were attended by the NJDEP, Hercules, and their consultants and documented in written meetings minute notes, presented in Appendix D.

The RIR is presented in five volumes because of the comprehensive coverage of the RI effort and the volume of the acquired analytical data. The intent of this volume is to provide a comprehensive stand-alone document summarizing key findings of each media-specific RIR volume to facilitate review of the RIR. However, to truly make the volume an independent document, it would have required a duplication of information that is

more effectively presented in other volumes of this RIR. Therefore, from time to time, the reviewer may find it necessary to refer to other volumes.

The RIR is organized into the following volumes:

- Volume A – RI Summary. This volume of the report presents RI objectives, brief summary of scope of work, data quality control objectives, brief summary of regional and site-specific geologic and hydrogeologic conditions, site conceptual model, ecological receptor analysis, brief summary of results, and conclusions and recommendations;
- Volume B – Soil remedial investigation;
- Volume C – Groundwater remedial investigation;
- Volume D – Sediment remedial investigation; and,
- Volume E – Surface Water remedial investigation.

This volume provides a summary of RI activities conducted at the Facility. It is designed to comply with the intent of the TRSR for reporting remedial investigation activities [N.J.A.C. 7:26E-4.8], derived from the implementation of the NJDEP approved Revised Site-Wide Remedial Investigation Work Plan (RIWP, MWH, 2006).

The following documents, each previously submitted and approved (as applicable) to NJDEP, were integral to the performance of the RI:

- The Field Site-Specific Health and Safety Plan (SSHSP – MWH [formerly Montgomery Watson], April 1999, Revised in October 2005) provides the health and safety procedures adhered to during the facility-wide investigations. The SSHSP is provided as Appendix E;
- The Revised Analytical Quality Assurance Project Plan (AQAPP – MWH [formerly Montgomery Watson], December 2000, Revised in March 2006) describes the quality assurance/quality control (QA/QC) procedures for all analytical activities conducted during the various facility-wide investigations. The AQAPP was modified to include Lancaster Laboratories, Inc. (LLI) and Severn Trent Laboratories (STL) as contract laboratories. The NJDEP approved the previous AQAPP. The AQAPP is provided as Appendix F;
- The Final Field Quality Assurance Project Plan (FQAPP – MWH [formerly Montgomery Watson], June 1999, Revised in February 2006) describes the field sampling and screening methodologies to be followed during the various facility-wide investigations. The FQAPP was modified to incorporate the

revised NJDEP Field Sampling Procedure Manual, updated in August 2005. The NJDEP approved the previous FQAPP. The FQAPP is provided as Appendix G;

- The Soils-SI (MWH, May 2004) presents the findings of the soil site investigation conducted at the Facility from March 1999 to September 2000. The NJDEP approved the Soils-SI in June 2005. The Soils-SI is provided as Appendix A and the NJDEP approval letter is provided in Appendix H;
- The GW-SI (MWH, July 2005) presents the findings of the groundwater site investigation conducted at the Facility from April 2001 to September 2002. The NJDEP approved the GW-SI in August 2005. The GW-SI is provided as Appendix B and the NJDEP approval letter is provided in Appendix H;
- The SW/SD-SI (MWH, November 2004) presents the findings of the surface water/sediment site investigation conducted at the Facility from November 1998 to May 2001. The NJDEP approved the SW/SD-SI in June 2005. The SW/SD-SI is provided as Appendix C and the NJDEP approval letter is provided in Appendix H;
- The Area I RIWP (MWH, August 2005) presents the RI scope of work pertaining to Area I. The NJDEP approved the Area I RIWP in October 2005. The Area I RIWP is provided as Appendix I and the NJDEP approval letter is provided in Appendix H; and,
- The RIWP (MWH, June 2006) presents the site-wide scope of work conducted during the RI. The NJDEP approved the RIWP in July 2006. The RIWP is provided as Appendix I and the NJDEP approval letters is provided in Appendix H. (Note: The Soils-RIR references the RIWP as the Revised Site-Wide RIWP to differentiate from the Area I RIWP.)

1.1. RI OBJECTIVES

The RI is one of a series of phases that comprise the facility-wide restoration strategy. Figure A-2 graphically presents this facility-wide restoration plan. The current RI strategy, approved by the NJDEP on July 6, 2005, includes addressing all environmental media (groundwater, surface water, sediment, and soil) within the following specified areas of the Facility (Figure A-3) during a single phase of investigation utilizing the triad approach:

Area I – RI, areas north and east of Powder Mill Road (B-Line, Finishing, Storage, eastern portions of Development, and portions of Miscellaneous/Offsite former operational areas);

Area II – RI, areas south and west of Mule Barn Road (Nitroglycerin (NG), Pentaerythritol Tetranitrate (PETN), TNT, Dynamite, and portions of Miscellaneous/Offsite former operational areas); and,

Area III – RI, central portions of the Facility (A-Line, Maintenance, Ammonia-Nitrate (AN), Diazo, Western Development, and portions of Miscellaneous/Offsite former operational areas).

The objectives of the RI as described in N.J.A.C. 7:26E-4.1 were met and included the following:

- Delineate the horizontal and vertical extent of contamination in all media;
- Determine the general surface and subsurface characteristics of the Facility;
- Identify the migration paths and actual or potential receptors of contaminants;
- Collect and evaluate the data necessary to evaluate remedial action alternatives;
- Collect the data necessary to evaluate actual and potential ecological impacts;
- Collect data necessary to develop permit limitations for any discharge to environmental media; and,
- Identify containment and/or stabilization activities to prevent contaminant exposure to on-site receptors and to prevent off-site migration of contaminants while remedial alternatives are being evaluated.

1.2. REPORT ORGANIZATION

This RI summary volume is organized as follows:

- Section 1 presents the report introduction, summary of RI objectives, organization of RI report, and brief description of the Facility history;
- Section 2 presents a description of the triad approach activities conducted as part of the RI;
- Section 3 presents a summary of the scope of work conducted during the RI by media;
- Section 4 presents a summary of the data quality control objectives;

- Section 5 presents a summary of the comparison criteria and frequent exceedance constituent (FEC) selection process by media;
- Section 6 presents the RIR conclusions by media;
- Section 7 presents the conceptual site model; and,
- Section 8 presents a description of future action that Hercules intends to perform in 2007.

1.3. FACILITY DESCRIPTION AND HISTORY

The approximately 1,200 acre Facility is located on Howard Boulevard, about 0.5 miles northwest of the center of Kenil, in Morris County, New Jersey (Figure A-2). The former production area of approximately 800 acres is centrally located in a relatively flat area. There is a slight slope extending to Howard Boulevard on the northwest side and a topographic ridge on the southeast side that separates the production area from the Berkshire Valley area. The remaining 400 acres act as a buffer between the former active portions of the Facility and the surrounding community.

The Facility began dynamite manufacturing operations in the 1870's and was operated by various companies until 1912 when Hercules was formed and became the sole owner. The Facility underwent a major expansion at this time in order to manufacture large volumes of various explosives and propellants in response to the demand for these products created by World War I. Since that time, a variety of explosives and specialty products have been produced at the Facility for military and commercial applications including 2,4,6-Trinitrotoluene (TNT), smokeless gunpowder, Ammonium Nitrate/Fuel Oil (ANFO), initiating materials, ingredients for medical applications, and materials for actuating devices.

In early 1995, Hercules sold the smokeless gunpowder business to Alliant Techsystems (Alliant), who operated the facility until December 31, 1996. Hercules re-acquired control of the facility on January 1, 1997 and as the property owner is responsible for the remediation and closure of the facility for sale or reuse. Appendix J presents a detailed

description of the Facility history, including summaries of previous environmental investigations.

2.0 TRIAD APPROACH

The triad approach is a process that promotes a routine and fluid exchange of information/ideas between the responsible party (Hercules) and the regulatory community (NJDEP) so that more timely and cost effective site investigation and cleanup can be performed. The triad approach was used routinely throughout the RI and was a major factor in the development of the RIWP, field sampling decision making process, and development of the five volume media-specific RIR. The triad approach is also anticipated to be a key component of the NJDEP review of the RIR and future restoration activities performed at the Facility.

Initially, the triad approach was implemented primarily as a verbal guidance tool used by Hercules and the former NJDEP case manager (Mr. Paul Harvey). However, as decisions became more complex and detail oriented, the triad approach meetings were documented through meeting minute notes developed by Hercules. Draft meeting minute notes were provided to the NJDEP for comment prior to finalization. The meeting minute notes are included as Appendix D.

The majority of the triad meetings were held as teleconferences with the addition of two meetings located at the Facility. Key information provided and decisions made with the triad approach included the following:

- In-depth presentation of the Facility history and site walk of the property;
- Development and submission of the RIWP that replaced the Area I RIWP;
- Progress of field activities and discussion of preliminary analytical results;
- Addition of sample locations based on preliminary analytical results;
- Refinement of sample collection procedures based on field experiences;
- Selection of FECs for detailed result presentation;
- Selection of information and format included in each volume of the RIR; and,
- Identification of site specific screening levels when no NJDEP criteria were available.

3.0 SCOPE OF WORK

The following sections summarize the field sampling scope of work for analytical samples collected during the RI, as presented in each media-specific RIR volume (Volume B – Soils, Volume C – Groundwater, Volume D – Sediment, and Volume E – Surface Water). The RI activities were conducted in accordance with N.J.A.C. 7:26E – 4.1 through 4.7 and the RIWP. A total of 2,019 samples were collected from 1,185 sample locations during the RI and where appropriate, used in conjunction with previously collected SI data to define the nature and extent of constituents present at concentrations exceeding the applicable media-specific cleanup criteria, presented below:

- Soil - A total of 1,295 soil samples were collected from 611 locations during the RI. All samples were analyzed for the RI-specific constituents, described in Section 3.3.
 - o 795 horizontal and vertical soil samples were collected from 395 Area of Concern (AOC) or grid based sample locations;
 - o Seven vertical delineation soil samples were collected from seven SI AOC-based locations;
 - o 485 horizontal and vertical delineation soil samples were collected from 208 locations from 44 AOCs reserved for the RI during the SI; and,
 - o Eight soil samples were collected from eight hydraulic oil pipeline trench sample locations from seven trenches.
- Groundwater - A total of 169 groundwater samples were collected from 112 locations during the RI. All samples were analyzed for the RI-specific constituents, described in Section 3.3.
 - o Two synoptic rounds of depth-to-water (DTW) measurements in the monitoring well network;
 - o Hydraulic conductivity (slug) testing of 19 monitoring wells;
 - o 73 horizontal and vertical delineation groundwater samples were collected from 73 monitoring well locations;
 - o 88 horizontal and vertical delineation groundwater samples were collected from 31 cone penetrometer (CPT) locations; and,

- o Eight groundwater samples were collected from eight hydraulic oil pipeline trench sample locations from seven trenches.
- Sediment - A total of 403 sediment samples were collected from 310 locations during the RI. All samples were analyzed for the RI-specific constituents, described in Section 3.3.
 - o 310 horizontal delineation sediment samples were collected from 310 sample locations; and,
 - o 93 vertical delineation sediment samples were collected at 93 horizontal sample locations where constituents were identified at concentrations exceeding the applicable cleanup criteria.
- Surface Water – A total of 152 surface water samples were collected from 152 locations during the RI. All samples were analyzed for the RI-specific constituents, described in Section 3.3.
 - o 124 discrete horizontal delineation surface water samples were collected from 124 sample locations; and,
 - o 28 composite horizontal delineation surface water samples were collected from Duck Pond and Shooting Pond.
 - o Field testing for pH and hardness at all sample locations.

Detailed descriptions of field tasks are provided in the RIWP. Sample handling, QA/QC procedures, and analytical methodologies are provided in the AQAPP (Appendix F). Field procedures and methodologies are provided in the FQAPP (Appendix G). Health and safety protocols are provided in the SSHSP (Appendix E).

3.1. SURVEYING OF SAMPLE LOCATIONS

All sample locations were surveyed as required by the Technical Requirements [N.J.A.C. 7:26E-3.3(c)3v(1)]. Surveying was accomplished using a combination of global positioning system (GPS) and traditional electronic distance measurement (EDM) equipment. GPS, with sub-meter accuracy, was the primary survey method for surface water/sediment/soils sample unless physiographic features blocked communication with GPS satellites, requiring conventional survey methods to obtain survey data. Monitoring wells were surveyed by a licensed New Jersey land surveyor using EDM equipment. The

horizontal survey control was referenced to the New Jersey State Plane coordinate system and the vertical survey control was referenced to the North American Vertical Datum (NAVD 1988).

3.2. INVESTIGATION-DERIVED WASTE MATERIAL MANAGEMENT

All investigation-derived waste (IDW) generated, as part of this investigation was managed to ensure compliance with state and federal regulations and to ensure a clean and safe workplace existed for field personnel. The specific IDW materials management procedures are described in Section 14.0 of the FQAPP (Appendix G).

3.3. LABORATORY ANALYSIS

All samples were analyzed for a media-specific suite of constituents based on the analytical results of the samples collected during the media-specific SIs (i.e., Soils-SI, GW-SI, SW/SD-SI). The media-specific RI analyte lists are comprised of any constituent identified at concentrations exceeding the applicable cleanup criteria in the media-specific SIs. Tables A-1 through A-4 present the RI specific analytical sampling requirements for soil, groundwater, sediment, and surface water, respectively.

The samples were submitted to LLI of Lancaster, Pennsylvania for laboratory analysis except for soil samples submitted for Diazodinitrophenol (DDNP) analysis. Twenty-three soil samples (collected at AOC H8-1) were submitted for DDNP analysis which was performed by General Physics Laboratory (GPL) of Frederick, MD. Per N.J.A.C. 7:26E-2.1, LLI and GPL are certified to provide laboratory services in the State of New Jersey (Certification Nos. 77011 and 60671 respectively). Sample handling and QA/QC procedures as well as analytical methodologies are provided in the AQAPP.

4.0 DATA QUALITY CONTROL

This section is a summary of the quality control review results for samples collected during the RI. LLI performed the chemical analyses for majority of the samples, and GPL performed DDNP analysis for 23 soil samples. All samples were validated by a third-party validator in accordance with the following Region II Standard Operating Procedures (SOPs) for data validation:

- Inorganics: Evaluation of Metals Data for the Contract Laboratory Program, USEPA (United States Environmental Protection Agency) Region II SOP HW-2, Revision 11, January 1992;
- Organics: Evaluation of Organic Data for the Contract Laboratory Program, USEPA Region II SOP HW-6, Revision 12, March 2001; and,
- Explosives: Explosives Residue SOP, USEPA Region II, Revision 1.3, September 1994.

The field samples and associated quality control samples were validated for the following parameters:

Analytical Group	Analytical Method	Soil	Groundwater	Sediment	Surface Water
VOCs	SW-846-8260B	X	X	X	X
Semi-Volatile Organic Constituents (SVOCs)	SW-846-8270C	X	X	X	X
Total Polychlorinated Biphenyls (PCBs)	SW-846-8082	X	X	-	-
Total Metals	SW-846-6010B	X	X	X	X
Dissolved Metals	SW-846-6010B		X		X
Mercury - Aqueous Mercury –Solid	SW-846-7470 A SW-846-7471 A	X	X	X	X
E&E	SW-846-8330	X	X	X	X
E&E – Nitrocellulose (NC)	Indiana Army Arsenal Procedure (IAAP)	X	-	X	-
E&E – NG – Aqueous E&E – NG – Solid	SW-846-8332 SW-846-8330	X	X	X	-
E&E - DDNP	SW-846-8330 A modified	X	-	-	-
E&E - Perchlorate	SW-846-8321 modified	-	X	-	-
Petroleum Hydrocarbons (PHCs)	SW-846-8015	X	X	-	-
General Chemistry - Ammonia Nitrogen	USEPA 350.2	-	X		
General Chemistry - Nitrite Nitrogen	USEPA 353.2	-	X	-	-
General Chemistry - Nitrate Nitrogen	USEPA 353.2	-	X	-	-
General Chemistry - Percent Solids	E160.3	-	-	X	-
General Chemistry - Total Organic Carbon (TOC)	Lloyd Kahn	-	-	X	-

Detailed analytical methodology and laboratory QA/QC specifications are provided in Section 6.0 of the AQAPP (Appendix F).

The quality of the data was assessed according to the USEPA's PARCC (precision, accuracy, representativeness, comparability and completeness) parameters. These criteria were used to identify unacceptable or biased data that could result in corrective actions being implemented, or otherwise require qualification of the data.

4.1. DATA QUALITY OBJECTIVES

The data quality objectives (DQOs) set forth in the AQAPP and the comparison of these DQOs with actual laboratory data results are summarized in the following table. Only DQOs specific to definitive data and resulting data validation are summarized.

DQO SUMMARY FOR DATA VALIDATION PARAMETERS

Parameter	Sample Media	DQO Goal	DQO Met?	Comments
Sample documentation	SO/GW/ SD/SW	100%	Yes	Discrepancies were noted by laboratory and resolved.
Chain-of-custody documentation	SO/GW/ SD/SW	100%	Yes	Discrepancies were noted by laboratory and resolved.
Instrument calibration meets laboratory's specification	SO/GW/ SD/SW	100%	Yes	Data exceeding criteria were qualified.
Analyte identification and quantification	SO/GW/ SD/SW	100%	Yes	
Trip blanks for VOCs	SO/GW/ SD/SW	1 per cooler	Yes	
Instrument blanks	SO/GW/ SD/SW	GC -every 10 samples	Yes	
		GC/MS – every 12 hours	Yes	
		Metals – every 10 samples	Yes	
Laboratory method blank	SO/GW/ SD/SW	1 per SDG	Yes	
Equipment blank	SO/GW/ SD/SW	1 per day	Yes	Sampled as appropriate.
Laboratory precision and accuracy	SO/GW/ SD/SW	100% within established limits for MS, LCS, duplicates, surrogates.	Yes	Data exceeding precision and accuracy limits were qualified.
Laboratory MDLs<PQLs	SO/GW/ SD/SW	100%	Yes	
LCS samples	SO/GW/ SD/SW	100% within established limits per SDG	Yes	Data exceeding limits were qualified.
MS/MSD samples	SO/GW/ SD/SW	5%	Yes	
Field duplicates	SO/GW/ SD/SW	5%	Yes	

Notes: SO = soil, GW = groundwater, SD = sediment, SW = surface water, GC = Gas Chromatograph, MS = Mass Spectrometer, MDL = method detection limit, PQL = practical quantitation limit, MS = matrix spike, MSD = matrix spike duplicate, LCS = laboratory control sample, SDG = sample delivery group

All analytical DQOs as set forth in the AQAPP were met. Data that exceeded limits for LCS and MS/MSD samples were qualified in accordance with the USEPA Region II SOPs as applicable.

4.2. SUMMARY OF DATA QUALITY AND RELIABILITY

The evaluation of the data against PARCC criteria provided information on the data quality and reliability. The results of this evaluation indicate that all data are of known and acceptable quality, based on the laboratory-established acceptance control limits or USEPA guidance. These data are considered valid and useable for decision-making purposes.

5.0 COMPARISON CRITERIA AND FREQUENT EXCEEDANCE CONSTITUENT SELECTION

The following sections summarize the comparison criteria and frequent exceedance constituent (FEC) selection processes by media.

5.1. SELECTION OF COMPARISON CRITERIA

The following sections present the regulatory criteria selected for comparison to the laboratory analytical results. In all cases, an established NJDEP criterion was first sought or calculated for each constituent using NJDEP guidance. In the event an established NJDEP criterion was not available or could not be calculated using NJDEP guidance, an existing alternate criterion was either selected or calculated based on nationally recognized sources.

The intent of using the alternate criteria is to provide a screening level indication for the evaluation of potential environment influence of detected constituents that are without established NJDEP criteria. Tables A-1 through A-4 present a complete list of the applicable comparison criteria and sources applied in the RIR. The criteria are summarized below.

5.1.1 Soil Quality Criteria

The analytical results of the soil samples were compared to the following regulatory criteria:

- NJDEP Soil Cleanup Criteria revised on May 12, 1999 (NJSCC 1999), including Impact to Groundwater Soil Cleanup Criteria (IGWSCC), Residential Direct Contact Soil Cleanup Criteria (RDCSCC), and Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC);
- Criteria for several E&E constituents, 2,4-Dinitrotoluene (2,4-DNT) and 2,6-Dinitrotoluene (2,6-DNT) (SVOCs) were provided to Hercules by NJDEP in a letter on June 19, 2003, including IGWSCC, RDCSCC, and NRDCSCC; and,

- Criteria for three SVOCs (1,2-Diphenylhydrazine (DPHY12), Benzidine (BZD), and N-nitrosodimethylamine (NNSM)) were obtained from the proposed New Jersey Draft Soil Remediation Standards published in the New Jersey Register on July 19, 2004, including IGWSCC, RDCSCC, and NRDCSCC.

5.1.2 Groundwater Quality Criteria

The analytical results of the groundwater samples were compared to the following regulatory criteria:

- NJDEP Groundwater Quality Standards Specific Groundwater Quality Criteria Class – IIA, re-adopted in October 2005 (NJDEP GWQS);
- USEPA Region III Risk Based Criteria (RBC) – October 2006;
- USEPA Region III Risk Based Criteria (RBC) – April 2006;
- Criteria for 2-Amino-4,6-Dinitrotoluene (2-A-DNT) and 4-Amino-2,6-Dinitrotoluene (4-A-DNT) were calculated following the NJDEP GWQS guidelines; and,
- Criterion for Perchlorate was provided by NJDEP during the RIR development in September 2006.

5.1.3 Sediment Quality Criteria

The analytical results of the sediment samples were compared to the following regulatory criteria:

- NJDEP Freshwater Sediment Screening Guidelines (FSSG) Lowest Effects Level (LEL) and NJDEP FSSG SEL;
- USEPA (Mid-Atlantic) Ecological Risk Assessment Freshwater Sediment Screening Benchmarks (USEPA SSB);
- Sediment Screening Benchmarks (SSB) retrieved from the Oak Ridge National Laboratory Risk Assessment Information System (RAIS); and,
- Preliminary Remediation Goals for Ecological Endpoints published by Efroymson, R.A., G.W. Suter II, B.E. Sample, D.S. Jones. 1997, of the U.S. Department of Energy, ES/ER/TM-162/R2 (DOE PRGEE).

5.1.4 Surface Water Quality Criteria

The analytical results of the surface water samples were compared to the following regulatory criteria:

- NJDEP Surface Water Quality Standards (SWQS) as specified in N.J.A.C. 7:9B October 2006. Specifically, all the connected surface water bodies that flow from the Facility to the Lamington River were compared to the NJDEP SWQS Fresh Water Class 2 – Non Trout Production Criteria 1 (FW2-NT(C1)) for human health and aquatic life parameters, as assigned by the N.J.A.C 7:9B to the Lamington River (Succasunna) – Source to Rt. 206 bridge section. Surface water bodies within the Facility that are isolated from and do not contribute surface water to the Lamington River were compared to the NJDEP SWQS FW2-NT human health and aquatic life criteria as specified by N.J.A.C. 7:9B; and,
- Criteria for E&E constituents and Benzo(g,h,i)perylene were developed according to 1998 USEPA Ambient Water Quality Criteria Derivation Methodology (AWQC), applicable to NJ surface water FW2-NT. The calculation is provided in detail in Table E-5 of Volume E – Surface Water.

5.2. MEDIA-SPECIFIC FEC SELECTION

The FEC concept was developed to assist RIR reviewers with assimilating an enormous amount of data in an efficient manner. FECs are generally defined as those constituents with significant percentages of detected concentrations above the corresponding media-specific criteria (determined by the number of exceedances divided by the total number of analyses for a specific constituent). FECs are identified for each media to facilitate and focus the site-wide understanding of key media-specific constituent exceedances. The concept will also be useful during development of the Remedial Action Selection Report (RASR) to identify constituents that will drive remedy selection. The FEC concept was not developed to eliminate any constituents of exceedance from future remedial action selection or compliance attainment. All constituents with media-specific cleanup criteria exceedances are included in the media-specific RIR volumes.

The basis for establishing the specific percentage of exceedances above which a constituent is considered an FEC varies from media to media but generally follows the

rationale that by setting the percentage at an appropriate level, the nature and extent of the FECs thereby defined will reasonably represent the overall site-wide nature and extent of exceedances in that media.

5.2.1 Soil FEC Selection

Soil FECs identified in the Soils-RIR are defined for the purpose of this report as constituents with detected concentrations exceeding the RDCSCC at relatively higher frequencies in each analytical group on a site-wide basis. The thresholds for each analytical group vary slightly, and are 5.5% (SVOCs), 5% (Metals), 2.5% (E&E) and 4% (Total PCBs). No VOCs were selected as FECs due to the overall low frequency of RDCSCC exceedances of VOCs (less than 0.6%). The following nine FECs were identified for soil:

- SVOCs: Benzo(b)fluoranthene (BZBF), Benzo(a)pyrene (BZAP), and 2,4/2,6-Dinitrotoluene (2,4/2,6-DNT);
- Metals: Lead, Arsenic, and Thallium;
- E&E: NG and TNT; and,
- Total PCBs.

5.2.2 Groundwater FEC Selection

Groundwater FECs identified in the GW-RIR are defined for the purpose of this report as constituents with detected concentrations exceeding the GWQS at a frequency greater than 4% on a site-wide basis (i.e., reported at concentrations above the GWQS in greater than 4% of all groundwater samples analyzed for the constituent during the RI). The following five FECs were identified for groundwater:

- 2-A-DNT;
- 4-A-DNT;
- NG;
- Hexahydro-1,3,5-Trinitro-1,3,5-Triazine (RDX); and,
- TNT

5.2.3 Sediment FEC Selection

Sediment FECs identified in the SD-RIR are defined for the purpose of this report as constituents with detected concentrations exceeding the LEL at a frequency greater than 35% on a site-wide basis (i.e., were reported at concentrations above the LEL in greater than 35% of all sediment samples analyzed for the constituent during the SI and RI. Arsenic (34.63%) was selected as a FEC at the request of the NJDEP Case Management team. The following four FECs were identified for sediment:

- Arsenic;
- Copper;
- Lead; and,
- Mercury.

5.2.4 Surface Water FEC Selection

Surface water FECs identified in the SW-RIR are defined as constituents with detected concentrations exceeding the SWQS at a frequency greater than 10% on a site-wide basis (i.e., were reported at concentrations above the SWQS greater than 10% of all surface water samples analyzed for the constituent during the RI). The following three FECs were identified for surface water:

- Total Arsenic;
- Total Lead; and,
- Total Mercury.

6.0 REMEDIAL INVESTIGATION CONCLUSIONS

The following sections present a summary of conclusions from each media-specific RIR volume. These conclusions are based on the evaluation of:

- 3,309 analytical soil samples (1,295 RI samples and 2,014 SI samples),
- 326 analytical groundwater samples (169 RI samples and 157 SI samples),
- 530 analytical sediment samples (403 RI samples and 127 SI samples), and,
- 272 analytical surface water samples (152 RI samples and 120 SI samples).

The results of SI sampling and analyses were used to select the focused laboratory analyses performed in the RI. The analytical results of each media were evaluated to determine the nature and extent of constituents exceeding the applicable cleanup criteria.

In addition to laboratory analyses, key site personnel historic knowledge and professional judgment based on extensive historic E&E manufacturing operations were considered. Key personnel consulted included Harry Pascoe (Facility Historian and former Employee), Karl Broton (former Facility Employee), Peter Braxton (former Facility Employee and Area Manager), Raymond Hunt (former Facility Safety and Environmental Manager), James Bevis (present Facility Manager), and Edward Meeks (Energetic Materials Specialist).

6.1. SOIL REMEDIAL INVESTIGATION CONCLUSIONS

The following section provides the conclusions for Volume B - Soils of the RIR. These conclusions are based on the evaluation of 3,309 laboratory analyzed soil samples (1,295 RI samples and 2,014 SI samples) collected throughout the Facility. The SI samples were analyzed for VOCs, SVOCs, Metals, E&E, and PCBs. The results of SI sampling and analyses were used to select the focused laboratory analyses performed in the RI (Table A-1). Specifically, the RI analyte list is comprised of any constituent identified at concentrations exceeding the applicable soil cleanup criteria presented in the Soils-SI (Table A-5).

6.1.1 Quality Assurance/Quality Control

The required sample frequencies and analytical suites presented in the RIWP were met for all soil samples collected during the RI with the exception of 20 samples that could not be collected due to refusal or lack of recovery (discussed in Section 2.4.5 – Volume B-Soils). However, due to the large number of samples collected, the intent of the RI was met and these samples were not necessary.

The DQOs established for laboratory analysis of samples collected in the field were met. The evaluation of the laboratory analysis against the USEPA precision, accuracy, representativeness, comparability, and completeness parameters determined that the laboratory data are of known and acceptable quality as qualified. Therefore, the laboratory data generated for the Soil RI are considered valid and usable for decision making-purposes.

6.1.2 Historic Fill

In order to allow expansion of the Facility over its history, fill material was imported from off-site to increase grade and support new construction. Historic fill is present on a significant portion of the Facility, and composed primarily of fly ash, bottom ash, and slag from off-site coal fired boilers. Due to the short duration of the major expansion from 1912 to 1914 only a small portion of the total historic fill could have been provided from on-site boilers. The historic fill is believed to have possessed Metal and Polynuclear Aromatic Hydrocarbons (PAH) constituents prior to entering the facility.

The deposition of historic fill appears to be widespread and heterogeneously distributed at the Facility. The total estimated areal extent of historic fill at the Facility is 161 acres. Given the broad distribution, it is likely that additional historic fill will be encountered throughout the formerly developed portions of the Facility.

Analytical samples collected during the SI and RI within areas of known historic fill exhibit a wide range of detected constituent concentrations. The detected constituents and constituent concentrations of historic fill samples are similar to the constituents and

constituent concentrations in Table 4-2 of N.J.A.C 7:26E-4.6 Remedial Investigation of Landfills and Historic Fill Material (Summary of Target Contaminant Concentrations in Typical Historic Fill Material). However, the concentrations of detected historic fill constituents are not consistent within the historic fill sample data set, suggesting that it had multiple sources.

6.1.3 Historical Redevelopment, Reworking and Decontamination

The Facility was operational for approximately 125 years and underwent substantial redevelopment activities including capital improvements and expansion activities, re-grading of the ground surface, demolition and decontamination activities, etc. These activities significantly disturbed the ground surface resulting in atypical heterogeneity. The Facility ceased operations in 1996 and underwent further demolition activities from 1996 to the present, further disturbing the ground surface.

Analytical samples collected for the Soils-SI were collected from 1999-2001, during the demolition activities initiated after the Facility closure. Disturbance of surface and near surface soil after the completion of the SI may have had an effect on concentrations of some constituents in some areas. Introduction of oxygen caused by physical movement of the soil may have promoted volatilization and biodegradation of some constituents. Furthermore, the breakdown of some constituents may have been promoted by the exposure to ultraviolet rays in sunlight. While these effects are likely minimal, results from the Soils-SI can be considered slightly conservative.

6.1.4 Analytical Results

The results of the laboratory analysis of the soil samples identified a total of 9,012,622 square feet (sq. ft.) site-wide with constituents detected at concentrations exceeding the IGWSCC, the RDCSCC or the NRDCSCC (Figure A-4), presented below by analytical group:

Analytical Group	Square Footage of IGWSCC Exceedances	Square Footage of RDCSCC Exceedances	Square Footage of NRDCSCC Exceedances
VOCs	99,523	51,497	0
SVOCs	2,951,659	2,188,283	1,366,838
Metals	NA	5,596,892	5,061,505
E&E	1,486,191	776,056	354,042
Total PCBs	12,295	671,121	116,347
Composite (Net)*	3,775,558	7,621,458	6,122,695

Note: Metals do not have IGWSCC

* = The composite (net) number represents the square footage of IGWSCC, RDCSCC, and NRDCSCC area exceedances incorporating all analytical groups site-wide. It is possible for an area exceedance to have identified more than one analytical group with constituents present at concentrations exceeding the IGWSCC, RDCSCC, or NRDCSCC. Therefore, the composite (net) number may not represent the sum of the square footage for each analytical group.

Within the areas identified in the table above, the results of the laboratory analysis of soil samples identified five VOCs, 19 SVOCs, 12 Metals, 8 E&E, and Total PCBs at concentrations exceeding the IGWSCC, RDCSCC or the NRDCSCC.

- Limited influence to groundwater from constituents in soil were noted across the site with two exceptions;
 - o Soil samples collected from the southern portion of Grid L10 and northern portion of Grid L11 indicate TNT and 2,4/2,6-DNT at concentrations exceeding the IGWSCC. Groundwater samples collected from this area, specifically MW-27, indicate TNT breakdown constituents (2-A-DNT, 4-A-DNT) and 2,4/2,6-DNT at concentrations exceeding the GWQS, as illustrated in Volume C–Groundwater RIR; and,
 - o Soils with constituents detected at concentrations exceeding the IGWSCC show a connection to groundwater quality in the TNT Area, the PETN Area, and the western Dynamite and NG Areas. Groundwater samples taken in these areas indicate TNT, TNT breakdown constituents (2-A-DNT, 4-A-DNT), 2,4/2,6-DNT and NG exceeding the GWQS, as illustrated in Volume C – Groundwater RIR.

- VOCs were detected at concentrations exceeding either the RDCSCC/NRDCSCC at very few sample locations and do not represent a significant environmental condition. The source for the VOCs is believed to be small historic single release events (likely attributed to maintenance activities);
- SVOCs detected at concentrations exceeding either the RDCSCC or NRDCSCC at the Facility are comprised primarily of PAH constituents. These constituents are primarily associated with the historically common practice of using fly ash, bottom ash, and slag as fill material (historic fill) to improve the grade of the Facility, recover unusable land, and establish numerous narrow gauge rail beds. To a lesser extent, these constituents are associated with historic manufacturing operations where these exceedances do not occur within the historic fill contour;
- 2,4/2,6-DNT (SVOC) detected at concentrations exceeding either the RDCSCC or NRDCSCC at the Facility are associated with historic manufacturing operations;
- Metals detected at concentrations exceeding either the RDCSCC or NRDCSCC at the Facility are primarily associated with the historically common practice of using fly ash, bottom ash, and slag as fill material (historic fill) to improve the grade of the Facility, recover unusable land, and establish numerous narrow gauge rail beds. To a lesser extent, these constituents are associated with historic manufacturing operations where these exceedances do not occur within the historic fill areal extent contour;
- E&E constituents detected at concentrations exceeding either the RDCSCC or NRDCSCC at the Facility are associated with historic manufacturing operations; and,
- Total PCBs detected at concentrations exceeding either the RDCSCC or NRDCSCC in the central Maintenance Area are associated with historical maintenance, power generation and power transmission activities. Other isolated exceedances are potentially due to the presence of individual transformers at various locations throughout the Facility.

Constituents detected above the Soil Cleanup Criteria (SCC) are contained within the Facility and occur primarily within the former operational areas. The horizontal extent of constituents detected at concentrations exceeding the SCC is well defined. The vertical extent of constituents detected at concentrations exceeding the SCC is largely defined. Limited additional characterization may be warranted prior to selecting the appropriate remedial action in the forthcoming RASR.

6.2. GROUNDWATER REMEDIAL INVESTIGATION CONCLUSIONS

The following section provides the conclusions for Volume C-Groundwater of the RIR. The conclusions are based on the evaluation of 326 laboratory analyzed groundwater samples (169 RI samples and 157 SI samples) collected throughout the Facility. The SI samples were analyzed for the USEPA Priority Pollutant List (PPL) VOC, SVOC, and Metals, E&E, and PCBs (in select locations). The results of SI sampling and analysis were used to select the focused laboratory analysis performed in this RI (Table A-2). Specifically, the RI analyte list is comprised of any constituent identified at concentrations exceeding the applicable comparison criteria presented in the GW-SI.

6.2.1 Quality Assurance/Quality Control

The required sample frequencies and analytical suites presented in the RIWP were met for all groundwater samples collected during the RI, with two exceptions, MW-22 and MW-5P. The proposed samples could not be collected from these wells because of casing interference caused by previous damage. However, due to the large number of samples collected, the intent of the RI was met and these samples were not necessary.

The data quality objectives established for laboratory analysis of samples collected in the field were met. The evaluation of the laboratory analysis against the USEPA precision, accuracy, representativeness, comparability, and completeness parameters determined that the laboratory data are of known and acceptable quality as qualified. Therefore, the laboratory data generated for the groundwater RI are considered valid and usable for decision making-purposes.

6.2.2 Geology/Hydrogeology

Three primary aquifers are present underlying the Facility. The valley-fill and carbonate rock aquifer system consists of the Upper Valley Fill Aquifer (UVFA), Lower Valley Fill Aquifer (LVFA), and carbonate rock aquifer. The UVFA and LVFA are hydraulically separated by the upper confining unit. The LVFA and the carbonate rock aquifer are hydraulically separated by a basal confining unit.

Groundwater flow directions within the UVFA underlying the Facility is locally variable due to elevated topographic areas and interaction with surface water bodies however two predominant flow directions are present (Figure A-5). The groundwater divide evident in the vicinity southeast of Duck Pond causes groundwater to flow either toward the southwest (Areas II and III) or northeast (northern portion of Area I). The southwestern flow component is the largest flow regime present at the Facility and underlies the majority of the former manufacturing areas. The two prominent bedrock ridges present do not contain any known faults that bisect the ridges and therefore act as horizontal no flow boundaries.

Topographically elevated portions of the Facility (ridges and locations of terminal moraine deposition) act as groundwater recharge zones and the highest hydraulic gradients/average linear groundwater flow velocities are identified in these areas. Topographically elevated areas also typically display a net downward vertical hydraulic gradient.

The topographic low regions of the central valley portion of the Facility act as groundwater discharge zones and the lowest hydraulic gradients/average linear flow velocities are identified in these areas. Topographically low regions typically display a net upward vertical hydraulic gradient and are attributed to the formation of the wet areas predominately present within Area II.

6.2.3 Health and Safety Screening for E&E Constituents

The results of the health and safety screening for E&E constituents indicated NG and other E&E constituents were not present at concentrations that posed an explosive hazard at the selected sampling locations. Additionally, the detected concentrations of NG suggest that there is not a large free phase accumulation of NG present at the Facility. However, considering the long operational history of the Facility, the possibility of encountering localized accumulations of free phase NG (primarily within NG, Dynamite, PETN, and southern/eastern TNT Areas) that may present an explosive hazard cannot be eliminated.

6.2.4 Analytical Results

The results of the laboratory analysis of the groundwater samples identified two discernable E&E plumes and 13 isolated points of exceedance present at the Facility based on constituent concentrations detected at levels exceeding the GWQS (Figure A-6). Within the two identified groundwater plumes and 13 isolated points of exceedance, the laboratory results identified the presence one VOC, eight SVOCs, six Total Metals, six E&E, and Total PCBs at concentrations exceeding the GWQS.

The two E&E plumes and 13 isolated points of exceedance do not appear to significantly affect surface water quality. The groundwater/surface water connection is further evaluated in Volume E–Surface Water RIR.

The larger of the two identified groundwater plumes contains several E&E constituent exceedances and is present within Area II underlying portions of the TNT, PETN, Dynamite, and Miscellaneous/Offsite Areas. The following conclusions are drawn concerning this plume:

- The groundwater results for GW-CPT-4, MW-39, MW-47, GW-CPT-5, GW-CPT-8, MW-43, MW-46, MW-19, GW-CPT-17, MW-44, GW-CPT-14, SW-R-D14-01/06/07, GW-CPT-18, GW-CPT-19, GW-CPT-20, GW-CPT-13, MW-45, GW-CPT-22, GW-CPT-21, MW-28, MW-28D, GW-CPT-24, SW-R-B14-01/02 indicate the presence of one or more of the following E&E constituents at concentrations exceeding the GWQS: TNT, 2-Amino-DNT, 4-Amino-DNT, RDX, NG, and Perchlorate;
- The presence of 2-Amino-DNT and 4-Amino-DNT identified within the plume area indicates natural attenuation of TNT is occurring;
- The horizontal and vertical limits of this plume have not been defined by GWQS compliance with analytical data in the southwestern side-gradient direction below the ridge. The remainder of the plume area has been defined horizontally and vertically; and,
- The UVFA is very thin on the ridge within the plume area and the LVFA is not anticipated to be present. The basal confining unit is expected to be present underlying the UVFA preventing the downward migration of constituents.

The smaller of the two identified groundwater plumes only contains RDX exceedances and is present within Area III underlying portions of the A-Line, Diazo, and Development Areas. The following conclusions are drawn concerning this plume:

- The groundwater results for MW-17, MW-34, and MW-16 indicate the presence of RDX at concentrations exceeding the GWQS; and,
- The horizontal and vertical limits of this plume have been defined by GWQS compliance.

The following conclusions are drawn concerning the 13 isolated points of exceedance:

- Two wells (MW-18 and MW-27) were identified with more than one isolated constituent exceedance;
- Trichloroethylene (TCE) detected at a concentration exceeding the GWQS at point of exceedance MW-18 is likely a result of a historic single release event (i.e., repair of equipment). Adjacent groundwater locations did not have exceedances of TCE and the level of exceedance indicate that this is a localized exceedance and therefore, does not represent a significant environmental condition. TCE was detected at an estimated concentration of 2 ug/l and cannot contribute to the regional TCE plume underlying the borough of Kenvil;
- SVOCs detected at concentrations exceeding the GWQS at GW-R-TR-03 are comprised primarily of PAH constituents. These constituents are associated with the historically common practice of using fly ash as fill material (historic fill) to improve the grade of the Facility, recover unusable land, and establish numerous narrow gauge rail beds. It is believed advancement of the trench disturbed the historic fill and caused fine grained particles to mix with the shallow groundwater encountered within the exposed area. The disturbed particulates do not represent natural groundwater conditions;
- The fingerprint scan performed on samples GW-R-TR-02/04/05 indicated the potential presence of residual motor or lubricating oil. Motor/lubricating oil is not indicative of high pressure hydraulic oil and is not associated with the former hydraulic pipelines. These samples were collected adjacent to the Maintenance Area and likely represent residuals from historic maintenance activities;
- 2,4/2,6-DNT detected at concentrations exceeding the GWQS at MW-27 and MW-47 are associated with historic operations;

- Metals detected at concentrations exceeding the GWQS at MW-10, MW-16, MW-18, MW-33, MW-38D, MW-44 and OB-2 are associated with historic operations which may have mobilized naturally occurring metals;
- E&E constituents detected at concentrations exceeding the GWQS at MW-27, MW-35D, MW-J1 and, OB-1 are associated with historic operations; and,
- Total PCBs detected at concentrations exceeding the GWQS at point of exceedance MW-41D are associated with a potentially isolated transformer that may have been damaged during a Facility explosion.

Of the 326 groundwater samples collected, only 13 isolated points of exceedance, one small plume consisting of one E&E compound and one larger plume consisting of several E&E compounds were identified. In addition, no free phase material was encountered. The larger plume requires some additional delineation along its southwestern edges but is otherwise well defined. In addition, the larger plume is demonstrating evidence of natural attenuation of at least one of its constituents.

Groundwater quality at the Facility is well defined. Limited additional characterization of one focused area will fully define all GWQS exceedances at the site. Given the long industrial history of the Facility, groundwater is largely unaffected by historic site operations.

6.3. SEDIMENT REMEDIAL INVESTIGATION CONCLUSIONS

The following section provides the conclusions for Volume D-Sediment of the RIR. These conclusions are based on the evaluation of 530 laboratory analyzed sediment samples (403 RI samples and 127 SI samples) collected throughout the Facility. The SI samples were analyzed for VOCs, SVOCs, Metals, E&E, and General Chemistry. The results of SI sampling and analyses were used to select the focused laboratory analyses performed in the RI (Table A-3). Specifically, the RI analyte list is comprised of any constituent identified at concentrations exceeding the applicable soil cleanup criteria presented in the Soils-SI (Table A-6).

6.3.1 Quality Assurance/Quality Control

The required sample frequencies and analytical suites presented in the RIWP were met for all sediment samples collected during the RI, with the exception of 14 proposed samples that were not able to be collected during the RI field event (Section 2.2). These sample locations either were dry or have been back-filled during the site redevelopment activities, so that they are no longer locations of sediment deposition and are redefined as soils. These samples are included in Volume B – Soils Remedial Investigation. However, due to the large number of samples collected, the intent of the RI was met and these samples were not necessary.

The data quality objectives established for laboratory analysis of samples collected in the field were met. The evaluation of the laboratory analysis against the USEPA precision, accuracy, representativeness, comparability, and completeness parameters determined that the laboratory data are of known and acceptable quality as qualified. Therefore, the laboratory data generated for the sediment RI are considered valid and usable for decision making-purposes.

6.3.2 Analytical Results

There are no site-related constituents with an established LEL or SEL exiting the Facility in sediment. Metal and SVOC constituents identified in the SI sediment sample SD-E16-3-01 at concentrations exceeding the LEL or SEL adjacent to the only surface water discharge point SW-E16-3-01 are attributed to impacts from Route 46. Sediment samples collected during the RI at the same location and up-gradient did not indicate any Metal or SVOC exceedances. Similar effects were observed at all surface water inflow points adjacent to roads Route 46 and Howard Boulevard and the New Jersey Transit Rail. The metal constituents were likely mobilized by surface water runoff from the roadway/rail during precipitation events and deposited into the Facility's surface water bodies. Potential sources of the metal constituents are discarded metal debris and oxidizing roadway devices (signs/guard rails/fencing).

The results of the laboratory analysis of the sediment samples identified the following regions site-wide with constituents detected at concentrations exceeding the LEL or SEL (Figure A-7), presented below by analytical group:

Analytical Group	Number of Discrete Stream Segment/Area Exceedances	Linear Footage of Discrete Stream Segment Exceedances	Square Footage of Discrete Area Exceedances
VOCs	2	115	43,036
SVOCs	38	9247	323,382
Metals	33	18,671	750,175
E&E	16	1815	25,823
Composite (Net)*	33	20,860	750,175

* = The number of composite stream segments/areas of exceedances, linear footage of discrete stream segment exceedances, and square footage of discrete area exceedances represents the number of individual stream segments or areas with constituents present at concentrations exceeding the LEL or SEL incorporating all analytical groups. It is possible for an individual stream segment or area to have identified more than one analytical group with constituents present at concentrations exceeding the LEL or SEL. Therefore, the composite number may not represent the sum of the stream segments/areas of exceedances, linear footage of discrete stream segment exceedances, or square footage of discrete area exceedances divided into analytical groups.

Within the 33 identified regions of exceedance, the laboratory results of the sediment SI and RI samples identified 1 VOC, 22 SVOCs, 10 Metals, and 5 E&E constituents at concentrations exceeding either the LEL or SEL.

- Tetrachloroethylene (PCE) detected at concentrations exceeding the LEL in the Western Drainage Area is not attributed to historic Facility operations. The sediment contamination appears to have been caused by contaminated groundwater discharge from off-site sources to surface water and sediment bodies. A large regional chlorinated VOC plume underlies the facility in the region of the Western Drainage Area. The chlorinated VOC plume is derived from off-site sources and has not been attributed to historic operations performed at the Facility. The PCE is likely entrained in the highly organic wet area sediments that are generally less than four ft. thick similar to other sample locations (SD-R-B15-05, SD-B15-2-01, SD-R-B15-04, and SD-R-C15-09) that detected PCE at concentrations exceeding the LEL. The NJDEP conducted a groundwater investigation of the southern portion of the Facility in March 1999 and based on verbal discussions with NJDEP concluded the Facility was not a source area for the regional plume;

- SVOCs detected at concentrations exceeding either the LEL or SEL at the Facility are comprised primarily of PAH constituents. These constituents are associated with the historically common practice of using fly ash as fill material (historic fill) to improve the grade of the Facility, recover unusable land, and establish numerous narrow gauge rail beds;
- Non-PAH SVOCs (2,4-DNT, 2,6-DNT, BZBF, Bis(2-Ethylhexyl) Phthalate (BIS2EHP), 4,6-Dinitro-2-Methylphenol (DN46M), Dn-N-Butyl Phthalate (DNBP), Diethyl Phthalate (DEPH), and NNSPH) detected at concentrations exceeding either the LEL or SEL at the Facility are associated with historic manufacturing processes;
- Metals detected at concentrations exceeding either the LEL or SEL at the Facility are associated with the historically common practice of using fly ash as fill material (historic fill) to improve the grade of the Facility, recover unusable land, and establish numerous narrow gauge rail beds. Prior to the 1920's, it is known that spent acids resulting from the nitration process of E&E manufacture (sour water) was discharged to the Facility's surface water bodies as no commercially viable means of recovering spent acids was available. The low pH sour water is believed to possibly contain metal constituents derived from contact with process vessels and piping. Detected concentrations of metal constituents exceeding either the LEL or SEL without associated PAH constituents attributed to historic fill are believed to be derived from the historic practice of discharging sour water to the surface water bodies; and,
- E&E constituents detected at concentrations exceeding the LEL at the Facility are associated with historic manufacturing operations.

Sediment quality at the Facility is well defined and all constituents detected above the LEL or SEL are contained within the boundary of the Facility. Considering the long operational history of the Facility the sediment quality is considerably unaffected by historic site operations.

6.4. SURFACE WATER REMEDIAL INVESTIGATION CONCLUSIONS

The following section provides the conclusions for Volume E-Surface Water of the RIR. These conclusions are based on the evaluation of 272 laboratory analyzed surface water samples (152 RI samples and 120 SI samples) collected throughout the Facility. The SI samples were analyzed for the USEPA PPL VOC, SVOC, Total Metals, Dissolved Metals, plus E&E, site related Ethers/Alcohols, and General Chemistry Parameters. The

results of SI sampling and analysis were used to select the focused laboratory analysis performed in this RI (Table A-4). Specifically, the RI analyte list is comprised of any constituent identified at concentrations exceeding the applicable comparison criteria presented in the SW/SD-SI.

6.4.1 Quality Assurance/Quality Control

The required sample frequencies and analytical suites presented in the RIWP were met for all surface water samples collected during the RI, with the exception of five sample locations that were not collected due to insufficient water at the sample locations. However, due to the large number of samples collected, the intent of the RI was met and these samples were not necessary.

The data quality objectives established for laboratory analysis of samples collected in the field were met. The evaluation of the laboratory analysis against the USEPA precision, accuracy, representativeness, comparability, and completeness parameters determined that the laboratory data are of known and acceptable quality as qualified. Therefore, the laboratory data generated for the surface water RI are considered valid and usable for decision making-purposes.

6.4.2 Surface Water/Groundwater Hydraulic Interaction

Prior to the RI, detailed information did not exist concerning the surface water/groundwater interaction at the Facility. However, staff gauges placed in Duck Pond, Shooting Pond, the unnamed pond within the Dynamite Area, and various streams and miscellaneous ponds located throughout the Facility indicate that surface water and shallow groundwater (water table) are hydraulically connected. The following surface water/groundwater interactions were noted:

- Duck Pond appears to receive groundwater discharge along its western section and recharges groundwater along its northern, southern, and eastern sections;
- Shooting Pond appears to recharge groundwater in all directions due to elevated topography and it is a man made surface water body;

- The unnamed pond in the Dynamite Area appears to primarily receive groundwater discharge from the northern, eastern, and western directions; and,
- The remaining streams and miscellaneous ponds either receive groundwater discharge or recharge groundwater depending on the local elevations of surface water and groundwater, largely dependant on topography.

6.4.3 Surface Water Mixing/Stratification

Vertical stratification of the surface water column is not present in the streams, wet areas, and shallow ponds located on the Facility. Vertical stratification is prevented from forming due to the shallow depths (less than 3-ft.), consistent disturbance from precipitation, and channel morphology.

Vertical stratification of the surface water column may be present within Duck Pond and Shooting Pond, the deepest surface water bodies present at the facility. Duck Pond's average depth is approximately 6-ft. and Shooting Pond's average depth is approximately 15-ft.

6.4.4 Analytical Results

There are no site-related constituents exiting the Facility in surface water in concentrations exceeding the SWQS. The results of the laboratory analysis of the surface water samples identified a total of 25 discrete stream segments/areas site-wide with constituents detected at concentrations exceeding the SWQS (Figure A-8), presented below by analytical group:

Analytical Group	Number of Discrete Stream Segment/ Area Exceedances	Linear Footage of Discrete Stream Segment Exceedances	Square Footage of Discrete Area Exceedances
VOCs	1	0	26,250
SVOCs	3	650	0
Total Metals	24	6,050	65,713
Dissolved Metals	2	100	16,563
E&E	5	500	1,250
Composite (Net) *	25	6,350	88,901

* = The number of composite stream segments/areas of exceedances, linear footage of discrete stream segment exceedances, and square footage of discrete area exceedances represents the number of individual stream segments or areas with constituents present at concentrations exceeding the SWQS incorporating all analytical groups. It is possible for an individual stream segment or area to have identified more than one analytical group with constituents present at concentrations exceeding the GWQS. Therefore, the composite number may not represent the sum of the stream segments/areas of exceedances, linear footage of discrete stream segment exceedances, or square footage of discrete area exceedances divided into analytical groups.

Within the 25 identified discrete stream segments/areas with exceedances, the results of the surface water sample laboratory analysis identified one VOC, three SVOCs, six Total Metals, four Dissolved Metals, and four E&E constituents at concentrations exceeding the SWQS;

- PCE detected at concentrations exceeding the SWQS in the southern Western Drainage Area is not associated with historic Facility operations. The PCE is attributed to the large regional chlorinated VOC plume that originates from offsite sources. This large regional chlorinated VOC plume has migrated through time and currently underlies a portion of the Facility in the region of the Western Drainage Area. Groundwater recharges surface water in this area causing the PCE derived from the offsite sources to enter surface water. The NJDEP conducted a groundwater investigation of the southern portion of the Facility in March 1999 and based on verbal discussion with NJDEP, the Department concluded the Facility was not a source area for the regional VOC plume;
- SVOCs detected at concentrations exceeding the SWQS in the Western Drainage Area and Central Drainage Area are comprised primarily of PAH constituents. PAH constituent concentrations detected above the SWQS are attributed to the presence of very fine grained sediments (silt sized and smaller) that have become suspended within the surface water column. These concentrations are not considered representative of dissolved PAH

concentrations. The very fine grained sediments have become suspended through a variety of natural stream processes (e.g. erosion, normal runoff, and flood events). The presence of the suspended sediment is transient, and influenced by factors such as the duration and intensity of precipitation events and seasonal variations in ground cover. The identified source of the PAH constituents is the historic fill used to improve the grade of the Facility, recover unusable land, and establish numerous narrow gauge rail beds within close proximity to the Facility's surface water bodies;

- The detected concentrations of 2,4-DNT (SVOC) at concentrations exceeding the SWQS in the Central Drainage Area are associated with historic manufacturing operations;
- Total Metals concentrations detected above the SWQS are attributed to the presence of very fine grained sediments (silt sized and smaller) that have become suspended within the surface water column. These concentrations are not considered representative of Dissolved Metals concentrations. The very fine grained sediments have become suspended through a variety of natural stream processes (e.g. erosion, normal runoff, and flood events). The presence of the suspended sediment is transient, and influenced by factors such as the duration and intensity of precipitation events and seasonal variations in ground cover. The identified source of the Total Metals is the historic fill used to improve the grade of the Facility, recover unusable land, and establish numerous narrow gauge rail beds within close proximity to the Facility's surface water bodies. Additionally, to lesser extent Total Metal exceedances in surface water are also associated with the erosion of metals from areas where heterogeneous deposition of metals in soil occurred as a result of historical fires and explosions;
- Dissolved Metals detected at concentrations exceeding the SWQS in Duck Pond and Tributaries Drainage and Miscellaneous Ponds Drainage are attributed to naturally occurring tannic acid produced from decaying hardwood vegetation (e.g. oak and walnut) in the slow moving surface water present within the upland wetland areas. The presence of tannic acid is observed as very dark brown surface water present within this portion of the Facility. The field analyzed pH values measured at the sample locations where dissolved metal constituents are detected at concentrations above the SWQS indicate slightly acidic conditions (Duck Pond and Tributaries had a pH of 5 and Miscellaneous Ponds had a pH of 6). Slightly acidic pH conditions due to the presence of naturally occurring tannic acid sufficiently alter the surface water chemistry within the upland wetland areas to allow the metal constituents to be present in the dissolved state. Once surface water has moved beyond the confines of the upland wetland areas the effects of the tannic acid are diluted and metal constituents less commonly occur in the dissolved state; and,

- E&E constituents detected at concentrations exceeding the SWQS in Western Drainage Area and Central Drainage Area are associated with historic manufacturing operations. The E&E SWQS exceedances at SW-R-B14-01/02 located in the Western Drainage Area and SW-R-D14-01 located in the Central Drainage Area are attributed to influence from the E&E groundwater plume present within these areas.

Surface water quality at the Facility is well defined and all constituents detected at concentrations above the SWQS are contained within the boundary of the Facility. Considering the long operational history of Facility the surface water quality is considerably unaffected by historic site operations.

6.5. SUMMARY OF RI CONCLUSIONS

This RIR is the culmination of two major field investigations spanning more than eight years including the analysis of over 4,400 samples of environmental media including soil, groundwater, sediment, and surface water. The principal findings of the investigations performed at the Facility are:

- The intent of the TRSR for remedial investigations [N.J.A.C. 7:26E – 4.1 through 4.8] and the site-specific objectives of the RIWP were met with one exception. A portion of the E&E influenced groundwater plume identified in the southwest corner of the Facility in Area II requires additional delineation efforts. Focused field activities planned in 2007 will finalize definition of the nature and extent for this groundwater plume. There is no evidence of any other potential off-site contamination caused by site related constituents.
- Any additional delineation of the nature and extent of specific constituents or areas of the site that may be considered appropriate is minor and does not affect the site-wide characterization of environmental media. Any further delineation would most effectively be completed as remedy pre-design or remedial action activities with the benefit of the known future use of the Facility as guidance to the scope of the additional effort. The extensive data presented in this report provides a sound basis to perform a remedial alternatives analysis and begin the remedy selection process.

- Based on the site-wide characterization and conceptual site model, there is no unacceptable on-site human health risk. Additionally, there is no unacceptable off-site human health risk with the possible exception of the E&E influenced groundwater plume (the potential risk associated with this plume will be determined pending further delineation in 2007). Therefore, no containment or stabilization activities are necessary to prevent on-site exposure or off-site migration of site related constituents for soil, sediment or surface water.

7.0 CONCEPTUAL SITE MODEL

This section describes the conceptual site model (CSM) for the Facility. The CSM integrates information from the various media specific SI/RI investigations (e.g., soils, surface water, sediment, and groundwater), site characteristics (e.g., geology, hydrogeology), and historic Facility operational knowledge. The purpose of the CSM is to integrate this information into a single narrative that evaluates the information with respect to the fate, transport, and potential routes of exposure of site-related constituents present at the facility that are associated with former industrial activities. Additionally, the CSM represents a planning tool that will assist with defining further site restoration and redevelopment activities performed at the Facility. The CSM is intended to be a dynamic document that is routinely re-evaluated as new information is collected/discovered, project objectives change, or Facility redevelopment becomes defined.

The objective of this CSM is to provide the following information:

- Identify the primary constituents associated with former Facility operations that are present within the environment;
- Identify the primary constituent release mechanisms present that allowed constituents associated with former Facility operations to enter the environment;
- Describe the main constituent transport processes that influence these constituents once they have entered the environment; and,
- Identify potential exposure pathways for environmental receptors.

The CSM is described in the following paragraphs below; graphical depiction of the CSM is presented on Figure A-9.

7.1. SUMMARY OF SITE-SPECIFIC GEOLOGY & HYDROGEOLOGY

Three primary aquifers are present underlying the Facility. The valley-fill and carbonate rock aquifer system consists of the UVFA, LVFA, and carbonate rock aquifer. The

UVFA and LVFA are hydraulically separated by the upper confining unit. The LVFA and the carbonate rock aquifer are hydraulically separated by basal confining unit.

Groundwater flow directions within the UVFA underlying the Facility is locally variable due to elevated topographic areas and interaction with surface water bodies; however two predominant flow directions are present (Figure A-5). The groundwater divide evident in the vicinity southeast of Duck Pond causes groundwater to flow either toward the southwest (Areas II and III) or northeast (northern portion of Area I). The southwestern flow component is the largest flow regime present at the Facility and underlies the majority of the former manufacturing areas. The two prominent bedrock ridges present do not contain any known faults that bisect the ridges and therefore act as horizontal no flow boundaries.

Topographically elevated portions of the Facility (ridges and locations of terminal moraine deposition) act as groundwater recharge zones and the highest hydraulic gradients/average linear groundwater flow velocities are identified in these areas. Topographically elevated areas also typically display a net downward vertical hydraulic gradient.

The topographic low regions of the central valley portion of the Facility act as groundwater discharge zones and the lowest hydraulic gradients/average linear flow velocities are identified in these areas. Topographically low regions typically display a net upward vertical hydraulic gradient and are attributed to the formation of the wet areas predominately present within Area II.

Appendix J presents a detailed description of regional and site-specific geology and hydrogeology.

7.2. SITE CHARACTERIZATION

The SI/RI activities have fulfilled the objectives of site characterization and have, with only one exception, collected the data necessary to select appropriate remedy selection alternatives. This was accomplished through the collection of site-related data including

laboratory analysis of more than 4,437 media-specific samples. The primary remaining data gap potentially effecting remedy selection is delineation of the E&E groundwater plume present within the southwestern portion of the Facility. This data gap is addressed within Section 8.0 - Future Actions. Upon completion of this future action item, remedy selection will follow.

NJDEP-approved site investigation procedures/protocols were followed to characterize the Facility. Typical localized uncertainties with respect to collection of discrete samples over large areas exist but should not influence remedy selection. Similarly, potential uncertainties at the site-wide level are minimal or non existent and also should not influence remedy selection.

7.2.1 Primary Analytical Groups of Concern

The following table summarizes the analytical results of the media-specific samples collected during the SI and RI.

Media	Analytical Groups Analyzed	Analytical Groups Exceeding Applicable Cleanup Criteria	FECs* Identified in the RIR
Soil	VOCs	VOCs	-
	SVOCs	SVOCs	BZAP, BZBF, 2,4/2,6-DNT
	Total Metals	Total Metals	Arsenic, Lead, Thallium
	E&E	E&E	NG, TNT
	PCBs	PCBs	Total PCBs
	PHCs	-	-
Groundwater**	VOCs	VOCs	-
	SVOCs	SVOCs	-
	Dissolved Metals	-	-
	Total Metals	Total Metals	-
	E&E	E&E	2-A-DNT, 4-A-DNT, NG, RDX, TNT
	PCBs	PCBs	-
	PHCs	-	-
	General Chemistry – Ammonia Nitrogen	General Chemistry – Ammonia Nitrogen	-
	General Chemistry – Nitrite Nitrogen	-	-
	General Chemistry – Nitrate Nitrogen	-	-
Sediment	VOCs	VOCs	-
	SVOCs	SVOCs	-
	Metals	Metals	Arsenic, Copper, Lead, Mercury
	E&E	E&E	-
	General Chemistry – Total Organic Carbon (TOC)	-	-
	General Chemistry – Percent Solids	-	-

Media	Analytical Groups Analyzed	Analytical Groups Exceeding Applicable Cleanup Criteria	FECs* Identified in the RIR
Surface Water**	VOCs	VOCs	-
	SVOCs	SVOCs	-
	Dissolved Metals	Dissolved Metals	-
	Total Metals	Total Metals	Arsenic, Lead, Mercury
	E&E	E&E	-
	General Chemistry – pH***	-	-
	General Chemistry – Hardness***	-	-

* - FECs were selected if a constituent had a high percentage of media-specific cleanup criteria exceedance compared to the total number of samples analyzed for that constituent, regardless of analytical group. Therefore, a FEC was not selected from each analytical group.

** - Due to the transient nature of SW and GW, only RI analytical results were included to select FECs.

*** - Parameters were analyzed in the field.

- = Not applicable.

The potential historic sources of the analytical groups/constituents with applicable cleanup criteria exceedances are generally consistent across the Facility and are described below.

- VOCs - Attributed primarily to the large regional chlorinated VOC plume underlying the southern portion of the Facility. The regional plume is derived from off-site sources and has not been attributed to historic operations performed at the Facility. To a much lesser extent, VOCs are attributed to historic manufacturing operations (small single release events) and historic maintenance activities;
- SVOCs – Attributed to historic fill (PAHs) and historic manufacturing operations (Non PAHs);
- Metals – Attributed to historic fill, historic manufacturing operations, and mobilization of naturally occurring metals;
- Dissolved Metals – Attributed to naturally occurring tannic acid that enables metals to be present in a dissolved state;
- E&E – Attributed to historic manufacturing operations;

- Total PCBs – Attributed to historic manufacturing operations and isolated transformers; and,
- PHCs – PHCs do not have applicable cleanup criteria but were identified in seven samples. The PHCs were identified as potential residual motor oil or lubricating oil and are attributed to historic maintenance activities.

The potential current sources of these analytical groups/constituents are residuals from historic operations, importation of historic fill, off-site plumes migrating onto the Facility, and sorbed phase site-related constituents on soils. There was a potential to encounter Non-Aqueous Phase Liquids (NAPLs) such as NG based on site history, but no evidence was observed during the SI or RI to indicate the presence of Light Non-Aqueous Phase Liquids (LNAPLs) or Dense Non-Aqueous Phase Liquids (DNAPLs).

Table A-7 presents a detailed description of physical and chemical properties of all constituents analyzed during the RI by analytical group. The table also illustrates the media where each constituent was analyzed, detected, and exceeded applicable cleanup criteria.

Appendix J presents a detailed description of the Facility background and history.

7.3. CONSTITUENT RELEASE MECHANISMS

The constituent release mechanisms identified at the Facility are similar in many ways to other large industrial manufacturing complexes that originated in the late 1800's. However, two release mechanisms, fires and explosions, though not unique to E&E manufacture, are significantly more destructive/frequent and were more important to constituent release than non E&E manufacturing facilities. Additionally, the Facility imported large quantities of historic fill from local sources that contained metal and PAH constituents prior to use at the Facility. The other constituent release mechanisms include land disposal, liquid waste conveyance, and general facility operations. Although these constituent release mechanisms were not as prominent as fires, explosions, and importation of historic fill, they influenced constituent distribution similar to other industrial manufacturing facilities of this time frame.

The following constituent release mechanisms were identified:

- **Explosions** have the tendency to scatter debris and constituents associated with manufacturing operations over an often unpredictable area (Attachment A of Appendix J);
- **Fires** resulting from both accidents and intentional thermal decontamination efforts required the use of significant quantities of water. Water flowing away from the area had the potential to redistribute constituents that were not consumed by the fire (Attachment B of Appendix J);
- **Historic fill** (consisting of fly ash, bottom ash, and slag derived from the combustion of coal) was imported largely from off-site sources. It was placed throughout the Facility to increase grade, eliminate shallow ponds/wet areas, improve drainage, and increase compatibility of the soils to allow construction transportation networks and large manufacturing complexes;
- **Land disposal** sites were identified as part of site investigation and demolition activities. These disposal sites appear to represent former low lying areas and are often associated with historic fill deposition;
- **Liquid waste** conveyances transported wastes to the surface water drainage systems (e.g., through unlined shallow ditches and trenches prior to the 1970's, below ground process pipe after the 1970's); and,
- **General facility operations** had the potential to release constituents to the environment through accidents, spills, and routine maintenance activities.

7.4. CONSTITUENT TRANSPORT PROCESSES

Once constituents have been introduced to the environment a number of human and natural processes have the potential to influence their transport. Due to the long and varied history of the Facility, redevelopment activities that involved regrading efforts played a predominant role in the transport of constituents associated with previous operations. Following redevelopment activities natural processes including erosion, infiltration, groundwater migration, and surface water flow played lesser roles in the transport of constituents associated with historic operations.

Below is a description of each transport process:

- **Facility redevelopment** was repeatedly performed over the history of the Facility to expand operations or to rebuild after accidental fires or explosions. During redevelopment activities, soil containing site-related constituents was redistributed;
- **Erosion** is the removal and transport of soil and sediment by water and wind. The two primary forms of erosion at the Facility are surface and stream channels/banks. It is believed soil erosion from precipitation runoff was much more prominent historically (from the late 1800's until approximately 1950) when the Facility intentionally removed vegetation to prevent the spread of fires. Currently, the Facility is vegetated and there is minimal loose soil, minimizing the effects of both wind and water erosion;
- **Infiltration** is precipitation that slowly percolates downward through the porous surficial soils until it reaches the water table. As the infiltration percolates it has the potential to encounter site related constituents that can dissolve into the infiltration and travel downward to deeper soils and the water table aquifer;
- **Groundwater migration** influences the transport of dissolved constituents present in the groundwater from areas of higher hydraulic elevation to lower hydraulic elevation and may result in groundwater discharging to surface water bodies and surface water bodies discharging to groundwater; and,
- **Surface water flow** has the capacity to carry both dissolved phase and total constituents that are adsorbed to fine grained sediments and suspended within the water column. Higher volumes of total constituents adsorbed to fine grained sediments can be transported during periods of high surface water flow encountered during storm events.

7.5. INTER-MEDIA CONNECTIONS

The soils, sediment, groundwater, and surface water present at the Facility do not represent static or isolated media. These media interact at discernable events (e.g. precipitation events) or continuously (e.g. groundwater recharge of surface water bodies). Where constituent concentrations exist in one media, the inter-media connection can influence the environmental quality of other media. Specifically, the following media relationships exist at the site and influence the movement of constituents from one media to another:

Soil/Sediment/Surface Water Interaction

- Soils (including historic fill constituents) can be eroded by surface erosion and transported to surface water bodies (i.e., streams and ponds). Upon entering the surface water bodies the soils can either be deposited as sediment or be transported further as suspended particles.
 - Analytical results from the SI and RI indicate that this process is influencing sediment and surface water quality in select areas. Soils containing detected constituents at concentrations exceeding either the RDCSCC or NRDCSCC have been identified in close proximity to some areas with surface water and/or sediment exceedances.
- Stream channels and banks can become eroded by differential flow velocities caused by natural irregularities (e.g. rocks, logs, etc.) within the channels or increased flow velocities due to precipitation events. This results in the suspension of constituents in surface water;
 - Analytical results from the SI and RI indicate that this process is influencing surface water quality in select areas. Areas containing soil with detected constituents at concentrations exceeding either the RDCSCC or NRDCSCC have been identified in close proximity to some areas with surface water exceedances.

Groundwater/Soil Interaction

- Precipitation infiltrating porous soils has the potential to encounter site related constituents that can become dissolved into the infiltration and travel downward to the water table aquifer. The aqueous solubility of the site related constituents and the soil's sorption/desorption characteristics are the primary factors that influence the potential of infiltration to incorporate dissolved state constituents. Once in contact with the water table, dissolved constituents may be transported through the natural movement of the groundwater.
 - Analytical results from the SI and RI indicate that over the majority of the Facility this process is not influencing groundwater quality. However, soils from Area II and Grids L10 and L11 in Area I with IGWSCC exceedances overlie areas with GWQS exceedances for the same constituents, indicating site-related constituents in these areas are mobile and influencing groundwater quality.

Groundwater/Surface Water/Sediment Interaction

- Groundwater largely recharges the surface water bodies at the Facility. Groundwater in select locations may contain dissolved constituents related to Facility operations. These dissolved constituents may enter the surface water bodies and become available for transport down-gradient through the flow of the surface water or movement of sediment.

- o Analytical results from the SI and RI indicate that over the majority of the Facility this process is not influencing surface water quality. However, several surface water samples collected from the Western Drainage Area and Central Drainage Area contain E&E constituents detected at concentrations exceeding the SWQS that are attributed to localized influence from the E&E groundwater plume present within these areas.
- o Analytical results from the SI and RI indicate that over the majority of the Facility this process is not affecting surface water or sediment quality. However, sediment samples collected from the Western Drainage Area contain VOCs detected at concentrations exceeding the SWQS and LEL that are attributed to groundwater discharge from off-site sources to surface water and sediment bodies. Specifically, the large regional chlorinated VOC plume underlying the Facility is discharging to surface water bodies along the southern boundary of the Facility, influencing surface water and sediment quality.

7.6. HUMAN RECEPTORS AND EXPOSURE PATHWAYS

Currently the Facility is secured with a fence and monitored by security personnel. There are no residences or commercial/industrial activities within the fence line. On-site personnel consist of the security patrol, site workers, and occasionally under controlled conditions, hunters. The area around the Facility is a mix of residential, commercial and industrial property.

A human exposure analysis is presented in Tables A-8 and A-9 for on-site and off-site receptors. On-site, applicable cleanup criteria exceedances have been identified in soil, surface water, sediment and groundwater, but because of current facility use, receptors are limited. Thus, the following pathway discussion focuses on individual receptors. Off-site, no applicable cleanup criteria exceedances have been identified but there are more potential receptors. Therefore, this discussion focuses on media.

Three on-site receptors were identified.

- **Facility Personnel.** The facility ceased operations in December 1996 and has since been involved solely with restoration activities. All personnel involved with restoration activities being performed on-site are required to comply with the United States Department of Labor: Occupational Safety and Health

Administration (OSHA) Hazardous Waste Operations and Emergency Response Standard (HAZWOPER) as specified in 29 Code of Federal Regulations (CFR) 1910.120. Personnel performing site restoration activities are required to adhere to the SSHSP and use personal protective equipment (PPE) to minimize exposure;

- **Hunters.** In order to cull the deer population, hunters approved by Hercules are granted access to the Facility during designated weekends up to 20 days per year. Hunters receive hazard communication training and are restricted from entering areas where constituents are likely to be present on the surface; and,
- **Trespassers.** Trespassing on the site is discouraged by a fence, prominently displayed “No Trespassing” signs, and is monitored by security personnel.
- Off-site migration pathways are possible from soil, groundwater, surface water and sediment.
- **Soil.** Constituents have been identified in surface and subsurface soil at the Facility. However it is highly unlikely that soil will migrate off-site by wind or water erosion due to the high ridges and established vegetation. The off-site migration pathways from soil are incomplete;
- **Groundwater.** Constituents have been identified in groundwater in the subsurface at the Facility. Additional investigation is necessary in the southwestern portion of the Facility where a groundwater plume of E&E constituents has been identified. An investigation to delineate the extent of this plume is outlined in Section 8.0 Future Actions;
- **Surface Water.** Constituents have been identified in surface water at the Facility. Surface water exits the site through a stream at the southwestern portion of the Facility. RI sampling results indicate that there are no constituents present above the surface water criteria in water exiting the site. Therefore this off-site migration pathway is incomplete; and,
- **Sediment.** Constituents have been identified in sediment at the Facility. However there are two weirs located in streams in the southern portion of the Facility adjacent to Patrol Road. These weirs restrict the movement of sediment from the eastern and central portions of the former manufacturing area. RI sampling results did not identify any evidence of sediment with constituents at concentrations exceeding the criteria moving off-site. Therefore off-site migration pathways from sediment are incomplete.

On-site potential exposure pathways and receptors are not a concern due to in-place engineering and institutional controls (Table A-8). With the exception of groundwater, off-site potential exposure pathways and receptors are not a concern because site-related

constituents are not migrating off-site (Table A-9). Additional groundwater investigation activities are warranted in the southwestern boundary of the Facility, as detailed in Section 8.1.

7.7. ECOLOGICAL RECEPTORS AND EXPOSURE PATHWAYS

A description of the Facility's ecological and updated human receptors and exposure pathways will be performed in the forthcoming ecological screening risk assessment scheduled to begin in the second quarter 2007. This section of the CSM will be updated and be included in the ecological screening risk assessment report. The ecological screening risk assessment is anticipated to be completed in the third quarter 2007.

7.8. FACILITY RESTORATION AND REDEVELOPMENT

Facility restoration and redevelopment is dependant on the selected future use of the Facility. This future use will guide the selection of the appropriate remedial technologies in the forthcoming RASR so that the Facility restoration process meets the requirements for the intended future use.

8.0 FUTURE ACTIONS

Hercules intends to perform a limited number of additional site characterization activities in 2007 as the NJDEP reviews and provides comments on the five-volume RIR. The proposed activities described below are limited in scope and focused toward reinforcing the conclusions of the various media RIRs. All sample collection activities will be performed in accordance with the field sampling procedures presented in the RIWP. Specific details of each sampling event will be presented to the NJDEP and discussed through the continued use of the triad approach. A preliminary schedule is presented as Figure A-10. The exact timing of the characterization activities will be finalized with the NJDEP through the triad approach.

8.1. GROUNDWATER SAMPLING

Additional groundwater samples are proposed in the subsections below to address the two groundwater plumes and 13 points of exceedance identified in the GW-RIR. The purpose of this sampling is to confirm the analytical results presented in the RIR.

8.1.1 Groundwater Plume Delineation (Area II)

A plume of NG, TNT, RDX, and TNT degradation products (2A-DNT and 4A-DNT) has been identified through laboratory analysis of groundwater samples underlying the former TNT, PETN, NG, and Dynamite Areas (Area II). The groundwater plume appears to be largely confined within the boundary of the Facility but additional investigation is required to confirm the exact boundary in the southwest corner of the Facility adjacent to Howard Boulevard and Route 46. The following activities are proposed:

- Collect groundwater samples from down-gradient perimeter monitoring wells (MW-28, MW-28D, MW-29, MW-29D, MW-32, MW-32D, MW-48, and MW-48D) for NG analyses. Hercules proposes analyzing the samples using an analytical method with a low detection limit in order to accommodate the decrease in groundwater criteria for NG. As stated in a letter submitted to NJDEP on April 10, 2007 (Appendix K), the GWQS utilized during the RIR for NG was 620 ug/l, per the USEPA Region III Tap Water RBC (October

2006). The value of 620 ug/l posted by USEPA was a typographical error and the USEPA revised the value for NG on December 29, 2006 to 3.7 ug/l. During the RI, analytical method SW-846-8832 was used to analyze NG in aqueous samples per NJDEP's request (MDL 120 ug/l, PQL 600 ug/l). Hercules proposes using modified analytical method SW-846-8330 for additional aqueous NG analysis (MDL 5.2 ug/l, PQL 15.0 ug/l) in order to provide analytical results with an MDL and PQL closer to the revised GWQS for NG (3.7 ug/l). There is currently no commercially available laboratory which can provide analytical results below the revised GWQS for NG;

- Perform electrical resistivity geophysical survey of TNT, PETN, and NG Areas. The resistivity geophysical survey will be used to determine the following;
 - o Define thickness of unconsolidated sediments;
 - o Estimate lithology of unconsolidated sediments;
 - o Identify anticipated fault in this area; and,
 - o Estimate competency of bedrock surface.
- Collect temporary groundwater samples (e.g. Geoprobe™, CPT, or modified Waterloo Profiler™) to refine definition of nature and extent of groundwater quality in this area after completion of the resistivity geophysical survey. Groundwater samples will be analyzed for the GW-RIR E&E target analyte list (Table A-2). Determine the number and location of sampling points through the triad approach following completion of the electrical resistivity geophysical survey;
- Select and install point of compliance monitoring wells following review of temporary groundwater sample results. Exact locations will be selected using the triad approach; and,
- Develop and submit Classification Exception Area (CEA).

8.1.2 RDX Groundwater Plume Delineation (Area III, Southwest Development Area)

A small well defined plume of RDX has been identified through laboratory analysis of groundwater samples collected from monitoring wells MW-16, MW-17, and MW-34 (Figure A-6) that are located immediately southwest of the Development Area (Area III). The areal extent of this plume is conservatively presented within the GW-RIR and may

depict a larger area than actually exists. The following activities are proposed to better define the areal extent of the RDX plume:

- Collect non-permanent groundwater samples (e.g. Geoprobe™, cone penetrometer, or modified Waterloo Profiler™) to refine definition of nature and extent of groundwater quality. Groundwater samples will be analyzed for RDX only. The non-permanent groundwater samples will be located between the three monitoring wells with identified RDX exceedances and the adjacent monitoring wells that did not identify RDX at concentrations exceeding the GWQS;
- If the non-permanent groundwater samples indicate the plume is smaller than depicted in the GW-RIR, select and install point of compliance monitoring wells. The possible number and location of the potential point of compliance monitoring wells, if necessary, will be selected using the triad approach; and,
- Develop and submit CEA.

8.1.3 Confirmation Groundwater Sampling

Hercules proposes to perform a second site-wide round of monitoring well groundwater sampling using the full GW-RIR analyte list (Table A-2). The objective will be to confirm the analytical results of the GW-RIR. Groundwater sampling will be performed in late third quarter or early fourth quarter 2007 so that any additional wells installed will be included in the site-wide sampling effort.

8.2. SELECT SOIL/SEDIMENT/SURFACE WATER SAMPLING

The Soil, SD, and SW-RIRs identified a limited number of items that could benefit from additional investigation to further refine site characterization and be useful for development of the forthcoming RASR. It is expected that significant interaction with the NJDEP through the triad approach will be necessary to fully scope and implement these activities. The following is a potential list of the anticipated activities:

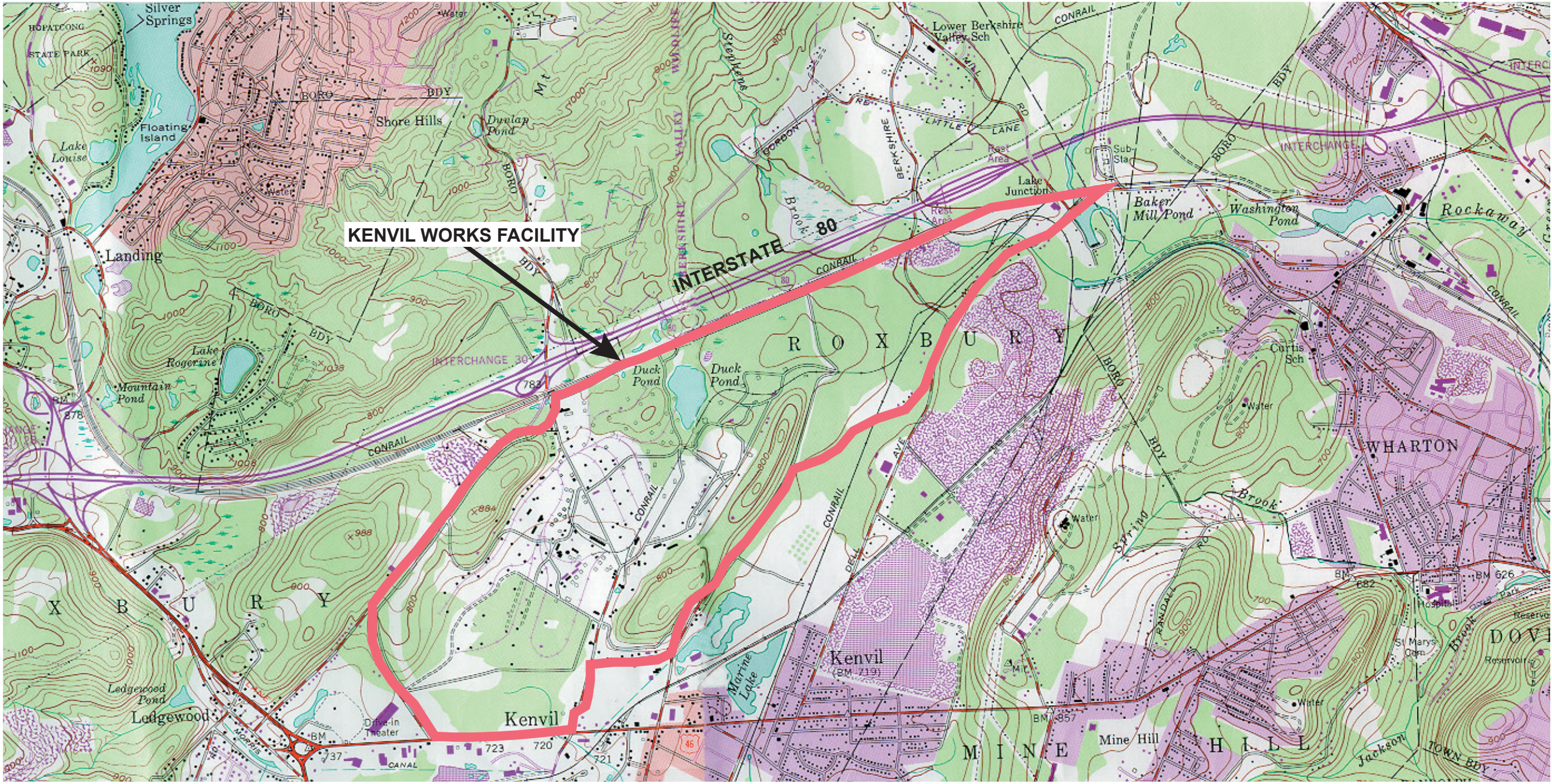
- Collect a limited number of soil samples at recently identified AOCs not previously investigated. Samples will be submitted for the Soils-RIR target analyte list;

- Collect a limited number of soil/sediment samples at select vertical delineation sample locations with applicable cleanup criteria exceedances to refine vertical delineation not defined in the RI;
- Collect up to two surface water samples adjacent to the facility outfall to reinforce the RIR conclusion that surface water exiting the facility is below SWQS. The surface water samples will be analyzed for the SW-RIR target analyte list;
- Collect several total and dissolved surface water samples for metal and PAH constituents in the southern Dynamite Area where Total Metal and PAH constituents were detected at concentrations exceeding the SWQS. The purpose of the samples will be to establish if erosion of historic fill is responsible for the presence of the Total Metal and PAH constituents identified in the surface water samples collected during the RI; and,
- Collect several surface water samples for tannic acid analysis in the pond west of Duck Pond and stream south of Shooting Pond where Dissolved Metals were detected at concentrations above the SWQS. The purpose of the samples will be to determine if the presence of naturally occurring tannic acid is the reason metal constituents are present in the dissolved state.

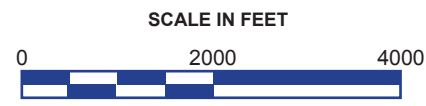
8.3. ECOLOGICAL SCREENING RISK ASSESSMENT

Ecological screening risk assessment tasks will be performed as discussed in the March 29, 2007 triad approach teleconference. Activities have begun in May 2007 and will be finalized in the third quarter of 2007. The ecological risk assessment will be crucial for completing the conceptual site model (e.g. receptor and exposure pathway identification). This assessment will be presented as an addendum to this RIR.

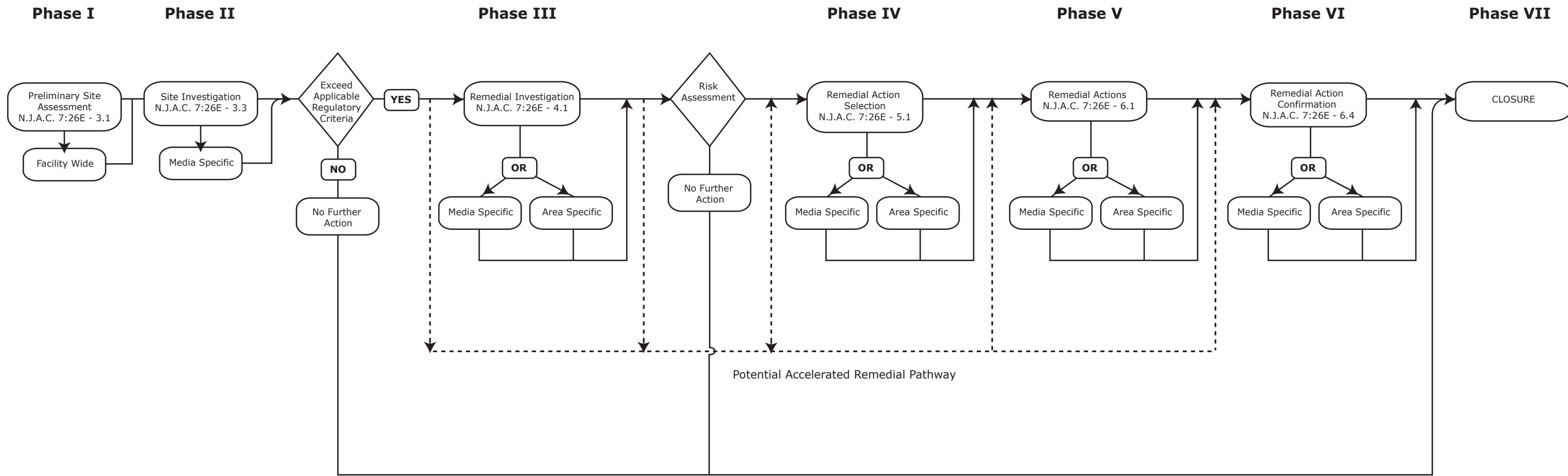
FIGURES



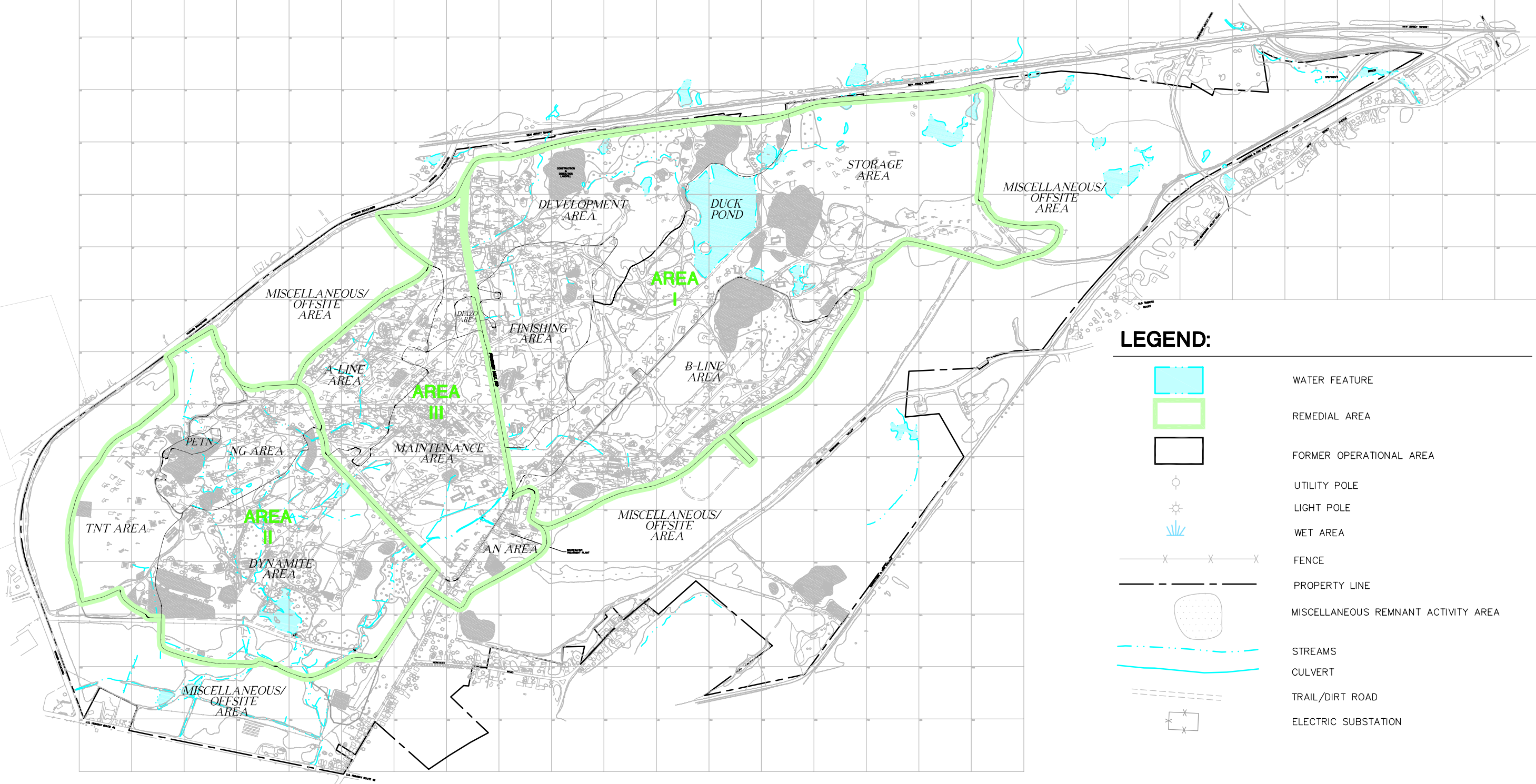
Source: Base map developed from the Stanhope, New Jersey 7.5 minute U.S.G.S. Topographic Quadrangle Map, dated 1954, photorevised 1981.



VOLUME A - REMEDIAL INVESTIGATION REPORT SUMMARY HERCULES INCORPORATED KENVIL WORKS FACILITY, NEW JERSEY	
FACILITY MAP	
 MWH	FIGURE A-1



S:\IND PROJECTS\Hercules-1267015\Kenvil\2111224_27_25 Area L_I_III R\15.0 Figures\Vol A\2111365-01.dwg



SOURCE:

1. SITE RECONNAISSANCE AND GPS SURVEY CONDUCTED BY MWH FROM MARCH TO JUNE 1998. SURVEY CONTROL PROVIDED BY PAUL J. EMILIUS JR., GEOD CORPORATION, N.J. LICENSE NO. 37186.
2. PLANIMETRIC MAP PREPARED BY ATLANTIS AERIAL SURVEY COMPANY, INC. FROM PHOTOGRAPHY DATED 3/18/95. GROUND CONTROL PROVIDED BY EDWARD F. SECCO P.L.S. N.J. LICENSE NO. 18607.
3. KENVIL WORKS FACILITY SITE HISTORICAL MAPS PROVIDED BY HERCULES INCORPORATED.

NOTES:

1. THESE FILES ARE IN THE NORTH AMERICAN DATUM 1983 NEW JERSEY STATE PLANE COORDINATE SYSTEM. THE TOPOGRAPHIC FILE REFERENCES THE NORTH AMERICAN VERTICAL DATUM 1988.
2. THE BOUNDARY LINE AS DELINEATED IS APPROXIMATE AND HAS BEEN DIGITIZED FROM A MAP ENTITLED "HERCULES INCORPORATED, KENVIL PLANT PROPERTY MAP, PLANT 080, ACCOUNT 9500, CLASSIFICATION 21045, FILE CODE 5WE REVISION 1" REVISED TO JUNE 11, 1970 PROVIDED BY REPRESENTATIVES OF HERCULES, INC., AND THE TAX MAP OF THE TOWNSHIP OF ROXBURY AND NOT FROM AN ACTUAL FIELD SURVEY OR WITH THE BENEFIT OF A TITLE SEARCH.



0 250 500 1000
SCALE: FEET
1"=1000'

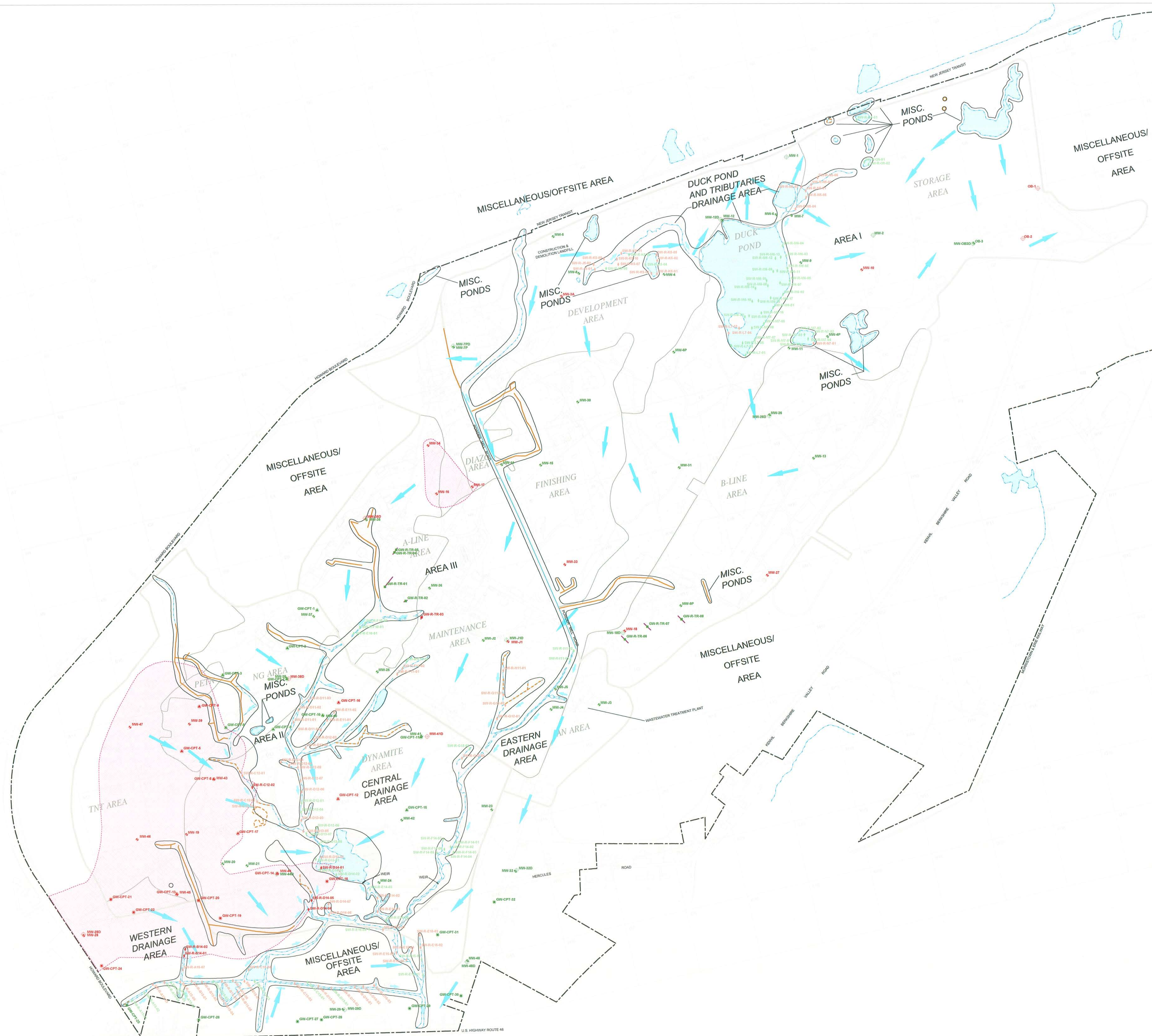
VOLUME A - REMEDIAL INVESTIGATION REPORT SUMMARY HERCULES INCORPORATED KENVIL WORKS FACILITY, NEW JERSEY

SITE MAP



FIGURE A-3

REV	DATE	BY	DESCRIPTION



LEGEND:

- INFERRED COMPOSITE AREAL EXTENT INCLUDING ALL ANALYTICAL GROUPS EXCEEDING HUMAN HEALTH OR AESTHETIC LIFE ACUTE SWQS OR GWQS, AS APPLICABLE
- RI SURFACE WATER SAMPLE LOCATION WITH SWQS EXCEEDANCE, ATTRIBUTED TO GROUNDWATER
- RI SURFACE WATER SAMPLE LOCATION WITH SWQS EXCEEDANCE, NOT ATTRIBUTED TO GROUNDWATER
- RI SURFACE WATER SAMPLE LOCATION WITH NO SWQS EXCEEDANCE
- SHALLOW MONITORING WELL LOCATION WITH GWQS EXCEEDANCE
- SHALLOW MONITORING WELL LOCATION WITH NO GWQS EXCEEDANCE
- DEEP MONITORING WELL LOCATION WITH GWQS EXCEEDANCE
- DEEP MONITORING WELL LOCATION WITH NO GWQS EXCEEDANCE
- E&E SCREENING CONE PENETROMETER (CPT) LOCATION WITH GWQS EXCEEDANCE
- E&E SCREENING CONE PENETROMETER (CPT) LOCATION WITH NO GWQS EXCEEDANCE
- CONE PENETROMETER (CPT) LOCATION WITH GWQS EXCEEDANCE
- CONE PENETROMETER (CPT) LOCATION WITH NO GWQS EXCEEDANCE
- TRENCH SAMPLE LOCATION WITH GWQS EXCEEDANCE
- TRENCH SAMPLE LOCATION WITH NO GWQS EXCEEDANCE
- J INDICATES THAT THE COMPOUND WAS ANALYZED FOR AND WAS DETECTED BELOW THE REPORTING LIMIT. NUMBER INDICATES AN ESTIMATED VALUE.
- U INDICATES THAT THE COMPOUND WAS ANALYZED FOR BUT NOT DETECTED. NUMBER INDICATES THE DETECTION LIMIT.
- SURFACE WATER FLOW DIRECTION
- GROUNDWATER FLOW DIRECTION
- DRY STREAM SEGMENT, AREA, OR FORMER DITCH (REFER TO NOTE 9)
- STREAM SEGMENT OR AREA WITHOUT SUFFICIENT WATER PRESENT (REFER TO NOTE 10)
- TRENCH FOR HYDRAULIC OIL INVESTIGATION
- WEIR
- PROPERTY LINE
- WATER FEATURE
- REMEDIAL AREA
- FORMER OPERATIONAL AREA
- UTILITY POLE
- LIGHT POLE
- WET AREA
- FENCE
- PROPERTY LINE
- GUIDE RAIL
- RAILROAD
- SMALL GAUGE RAIL
- PERIMETER OF WET AREA
- CULVERT
- STREAMS
- TRAIL/DIRT ROAD
- ELECTRIC SUBSTATION
- BUILDING

NOTES:

1. THESE FILES ARE IN THE NORTH AMERICAN DATUM 1983 NEW JERSEY STATE PLANE COORDINATE SYSTEM. THE TOPOGRAPHIC FILE REFERENCES THE NORTH AMERICAN VERTICAL DATUM 1988. THE FACILITY GRID SYSTEM WAS HISTORICALLY DEVELOPED BY HERCULES INCORPORATED TO AD- SITE MANAGEMENT, AND GRID LINES ARE NOT ORIENTED TO TRUE NORTH.
2. THE BOUNDARY LINE AS DELINEATED IS APPROXIMATE AND HAS BEEN DIGITIZED FROM A MAP ENTITLED "HERCULES INCORPORATED, KENVEL PLANT PROPERTY MAP, PLANT 080, ACCOUNT 8000, CLASSIFICATION 21045, FILE CODE 080 REVISION 1" REVISED TO JUNE 11, 1979, PROVIDED BY REPRESENTATIVES OF HERCULES, INC. AND THE TAX MAP OF THE TOWNSHIP OF ROSELAND AND NOT FROM AN ACTUAL FIELD SURVEY OR WITH THE BENEFIT OF A TRUE SEARCH.
3. GROUNDWATER REMEDIAL INVESTIGATION SAMPLE LOCATIONS WERE SELECTED BASED ON ANALYTICAL RESULTS PRESENTED IN THE GROUNDWATER SITE INVESTIGATION (GW-SI) REPORT (MWH, 2004). SURFACE WATER REMEDIAL INVESTIGATION SAMPLE LOCATIONS WERE SELECTED BASED ON ANALYTICAL RESULTS PRESENTED IN THE SURFACE WATER/SEGMENT SITE INVESTIGATION (SW-SI) REPORT (MWH, 2004).
4. GROUNDWATER ANALYTICAL SAMPLE RESULTS WERE COMPARED TO CRITERIA DERIVED FROM THE FOLLOWING APPLICABLE GROUNDWATER QUALITY STANDARDS (GWQS): THE 1993 SURFACE WATER QUALITY STANDARDS (1993 SWQS), OCTOBER 2006 ENVIRONMENTAL PROTECTION AGENCY NATIONAL RECOMMENDED WATER QUALITY CRITERIA (EPA NWWQC), 2006 ENVIRONMENTAL PROTECTION AGENCY AMBIENT WATER QUALITY CRITERIA (AWQC), 1995.
5. SURFACE WATER ANALYTICAL SAMPLE RESULTS WERE COMPARED TO CRITERIA DERIVED FROM THE FOLLOWING APPLICABLE SURFACE WATER QUALITY STANDARDS (SWQS): THE 1993 SURFACE WATER QUALITY STANDARDS (1993 SWQS), OCTOBER 2006 ENVIRONMENTAL PROTECTION AGENCY NATIONAL RECOMMENDED WATER QUALITY CRITERIA (EPA NWWQC), 2006 ENVIRONMENTAL PROTECTION AGENCY AMBIENT WATER QUALITY CRITERIA (AWQC), 1995.
6. AREAL EXTENTS WERE DETERMINED FOR SAMPLE LOCATIONS THAT EXCEEDED THE GROUNDWATER AND SURFACE WATER CRITERIA BY ANALYTICAL GROUP. SURFACE WATER SAMPLE LOCATIONS WERE INCLUDED IN ORDER TO ILLUSTRATE THE RELATIONSHIP BETWEEN GROUNDWATER AND SURFACE WATER.
7. ANALYTICAL SAMPLES PRESENTED ON THIS FIGURE WERE COLLECTED DURING THE REMEDIAL INVESTIGATION.
8. AREAL EXTENTS HAVE INCORPORATED INFERRED EXTENTS UTILIZING THE ISOCONCENTRATION FIGURES, AS APPLICABLE.
9. SOLID BROWN LINES REPRESENT DRY STREAM SEGMENTS OR FORMER DITCHES THAT NO LONGER CARRY WATER SINCE MANUFACTURING OPERATIONS HAVE CEASED. THESE AREAS ARE NO LONGER CONSIDERED SURFACE WATER OR SEGMENT BODIES AND ARE CONSIDERED SOIL IN THE REMEDIAL INVESTIGATION REPORT.
10. DASHED BROWN LINES REPRESENT STREAM SEGMENTS OR AREAS WITHOUT SUFFICIENT WATER PRESENT FOR SURFACE WATER SAMPLE COLLECTION, HOWEVER SATURATED SEGMENTS ARE PRESENT.



SCALE IN FEET
1" = 250'

REV	DATE	BY	DESCRIPTION

LEGEND:

- INFERRED COMPOSITE AREAL EXTENT INCLUDING ALL ANALYTICAL GROUPS EXCEEDING THE SEL
- INFERRED COMPOSITE AREAL EXTENT INCLUDING ALL ANALYTICAL GROUPS EXCEEDING THE LEL
- RI SEDIMENT SAMPLE LOCATION WITH LEL OR SEL EXCEEDANCE
- SI SEDIMENT SAMPLE LOCATION WITH LEL OR SEL EXCEEDANCE
- RI SEDIMENT SAMPLE LOCATION WITH NO LEL OR SEL EXCEEDANCES
- SI SEDIMENT SAMPLE LOCATION WITH NO LEL OR SEL EXCEEDANCES
- SURFACE WATER FLOW DIRECTIONS
- DRY STREAM SEGMENT, AREA, OR FORMER DITCH (REFER TO NOTE 9)
- STREAM SEGMENT OR AREA WITHOUT SUFFICIENT WATER PRESENT (REFER TO NOTE 10)
- WEIR
- PROPERTY LINE
- WATER FEATURE
- REMEDIAL AREA
- FORMER OPERATIONAL AREA
- UTILITY POLE
- LIGHT POLE
- WET AREA
- FENCE
- PROPERTY LINE
- GUIDE RAIL
- RAILROAD
- SMALL GAUGE RAIL
- PERIMETER OF WET AREA
- CULVERT
- STREAMS
- TRAIL/DIRT ROAD
- ELECTRIC SUBSTATION
- BUILDING

NOTES:

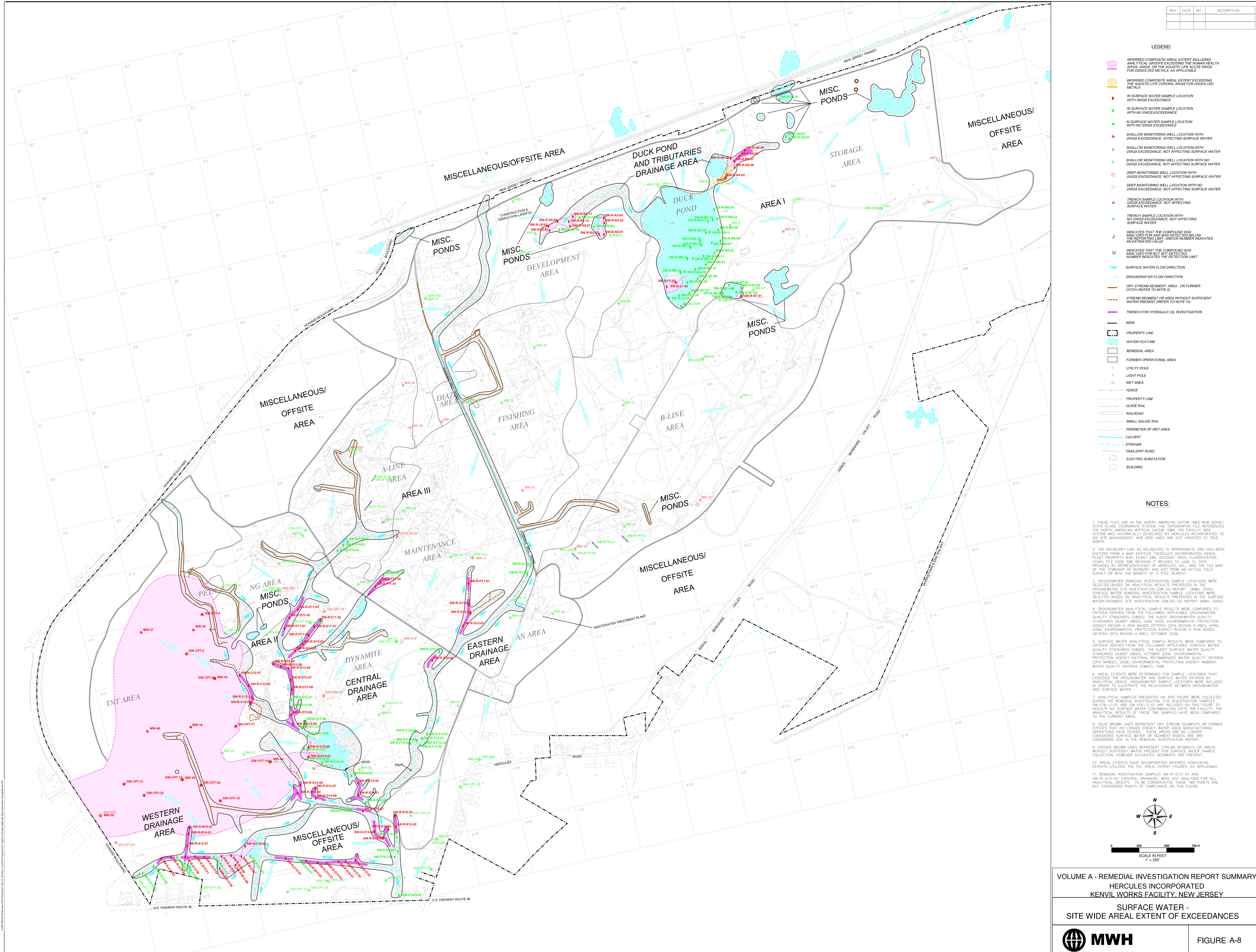
- THESE FILES ARE IN THE NORTH AMERICAN DATUM 1983 NEW JERSEY STATE PLANE COORDINATE SYSTEM. THE TOPOGRAPHIC FILE REFERENCES THE NORTH AMERICAN VERTICAL DATUM 1988. THE FACILITY GRID SYSTEM WAS HISTORICALLY DEVELOPED BY HERCULES INCORPORATED TO AID SITE MANAGEMENT, AND GRID LINES ARE NOT ORIENTED TO TRUE NORTH.
- THE BOUNDARY LINE AS DELINEATED IS APPROXIMATE AND HAS BEEN DIGITIZED FROM A MAP ENTITLED "HERCULES INCORPORATED, KENVIL PLANT PROPERTY MAP, PLANT Q80, ACCOUNT 9500, CLASSIFICATION 21045, FILE CODE ONE REVISION, 11, 1970 PROVIDED BY REPRESENTATIVES OF HERCULES, INC., AND THE TAX MAP OF THE TOWNSHIP OF ROXBURY AND NOT FROM AN ACTUAL FIELD SURVEY OR WITH THE BENEFIT OF A TITLE SEARCH.
- DASHED TOPOGRAPHIC CONTOURS INDICATE AREAS WHERE THE GROUND IS OCCURRED BY DENSE TREES OR SHADOWS. THESE AREAS MAY NOT CONFORM TO ACTUAL STANDARDS.
- SEDIMENT REMEDIAL INVESTIGATION SAMPLE LOCATIONS WERE SELECTED BASED ON ANALYTICAL RESULTS PRESENTED IN THE SURFACE WATER/SEDIMENT SITE INVESTIGATION (SW/SD-SI) REPORT (W/04-004).
- SEDIMENT ANALYTICAL SAMPLE RESULTS WERE COMPARED TO CRITERIA DERIVED FROM THE FOLLOWING APPLICABLE SEDIMENT STANDARDS: NJDEP FRESHWATER SEDIMENT SCREENING GUIDELINES (FSSG) LOWEST EFFECTS LEVEL (LEL) AND SEVERE EFFECTS LEVEL (SEL); 1998 OAH ROSE NATIONAL LABORATORY RISK ASSESSMENT INFORMATION SYSTEM (RAIS); ECOLOGICAL RISK ASSESSMENT FRESHWATER SEDIMENT SCREENING BENCHMARKS (SSB).
- AREAL EXTENTS WERE DETERMINED FOR SAMPLE LOCATIONS THAT EXCEEDED THE LOWEST EFFECTS LEVEL (LEL) AND SEVERE EFFECTS LEVEL (SEL) BY ANALYTICAL GROUP.
- ANALYTICAL SAMPLES PRESENTED ON THIS FIGURE WERE COLLECTED DURING THE SITE AND REMEDIAL INVESTIGATIONS.
- AREAL EXTENTS HAVE INCORPORATED INFERRED HORIZONTAL EXTENTS UTILIZING THE FEC AREAL EXTENT FIGURES, AS APPLICABLE.
- SOLID BROWN LINES REPRESENT DRY STREAM SEGMENTS OR FORMER DITCHES THAT NO LONGER CONVEY WATER SINCE MANUFACTURING OPERATIONS HAVE CEASED. THESE AREAS ARE NO LONGER CONSIDERED SURFACE WATER OR SEDIMENT BODIES AND ARE CONSIDERED SOIL IN THE REMEDIAL INVESTIGATION REPORT.
- DASHED BROWN LINES REPRESENT STREAM SEGMENTS OR AREAS WITHOUT SUFFICIENT WATER PRESENT FOR SURFACE WATER SAMPLE COLLECTION, HOWEVER SATURATED SEDIMENTS ARE PRESENT.
- REMEDIAL INVESTIGATION SAMPLES SD-R-F14-02, SD-R-G11-01, SD-R-G12-04, SD-R-G12-05, SD-R-G12-12, SD-R-H11-04 AND SD-R-H15-01 (EASTERN DRAINAGE) AND SD-R-K3-14 (MISCELLANEOUS PONDS DRAINAGE) ARE NOT CONSIDERED AS POINTS OF COMPLIANCE, BECAUSE THESE SAMPLES WERE NOT ANALYZED FOR THE ANALYTICAL GROUPS OF CONCERN IN THE PARTICULAR AREAS. SEE SECTION 3.3 OF THE TEXT FOR DETAILED EXPLANATION.



VOLUME A - REMEDIAL INVESTIGATION REPORT SUMMARY
HERCULES INCORPORATED
KENVIL WORKS FACILITY, NEW JERSEY
SEDIMENT-
SITE WIDE AREAL EXTENT OF EXCEEDANCES

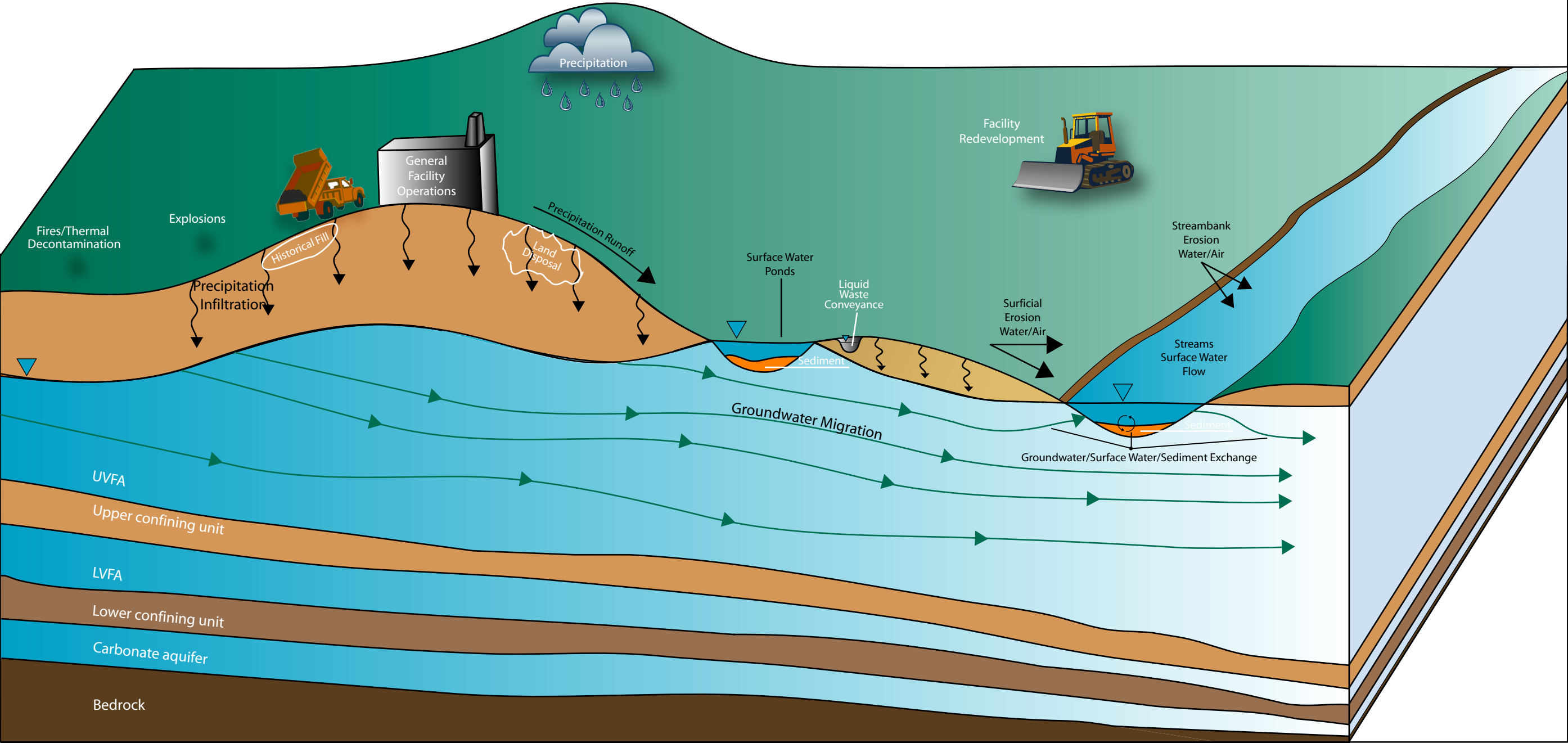


FIGURE A-7

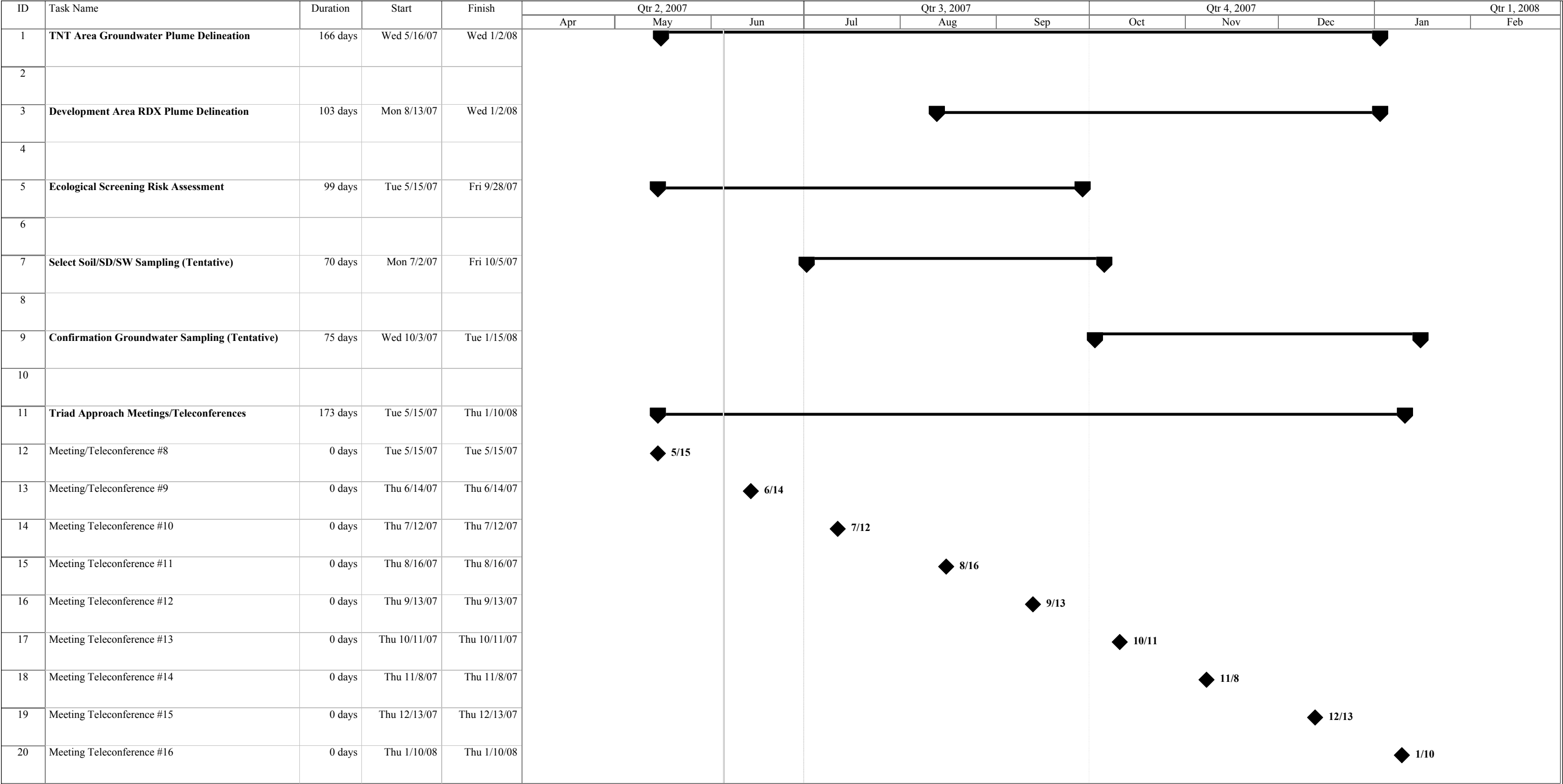


VOLUME A - REMEDIAL INVESTIGATION REPORT SUMMARY
HERCULES INCORPORATED
KENIL WORKS FACILITY, NEW JERSEY

SURFACE WATER -
SITE WIDE AREAL EXTENT OF EXCEEDANCES



Notes:
LVFA = Lower Valley Fill Aquifer
UVFA = Upper Valley Fill Aquifer
Water Level



Project: Kenvil 2007 Draft Schedule(5_24
Date: Tue 6/5/07

Task



Progress



Summary



External Tasks



Deadline



Split



Milestone



Project Summary



External Milestone



VOLUME A - REMEDIAL INVESTIGATION REPORT SUMMARY
HERCULES INCORPORATED
KENVIL WORKS FACILITY, NEW JERSEY

FUTURE ACTIONS - SCHEDULE



MWH

FIGURE A-10

TABLES

Table A-1-A

Soil - RI Analytical Methods and Criteria Summary
Volume A - Remedial Investigation Report Summary
Hercules Incorporated
Kenvil Works Facility, New Jersey

Analytical Group		Constituent	Units	IGWSCC	Source of IGWSCC	RDCSCC	NRDCSCC	Analytical Method	Source of RDCSCC/NRDCSCC
VOCS		ACRYLONITRILE	UG/KG	1000	NJSCC 1999	1000	5000	SW8260B	NJSCC 1999
		BENZENE	UG/KG	1000	NJSCC 1999	3000	13000	SW8260B	NJSCC 1999
		CHLOROBENZENE	UG/KG	1000	NJSCC 1999	37000	680000	SW8260B	NJSCC 1999
		METHYLENE CHLORIDE	UG/KG	1000	NJSCC 1999	49000	210000	SW8260B	NJSCC 1999
		TETRACHLOROETHYLENE (PCE)	UG/KG	1000	NJSCC 1999	4000	6000	SW8260B	NJSCC 1999
		1,4-DICHLOROBENZENE	UG/KG	100000	NJSCC 1999	570000	10000000	SW8270C	NJSCC 1999
		2,4-DINITROPHENOL	UG/KG	10000	NJSCC 1999	110000	2100000	SW8270C	NJSCC 1999
SVOCS		2,4/2,6-DINITROTOLUENE	UG/KG	0.3*	Site Specific Screening Level, Provided by NJDEP June 2003	940*	4200*	SW8270C	Site Specific Screening Level, Provided by NJDEP June 2003
SVOCS		BENZO(A)ANTHRACENE	UG/KG	500000	NJSCC 1999	900	4000	SW8270C	NJSCC 1999
SVOCS		BENZO(A)PYRENE	UG/KG	100000	NJSCC 1999	660	660	SW8270C	NJSCC 1999
SVOCS		BENZO(B)FLUORANTHENE	UG/KG	50000	NJSCC 1999	900	4000	SW8270C	NJSCC 1999
SVOCS		BENZO(K)FLUORANTHENE	UG/KG	500000	NJSCC 1999	900	4000	SW8270C	NJSCC 1999
SVOCS		BENZYL BUTYL PHTHALATE	UG/KG	100000	NJSCC 1999	1100000	10000000	SW8270C	NJSCC 1999
SVOCS		BIS(2-ETHYLHEXYL) PHTHALATE	UG/KG	100000	NJSCC 1999	49000	210000	SW8270C	NJSCC 1999
SVOCS		CHRYSENE	UG/KG	500000	NJSCC 1999	9000	40000	SW8270C	NJSCC 1999
SVOCS		DI-N-BUTYL PHTHALATE	UG/KG	100000	NJSCC 1999	5700000	10000000	SW8270C	NJSCC 1999
SVOCS		DIBENZ(A,H)ANTHRACENE	UG/KG	100000	NJSCC 1999	660	660	SW8270C	NJSCC 1999
SVOCS		DIETHYL PHTHALATE	UG/KG	50000	NJSCC 1999	10000000	10000000	SW8270C	NJSCC 1999
SVOCS		INDENO(1,2,3-C,D)PYRENE	UG/KG	500000	NJSCC 1999	900	4000	SW8270C	NJSCC 1999
SVOCS		N-NITROSODI-N-PROPYLAMINE	UG/KG	10000	NJSCC 1999	660	660	SW8270C	NJSCC 1999
SVOCS		N-NITROSODIPHENYLAMINE	UG/KG	100000	NJSCC 1999	140000	600000	SW8270C	NJSCC 1999
METALS		ANTIMONY	MG/KG	NS	NA	14	340	SW6010B	NJSCC 1999
METALS		ARSENIC	MG/KG	NS	NA	20	20	SW6010B	NJSCC 1999
METALS		BERYLLIUM	MG/KG	NS	NA	2	2	SW6010B	NJSCC 1999
METALS		CADMIUM	MG/KG	NS	NA	39	100	SW6010B	NJSCC 1999
METALS		COPPER	MG/KG	NS	NA	600	600	SW6010B	NJSCC 1999
METALS		LEAD	MG/KG	NS	NA	400	600	SW6010B	NJSCC 1999
METALS		MERCURY	MG/KG	NS	NA	14	270	SW7471A	NJSCC 1999
METALS		NICKEL	MG/KG	NS	NA	250	2400	SW6010B	NJSCC 1999
METALS		SELENIUM	MG/KG	NS	NA	63	3100	SW6010B	NJSCC 1999
METALS		SILVER	MG/KG	NS	NA	110	4100	SW6010B	NJSCC 1999
METALS		THALLIUM	MG/KG	NS	NA	2	2	SW6010B	NJSCC 1999
METALS		ZINC	MG/KG	NS	NA	1500	1500	SW6010B	NJSCC 1999
E&E		1,3-DINITROBENZENE	UG/KG	20*	Site Specific Screening Level, Provided by NJDEP June 2003	7800*	100000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E		2,4,6-TRINITROTOLUENE	UG/KG	40*	Site Specific Screening Level, Provided by NJDEP June 2003	21000*	95000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E		2-AMINO-4,6-DINITROTOLUENE	UG/KG	40*	Site Specific Screening Level, Provided by NJDEP June 2003	4700*	61000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E		4-AMINO-2,6-DINITROTOLUENE	UG/KG	NS	NA	4700*	61000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E		HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE (RDX)	UG/KG	NS	NA	5800*	26000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E		NITROCELLULOSE	UG/KG	NS	NA	10000000	10000000	IAAP83	NJSCC 1999
E&E		NITROGLYCERIN	UG/KG	NS	NA	46000*	200000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003

Table A-1-A

Soil - RI Analytical Methods and Criteria Summary
Volume A - Remedial Investigation Report Summary
Hercules Incorporated
Kenvil Works Facility, New Jersey

Analytical Group	Constituent	Units	IGWSCC	Source of IGWSCC	RDCSCC	NRDCSCC	Analytical Method	Source of RDCSCC/NRDCSCC
E&E	OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE (HMX)	UG/KG	NS	NA	3900000*	10000000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
PCBS	PCB-1016 (AROCHLOR 1016)	UG/KG	NS	NA	NS	NS	SW8082	NA
PCBS	PCB-1221 (AROCHLOR 1221)	UG/KG	NS	NA	NS	NS	SW8082	NA
PCBS	PCB-1232 (AROCHLOR 1232)	UG/KG	NS	NA	NS	NS	SW8082	NA
PCBS	PCB-1242 (AROCHLOR 1242)	UG/KG	NS	NA	NS	NS	SW8082	NA
PCBS	PCB-1248 (AROCHLOR 1248)	UG/KG	NS	NA	NS	NS	SW8082	NA
PCBS	PCB-1254 (AROCHLOR 1254)	UG/KG	NS	NA	NS	NS	SW8082	NA
PCBS	PCB-1260 (AROCHLOR 1260)	UG/KG	NS	NA	NS	NS	SW8082	NA
PCBS	TOTAL PCBS	UG/KG	50000	NJSCC 1999	490	2000	SW8082	NJSCC 1999

Notes:
VOCS = Volatile organic constituents
SVOCS = Semi-volatile organic constituents
E&E = Explosive and energetic constituents
PCBS = Polychlorinated biphenyls
IGWSCC = Impact to groundwater soil cleanup criteria
RDCSCC = Residential direct contact soil cleanup criteria
NRDCSCC = Non-residential direct contact soil cleanup criteria
NA = Not applicable
NS = No standard
* Site Specific Screening Level = Criteria were provided to Hercules by NJDEP in the June 19, 2003 Correspondence

Source:
NJSCC 1999 = NJDEP Soil Cleanup Criteria last revised on May 12, 1999

Table A-1-B

Soil - RI Analytical Methods and Criteria Summary for DDNP Pond Samples
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Analytical Group	Constituent	Units	IGWSCC	Source of IGWSCC	RDCSCC	NRDCSCC	Analytical Method	Source of RDCSCC/NRDCSCC
SVOCS	1,2,4-TRICHLOROBENZENE	UG/KG	100000	NJSCC 1999	68000	1200000	SW8270C	NJSCC 1999
SVOCS	1,2-DICHLOROBENZENE	UG/KG	50000	NJSCC 1999	5100000	10000000	SW8270C	NJSCC 1999
SVOCS	1,2-DIPHENYLHYDRAZINE	UG/KG	8*	Site Specific Screening Level, Proposed NJ SRS	600*	2000*	SW8270C	Site Specific Screening Level, Proposed NJ SRS
SVOCS	1,3-DICHLOROBENZENE	UG/KG	100000	NJSCC 1999	5100000	10000000	SW8270C	NJSCC 1999
SVOCS	1,4-DICHLOROBENZENE	UG/KG	100000	NJSCC 1999	570000	10000000	SW8270C	NJSCC 1999
SVOCS	2,4,6-TRICHLOROPHENOL	UG/KG	10000	NJSCC 1999	62000	270000	SW8270C	NJSCC 1999
SVOCS	2,4-DICHLOROPHENOL	UG/KG	10000	NJSCC 1999	170000	3100000	SW8270C	NJSCC 1999
SVOCS	2,4-DIMETHYLPHENOL	UG/KG	10000	NJSCC 1999	1100000	10000000	SW8270C	NJSCC 1999
SVOCS	2,4-DINITROPHENOL	UG/KG	10000	NJSCC 1999	110000	2100000	SW8270C	NJSCC 1999
SVOCS	2,4/2,6-DINITROTOLUENE	UG/KG	0.3*	Site Specific Screening Level, Provided by NJDEP June 2003	940*	4200*	SW8270C	Site Specific Screening Level, Provided by NJDEP June 2003
SVOCS	2-CHLORONAPHTHALENE	UG/KG	NS	NA	NS	NS	SW8270C	NA
SVOCS	2-CHLOROPHENOL	UG/KG	10000	NJSCC 1999	280000	5200000	SW8270C	NJSCC 1999
SVOCS	2-NITROPHENOL	UG/KG	NS	NA	NS	NS	SW8270C	NA
SVOCS	3,3'-DICHLOROBENZIDINE	UG/KG	100000	NJSCC 1999	2000	6000	SW8270C	NJSCC 1999
SVOCS	4,6-DINITRO-2-METHYLPHENOL	UG/KG	NS	NA	NS	NS	SW8270C	NA
SVOCS	4-BROMOPHENYL PHENYL ETHER	UG/KG	NS	NA	NS	NS	SW8270C	NA
SVOCS	4-CHLORO-3-METHYLPHENOL	UG/KG	100000	NJSCC 1999	10000000	10000000	SW8270C	NJSCC 1999
SVOCS	4-CHLOROPHENYL PHENYL ETHER	UG/KG	NS	NA	NS	NS	SW8270C	NA
SVOCS	4-NITROPHENOL	UG/KG	NS	NA	NS	NS	SW8270C	NA
SVOCS	ACENAPHTHENE	UG/KG	100000	NJSCC 1999	3400000	10000000	SW8270C	NJSCC 1999
SVOCS	ACENAPHTHYLENE	UG/KG	NS	NA	NS	NS	SW8270C	NA
SVOCS	ANTHRACENE	UG/KG	100000	NJSCC 1999	10000000	10000000	SW8270C	NJSCC 1999
SVOCS	BENZIDINE	UG/KG	0.0006*	Site Specific Screening Level, Proposed NJ SRS	2*	8*	SW8270C	Site Specific Screening Level, Proposed NJ SRS
SVOCS	BENZO(A)ANTHRACENE	UG/KG	500000	NJSCC 1999	900	4000	SW8270C	NJSCC 1999
SVOCS	BENZO(A)PYRENE	UG/KG	100000	NJSCC 1999	660	660	SW8270C	NJSCC 1999
SVOCS	BENZO(B)FLUORANTHENE	UG/KG	50000	NJSCC 1999	900	4000	SW8270C	NJSCC 1999
SVOCS	BENZO(G,H,I)PERYLENE	UG/KG	NS	NA	NS	NS	SW8270C	NA
SVOCS	BENZO(K)FLUORANTHENE	UG/KG	500000	NJSCC 1999	900	4000	SW8270C	NJSCC 1999
SVOCS	BENZYL BUTYL PHTHALATE	UG/KG	100000	NJSCC 1999	1100000	10000000	SW8270C	NJSCC 1999
SVOCS	BIS(2-CHLOROETHOXY) METHANE	UG/KG	NS	NA	NS	NS	SW8270C	NA
SVOCS	BIS(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	UG/KG	10000	NJSCC 1999	660	3000	SW8270C	NJSCC 1999
SVOCS	BIS(2-CHLOROISOPROPYL) ETHER	UG/KG	10000	NJSCC 1999	2300000	10000000	SW8270C	NJSCC 1999
SVOCS	BIS(2-ETHYLHEXYL) PHTHALATE	UG/KG	100000	NJSCC 1999	49000	210000	SW8270C	NJSCC 1999
SVOCS	CHRYSENE	UG/KG	500000	NJSCC 1999	9000	40000	SW8270C	NJSCC 1999
SVOCS	DI-N-BUTYL PHTHALATE	UG/KG	100000	NJSCC 1999	5700000	10000000	SW8270C	NJSCC 1999
SVOCS	DI-N-OCTYLPHTHALATE	UG/KG	100000	NJSCC 1999	1100000	10000000	SW8270C	NJSCC 1999
SVOCS	DIBENZ(A,H)ANTHRACENE	UG/KG	100000	NJSCC 1999	660	660	SW8270C	NJSCC 1999
SVOCS	DIETHYL PHTHALATE	UG/KG	50000	NJSCC 1999	10000000	10000000	SW8270C	NJSCC 1999
SVOCS	DIMETHYL PHTHALATE	UG/KG	50000	NJSCC 1999	10000000	10000000	SW8270C	NJSCC 1999
SVOCS	FLUORANTHENE	UG/KG	100000	NJSCC 1999	2300000	10000000	SW8270C	NJSCC 1999
SVOCS	FLUORENE	UG/KG	100000	NJSCC 1999	2300000	10000000	SW8270C	NJSCC 1999
SVOCS	HEXACHLOROBENZENE	UG/KG	100000	NJSCC 1999	660	2000	SW8270C	NJSCC 1999
SVOCS	HEXACHLOROBUTADIENE	UG/KG	100000	NJSCC 1999	1000	21000	SW8270C	NJSCC 1999
SVOCS	HEXACHLOROCYCLOPENTADIENE	UG/KG	100000	NJSCC 1999	400000	7300000	SW8270C	NJSCC 1999
SVOCS	HEXACHLOROETHANE	UG/KG	100000	NJSCC 1999	6000	100000	SW8270C	NJSCC 1999

Table A-1-B

Soil - RI Analytical Methods and Criteria Summary for DDNP Pond Samples
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Analytical Group		Constituent	Units	IGWSCC	Source of IGWSCC	RDCSCC	NRDCSCC	Analytical Method	Source of RDCSCC/NRDCSCC
SVOCS	INDENO(1,2,3-C,D)PYRENE		UG/KG	500000	NJSCC 1999	900	4000	SW8270C	NJSCC 1999
SVOCS	ISOPHORONE		UG/KG	50000	NJSCC 1999	1100000	10000000	SW8270C	NJSCC 1999
SVOCS	N-NITROSODI-N-PROPYLAMINE		UG/KG	10000	NJSCC 1999	660	660	SW8270C	NJSCC 1999
SVOCS	N-NITROSODIMETHYLAMINE		UG/KG	0.001*	Site Specific Screening Level, Proposed NJ SRS	10*	60*	SW8270C	Site Specific Screening Level, Proposed NJ SRS
SVOCS	N-NITROSODIPHENYLAMINE		UG/KG	100000	NJSCC 1999	140000	600000	SW8270C	NJSCC 1999
SVOCS	NAPHTHALENE		UG/KG	100000	NJSCC 1999	230000	4200000	SW8270C	NJSCC 1999
SVOCS	PENTACHLOROPHENOL		UG/KG	100000	NJSCC 1999	6000	24000	SW8270C	NJSCC 1999
SVOCS	PHENANTHRENE		UG/KG	NS	NA	NS	NS	SW8270C	NA
SVOCS	PHENOL		UG/KG	50000	NJSCC 1999	10000000	10000000	SW8270C	NJSCC 1999
SVOCS	PYRENE		UG/KG	100000	NJSCC 1999	1700000	10000000	SW8270C	NJSCC 1999
E&E	1,3,5-TRINITROBENZENE		UG/KG	NS	NA	2300000*	10000000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E	1,3-DINITROBENZENE		UG/KG	20*	Site Specific Screening Level, Provided by NJDEP June 2003	7800*	100000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E	2,4,6-TRINITROTOLUENE		UG/KG	40*	Site Specific Screening Level, Provided by NJDEP June 2003	21000*	95000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E	2-AMINO-4,6-DINITROTOLUENE		UG/KG	40*	Site Specific Screening Level, Provided by NJDEP June 2003	4700*	61000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E	2-NITROTOLUENE		UG/KG	NS	NA	780000*	10000000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E	3-NITROTOLUENE		UG/KG	NS	NA	1600000*	10000000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E	4-AMINO-2,6-DINITROTOLUENE		UG/KG	NS	NA	4700*	61000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E	4-NITROTOLUENE		UG/KG	NS	NA	780000*	10000000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E	DIAZODINITROPHENOL		UG/KG	NS	NA	10000000	10000000	SW8330	NJSCC 1999
E&E	HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE (RDX)		UG/KG	NS	NA	5800*	26000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E	NITROBENZENE		UG/KG	10000	NJSCC 1999	39000*	510000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E	NITROCELLULOSE		UG/KG	NS	NA	10000000	10000000	IAAP83	NJSCC 1999
E&E	NITROGLYCERIN		UG/KG	NS	NA	46000*	200000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E	OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE (HMX)		UG/KG	NS	NA	3900000*	10000000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E	PENTAERYTHRITOL TETRANITRATE		UG/KG	NS	NA	NS	NS	SW8330	NA
E&E	TETRYL		UG/KG	NS	NA	780000*	10000000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003

Notes:
DDNP = Diazodinitrophenol
SVOCS = Semi-volatile organic constituents
E&E = Explosive and energetic constituents
IGWSCC = Impact to groundwater soil cleanup criteria
RDCSCC = Residential direct contact soil cleanup criteria
NRDCSCC = Non-residential direct contact soil cleanup criteria
NA = Not applicable
NS = No standard
* Site Specific Screening Level = Criteria were provided to Hercules by NJDEP in the June 19, 2003 Correspondence
Sources:
Proposed NJ SRS = Criteria were obtained from the NJDEP Soil Remediation Standards proposed July 2004
NJSCC 1999 = NJDEP Soil Cleanup Criteria last revised on May 12, 1999

Table A-1-C

Soil - RI Analytical Methods and Criteria Summary for Trench Samples
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Analytical Group		Constituent	Units	IGWSCC	RDCSCC	NRDCSCC	Analytical Method	Source of IGWSCC/RDCSCC/NRDCSCC
VOCS		BENZENE	UG/KG	1000	3000	13000	SW8260B	NJSCC 1999
VOCS		ETHYLBENZENE	UG/KG	100000	1000000	1000000	SW8260B	NJSCC 1999
VOCS		TERT-BUTYL METHYL ETHER	UG/KG	NS	NS	NS	SW8260B	NA
VOCS		TOLUENE	UG/KG	500000	1000000	1000000	SW8260B	NJSCC 1999
VOCS		XYLENES, TOTAL	UG/KG	67000	410000	1000000	SW8260B	NJSCC 1999
SVOCS		1-METHYLNAPHTHALENE	UG/KG	NS	NS	NS	SW8270C	NA
SVOCS		2-METHYLNAPHTHALENE	UG/KG	NS	NS	NS	SW8270C	NA
SVOCS		ACENAPHTHENE	UG/KG	100000	3400000	10000000	SW8270C	NJSCC 1999
SVOCS		ACENAPHTHYLENE	UG/KG	NS	NS	NS	SW8270C	NA
SVOCS		ANTHRACENE	UG/KG	100000	10000000	10000000	SW8270C	NJSCC 1999
SVOCS		BENZO(A)ANTHRACENE	UG/KG	500000	900	4000	SW8270C	NJSCC 1999
SVOCS		BENZO(A)PYRENE	UG/KG	100000	660	660	SW8270C	NJSCC 1999
SVOCS		BENZO(B)FLUORANTHENE	UG/KG	50000	900	4000	SW8270C	NJSCC 1999
SVOCS		BENZO(G,H,I)PERYLENE	UG/KG	NS	NS	NS	SW8270C	NA
SVOCS		BENZO(K)FLUORANTHENE	UG/KG	500000	900	4000	SW8270C	NJSCC 1999
SVOCS		CHRYSENE	UG/KG	500000	9000	40000	SW8270C	NJSCC 1999
SVOCS		DIBENZ(A,H)ANTHRACENE	UG/KG	100000	660	660	SW8270C	NJSCC 1999
SVOCS		FLUORANTHENE	UG/KG	100000	2300000	10000000	SW8270C	NJSCC 1999
SVOCS		FLUORENE	UG/KG	100000	2300000	10000000	SW8270C	NJSCC 1999
SVOCS		INDENO(1,2,3-C,D)PYRENE	UG/KG	500000	900	4000	SW8270C	NJSCC 1999
SVOCS		NAPHTHALENE	UG/KG	100000	230000	4200000	SW8270C	NJSCC 1999
SVOCS		PHENANTHRENE	UG/KG	NS	NS	NS	SW8270C	NA
SVOCS		PYRENE	UG/KG	100000	1700000	10000000	SW8270C	NJSCC 1999
PHC		PHC AS #2 FUEL OILS C10-C23 #2 DIESEL, #2 FUEL OIL	MG/KG	NS	NS	NS	SW8015B	NA
PHC		#6 FUEL OIL	MG/KG	NS	NS	NS	SW8015B	NA
PHC		COAL TAR OIL	MG/KG	NS	NS	NS	SW8015B	NA
PHC		GASOLINE	MG/KG	NS	NS	NS	SW8015B	NA
PHC		KEROSENE	MG/KG	NS	NS	NS	SW8015B	NA
PHC		MINERAL SPIRITS	MG/KG	NS	NS	NS	SW8015B	NA
PHC		MOTOR OILS	MG/KG	NS	NS	NS	SW8015B	NA

Notes:

VOCS = Volatile organic constituents

SVOCS = Semi-volatile organic constituents

PHC = Petroleum hydrocarbon

IGWSCC = Impact to groundwater soil cleanup criteria

RDCSCC = Residential direct contact soil cleanup criteria

NRDCSCC = Non-residential direct contact soil cleanup criteria

NA = Not applicable

NS = No standard

Source:

NJSCC 1999 = NJDEP Soil Cleanup Criteria last revised on May 12, 1999

Table A-2-A

Groundwater - RI Analytical Methods and Criteria Summary
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Analytical Group	Constituent	Units	GWQS	Analytical Method	Source
VOCS	CIS-1,2-DICHLOROETHYLENE	UG/L	70	SW8260B	NJDEP GWQS 2005
VOCS	TETRACHLOROETHYLENE(PCE)	UG/L	1	SW8260B	NJDEP GWQS 2005
VOCS	TRICHLOROETHYLENE (TCE)	UG/L	1	SW8260B	NJDEP GWQS 2005
SVOCS	2,4/2,6-DINITROTOLUENE	UG/L	10	SW8270C	NJDEP GWQS 2005
SVOCS	BIS(2-ETHYLHEXYL) PHTHALATE	UG/L	3	SW8270C	NJDEP GWQS 2005
METALS	ANTIMONY	MG/L	0.006	SW6010B	NJDEP GWQS 2005
METALS	ARSENIC	MG/L	0.003	SW6010B	NJDEP GWQS 2005
METALS	BERYLLIUM	MG/L	0.001	SW6010B	NJDEP GWQS 2005
METALS	CADMIUM	MG/L	0.004	SW6010B	NJDEP GWQS 2005
METALS	CHROMIUM, TOTAL	MG/L	0.07	SW6010B	NJDEP GWQS 2005
METALS	COPPER	MG/L	1.3	SW6010B	NJDEP GWQS 2005
METALS	LEAD	MG/L	0.005	SW6010B	NJDEP GWQS 2005
METALS	MERCURY	MG/L	0.002	SW7470A	NJDEP GWQS 2005
METALS	NICKEL	MG/L	0.1	SW6010B	NJDEP GWQS 2005
METALS	SELENIUM	MG/L	0.04	SW6010B	NJDEP GWQS 2005
METALS	THALLIUM	MG/L	0.002	SW6010B	NJDEP GWQS 2005
METALS	ZINC	MG/L	2	SW6010B	NJDEP GWQS 2005
DISSOLVED METALS	ANTIMONY	MG/L	0.006	SW6010B	NJDEP GWQS 2005
DISSOLVED METALS	ARSENIC	MG/L	0.003	SW6010B	NJDEP GWQS 2005
DISSOLVED METALS	BERYLLIUM	MG/L	0.001	SW6010B	NJDEP GWQS 2005
DISSOLVED METALS	CADMIUM	MG/L	0.004	SW6010B	NJDEP GWQS 2005
DISSOLVED METALS	CHROMIUM, TOTAL	MG/L	0.07	SW6010B	NJDEP GWQS 2005
DISSOLVED METALS	COPPER	MG/L	1.3	SW6010B	NJDEP GWQS 2005
DISSOLVED METALS	LEAD	MG/L	0.005	SW6010B	NJDEP GWQS 2005
DISSOLVED METALS	MERCURY	MG/L	0.002	SW7470A	NJDEP GWQS 2005
DISSOLVED METALS	NICKEL	MG/L	0.1	SW6010B	NJDEP GWQS 2005
DISSOLVED METALS	SELENIUM	MG/L	0.04	SW6010B	NJDEP GWQS 2005
DISSOLVED METALS	THALLIUM	MG/L	0.002	SW6010B	NJDEP GWQS 2005
DISSOLVED METALS	ZINC	MG/L	2	SW6010B	NJDEP GWQS 2005
E&E	1,3,5-TRINITROBENZENE	UG/L	1100*	SW8330	Site Specific Screening Level, EPA Region III RBC Oct 2006
E&E	2,4,6-TRINITROTOLUENE	UG/L	2.2*	SW8330	Site Specific Screening Level, EPA Region III RBC Oct 2006
E&E	2-AMINO-4,6-DINITROTOLUENE	UG/L	1.4*	SW8330	Site Specific Screening Level, Calculated using NJDEP GWQS 2005
E&E	2-NITROTOLUENE	UG/L	61*	SW8330	Site Specific Screening Level, EPA Region III RBC Oct 2006
E&E	3-NITROTOLUENE	UG/L	120*	SW8330	Site Specific Screening Level, EPA Region III RBC April
E&E	4-AMINO-2,6-DINITROTOLUENE	UG/L	1.4*	SW8330	Site Specific Screening Level, Calculated using NJDEP GWQS 2005
E&E	4-NITROTOLUENE	UG/L	61*	SW8330	Site Specific Screening Level, EPA Region III RBC April
E&E	HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE (RDX)	UG/L	0.61*	SW8330	Site Specific Screening Level, EPA Region III RBC Oct 2006

Table A-2-A

Groundwater - RI Analytical Methods and Criteria Summary
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Analytical Group	Constituent	Units	GWQS	Analytical Method	Source
E&E	NITROGLYCERIN	UG/L	620*	SW8332	Site Specific Screening Level, EPA Region III RBC Oct 2006
E&E	OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE (HMX)	UG/L	1800*	SW8330	Site Specific Screening Level, EPA Region III RBC Oct 2006
E&E	PERCHLORATE	UG/L	5*	SW8321	Site Specific Screening Level, Provided by NJDEP Sept 2006
PCBS	PCB-1016 (AROCHLOR 1016)	UG/L	NS	SW8082	NA
PCBS	PCB-1221 (AROCHLOR 1221)	UG/L	NS	SW8082	NA
PCBS	PCB-1232 (AROCHLOR 1232)	UG/L	NS	SW8082	NA
PCBS	PCB-1242 (AROCHLOR 1242)	UG/L	NS	SW8082	NA
PCBS	PCB-1248 (AROCHLOR 1248)	UG/L	NS	SW8082	NA
PCBS	PCB-1254 (AROCHLOR 1254)	UG/L	NS	SW8082	NA
PCBS	PCB-1260 (AROCHLOR 1260)	UG/L	NS	SW8082	NA
PCBS	TOTAL PCBS	UG/L	0.5	SW8082	NJDEP GWQS 2005
GENERAL CHEMISTRY	AMMONIA NITROGEN	MG/L	3	E350.2	NJDEP GWQS 2005
GENERAL CHEMISTRY	NITROGEN, NITRATE (AS N)	MG/L	10	E353.2	NJDEP GWQS 2005
GENERAL CHEMISTRY	NITROGEN, NITRITE	MG/L	1	E353.2	NJDEP GWQS 2005

Notes:

- VOCS = Volatile organic constituents
- SVOCS = Semi-volatile organic constituents
- E&E = Explosive and energetic constituents
- PCBS = Polychlorinated biphenyls
- GWQS = Groundwater quality standard
- NS = No standard
- NA = Not applicable
- * = Site Specific Screening Level, derived from source indicated on table

Sources:

- NJDEP GWQS 2005 = NJDEP Groundwater Quality Standards June 2005
- EPA Region III RBC April 2006 = April 2006 EPA Region III Risk-Based Criteria
- EPA Region III RBC October 2006 = October 2006 EPA Region III Risk-Based Criteria
- Calculated NJDEP GWQS 2005 = Site Specific Screening Level calculated using NJDEP GWQS 2005

Table A-2-B

Groundwater - RI Analytical Methods and Criteria Summary for Trench Samples
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Analytical Group		Constituent	Units	GWQS	Analytical Method	Source
VOCS	BENZENE		UG/L	1	SW8260B	NJDEP GWQS 2005
VOCS	ETHYLBENZENE		UG/L	700	SW8260B	NJDEP GWQS 2005
VOCS	TERT-BUTYL METHYL ETHER		UG/L	70	SW8260B	NJDEP GWQS 2005
VOCS	TOLUENE		UG/L	1000	SW8260B	NJDEP GWQS 2005
VOCS	XYLENES, TOTAL		UG/L	1000	SW8260B	NJDEP GWQS 2005
SVOCS - PAHS	1-METHYLNAPHTHALENE		UG/L	NS	SW8270C	NA
SVOCS - PAHS	2-METHYLNAPHTHALENE		UG/L	100	SW8270C	NJDEP GWQS 2005
SVOCS - PAHS	ACENAPHTHENE		UG/L	400	SW8270C	NJDEP GWQS 2005
SVOCS - PAHS	ACENAPHTHYLENE		UG/L	NS	SW8270C	NA
SVOCS - PAHS	ANTHRACENE		UG/L	2000	SW8270C	NJDEP GWQS 2005
SVOCS - PAHS	BENZO(A)ANTHRACENE		UG/L	0.1	SW8270C	NJDEP GWQS 2005
SVOCS - PAHS	BENZO(A)PYRENE		UG/L	0.1	SW8270C	NJDEP GWQS 2005
SVOCS - PAHS	BENZO(B)FLUORANTHENE		UG/L	0.2	SW8270C	NJDEP GWQS 2005
SVOCS - PAHS	BENZO(G,H,I)PERYLENE		UG/L	100	SW8270C	NJDEP GWQS 2005
SVOCS - PAHS	BENZO(K)FLUORANTHENE		UG/L	0.5	SW8270C	NJDEP GWQS 2005
SVOCS - PAHS	CHRYSENE		UG/L	5	SW8270C	NJDEP GWQS 2005
SVOCS - PAHS	DIBENZ(A,H)ANTHRACENE		UG/L	0.3	SW8270C	NJDEP GWQS 2005
SVOCS - PAHS	FLUORANTHENE		UG/L	300	SW8270C	NJDEP GWQS 2005
SVOCS - PAHS	FLUORENE		UG/L	300	SW8270C	NJDEP GWQS 2005
SVOCS - PAHS	INDENO(1,2,3-C,D)PYRENE		UG/L	0.2	SW8270C	NJDEP GWQS 2005
SVOCS - PAHS	NAPHTHALENE		UG/L	300	SW8270C	NJDEP GWQS 2005
SVOCS - PAHS	PHENANTHRENE		UG/L	100	SW8270C	NJDEP GWQS 2005
SVOCS - PAHS	PYRENE		UG/L	200	SW8270C	NJDEP GWQS 2005
PHCS	#2 FUEL OIL		MG/L	NS	SW8015B	NA
PHCS	#6 FUEL OIL		MG/L	NS	SW8015B	NA
PHCS	COAL TAR OIL		MG/L	NS	SW8015B	NA
PHCS	DIESEL FUEL		MG/L	NS	SW8015B	NA
PHCS	GASOLINE		MG/L	NS	SW8015B	NA
PHCS	KEROSENE		MG/L	NS	SW8015B	NA
PHCS	MINERAL SPIRITS		MG/L	NS	SW8015B	NA
PHCS	MOTOR OILS		MG/L	NS	SW8015B	NA
PHCS	HYDRAULIC OIL		MG/L	NS	SW8015B	NA

Notes:
VOCS = Volatile organic constituents
SVOCS = Semi-volatile organic constituents
PAHS = Polynuclear aromatic hydrocarbons
PHCS = Petroleum hydrocarbons
GWQS = Groundwater quality standard
NS = No standard
NA = Not applicable
Source:
NJDEP GWQS 2005 = NJDEP Groundwater Quality Standards June 2005

Table A-3

Sediment - RI Analytical Methods and Criteria Summary
Volume A - Remedial Investigation Report Summary
Hercules Incorporated
Kenvil Works Facility, New Jersey

Analytical Group	Constituent	Units	LEL	SEL	Analytical Method	Source
VOCS	TETRACHLOROETHYLENE (PCE)	UG/KG	450	NS	SW8260B	NJDEP - FSSG
SVOCS	2,4-DINITROTOLUENE	UG/KG	14.4*	NS	SW8270C	RAIS-3
SVOCS	2,6-DINITROTOLUENE	UG/KG	39.8*	NS	SW8270C	RAIS-3
SVOCS - PAHS	ACENAPHTHENE - INTERMITTENT STREAMS	UG/KG	16	7.3*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	ACENAPHTHENE - PONDS	UG/KG	16	25*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	ACENAPHTHENE - STREAMS	UG/KG	16	8.2*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	ACENAPHTHENE - WET AREAS	UG/KG	16	15*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	ACENAPHTHYLENE - INTERMITTENT STREAMS	UG/KG	44	9.3*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	ACENAPHTHYLENE - PONDS	UG/KG	44	32*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	ACENAPHTHYLENE - STREAMS	UG/KG	44	10*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	ACENAPHTHYLENE - WET AREAS	UG/KG	44	19*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	ANTHRACENE - INTERMITTENT STREAMS	UG/KG	220	5391*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	ANTHRACENE - PONDS	UG/KG	220	18279*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	ANTHRACENE - STREAMS	UG/KG	220	6065*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	ANTHRACENE - WET AREAS	UG/KG	220	10924*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(a)ANTHRACENE - INTERMITTENT STREAMS	UG/KG	320	21562*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(a)ANTHRACENE - PONDS	UG/KG	320	73116*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(a)ANTHRACENE - STREAMS	UG/KG	320	24262*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(a)ANTHRACENE - WET AREAS	UG/KG	320	43694*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(a)PYRENE - INTERMITTENT STREAMS	UG/KG	370	20979*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(a)PYRENE - PONDS	UG/KG	370	71140*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(a)PYRENE - STREAMS	UG/KG	370	23606*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(a)PYRENE - WET AREAS	UG/KG	370	42513*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(g,h,i)PERYLENE - INTERMITTENT STREAMS	UG/KG	170	4662*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(g,h,i)PERYLENE - PONDS	UG/KG	170	15809*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(g,h,i)PERYLENE - STREAMS	UG/KG	170	5246*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(g,h,i)PERYLENE - WET AREAS	UG/KG	170	9447*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(k)FLUORANTHENE - INTERMITTENT STREAMS	UG/KG	240	19523*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(k)FLUORANTHENE - PONDS	UG/KG	240	66200*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(k)FLUORANTHENE - STREAMS	UG/KG	240	21967*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(k)FLUORANTHENE - WET AREAS	UG/KG	240	39561*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	CHRYSENE - INTERMITTENT STREAMS	UG/KG	340	6702*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	CHRYSENE - PONDS	UG/KG	340	22725*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	CHRYSENE - STREAMS	UG/KG	340	7541*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	CHRYSENE - WET AREAS	UG/KG	340	13581*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	DIBENZ(a,h)ANTHRACENE - INTERMITTENT STREAMS	UG/KG	60	1894*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	DIBENZ(a,h)ANTHRACENE - PONDS	UG/KG	60	6422*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	DIBENZ(a,h)ANTHRACENE - STREAMS	UG/KG	60	2131*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	DIBENZ(a,h)ANTHRACENE - WET AREAS	UG/KG	60	3838*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	FLUORANTHENE - INTERMITTENT STREAMS	UG/KG	750	14860*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	FLUORANTHENE - PONDS	UG/KG	750	50391*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	FLUORANTHENE - STREAMS	UG/KG	750	16721*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	FLUORANTHENE - WET AREAS	UG/KG	750	30113*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	FLUORENE - INTERMITTENT STREAMS	UG/KG	190	2331*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	FLUORENE - PONDS	UG/KG	190	7904*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	FLUORENE - STREAMS	UG/KG	190	2623*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	FLUORENE - WET AREAS	UG/KG	190	4724*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	NAPHTHALENE - INTERMITTENT STREAMS	UG/KG	160	31*	SW8270C	NJDEP - FSSG

Table A-3

Sediment - RI Analytical Methods and Criteria Summary
Volume A - Remedial Investigation Report Summary
Hercules Incorporated
Kenvil Works Facility, New Jersey

Analytical Group	Constituent	Units	LEL	SEL	Analytical Method	Source
SVOCS - PAHS	NAPHTHALENE - PONDS	UG/KG	160	104*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	NAPHTHALENE - STREAMS	UG/KG	160	34*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	NAPHTHALENE - WET AREAS	UG/KG	160	62*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	PHENANTHRENE - INTERMITTENT STREAMS	UG/KG	560	13841*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	PHENANTHRENE - PONDS	UG/KG	560	46933*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	PHENANTHRENE - STREAMS	UG/KG	560	15573*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	PHENANTHRENE - WET AREAS	UG/KG	560	28047*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	PYRENE - INTERMITTENT STREAMS	UG/KG	490	12384*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	PYRENE - PONDS	UG/KG	490	41993*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	PYRENE - STREAMS	UG/KG	490	13934*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	PYRENE - WET AREAS	UG/KG	490	25095*	SW8270C	NJDEP - FSSG
METALS	ARSENIC	MG/KG	6	33	SW6010B	NJDEP - FSSG
METALS	CADMIUM	MG/KG	0.6	10	SW6010B	NJDEP - FSSG
METALS	CHROMIUM, TOTAL	MG/KG	26	110	SW6010B	NJDEP - FSSG
METALS	COPPER	MG/KG	16	110	SW6010B	NJDEP - FSSG
METALS	LEAD	MG/KG	31	250	SW6010B	NJDEP - FSSG
METALS	MERCURY	MG/KG	0.2	2	SW7471A	NJDEP - FSSG
METALS	NICKEL	MG/KG	16	75	SW6010B	NJDEP - FSSG
METALS	SILVER	MG/KG	1	3.7	SW6010B	NJDEP - FSSG
METALS	ZINC	MG/KG	120	820	SW6010B	NJDEP - FSSG
E&E	1,3,5-TRINITROBENZENE	UG/KG	2*	NS	SW8330	DOE PRGEE
E&E	2,4,6-TRINITROTOLUENE	UG/KG	92*	NS	SW8330	USEPA SSB
E&E	2-AMINO-4,6-DINITROTOLUENE	UG/KG	NS	NS	SW8330	NA
E&E	4-AMINO-2,6-DINITROTOLUENE	UG/KG	NS	NS	SW8330	NA
E&E	HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE (RDX)	UG/KG	13*	NS	SW8330	USEPA SSB
E&E	NITROBENZENE	UG/KG	145*	NS	SW8330	RAIS-3
E&E	NITROCELLULOSE	UG/KG	NS	NS	IAAP83	NA
E&E	NITROGLYCERIN	UG/KG	NS	NS	SW8330	NA
E&E	OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE (HMX)	UG/KG	6*	NS	SW8330	DOE PRGEE
E&E	PENTAERYTHRITOL TETRANITRATE	UG/KG	NS	NS	SW8330	NA
GENERAL CHEMISTRY	GRAIN SIZE	% PASSING	NS	NS	ASTM D4/D422	NA
GENERAL CHEMISTRY	MOISTURE, PERCENT	%W/W	NS	NS	E160.3	NA
GENERAL CHEMISTRY	TOTAL ORGANIC CARBON	MG/KG	NS	NS	LYDKHN	NA

Notes:

VOCS = Volatile organic constituents

SVOCS = Semi-volatile organic constituents

PAHS = Polynuclear aromatic hydrocarbons

SVOCS - PAHS = SEL values for SVOCS - PAHs were calculated based on site specific TOC levels as specified in the NJDEP Guidance for Sediment Quality Evaluations

E&E = Explosive and energetic constituents

NA = Not applicable

NS = No standard

LEL = NJDEP Freshwater Sediment Screening Guidelines (FSSG) lowest effects level

SEL = NJDEP FSSG severe effects level

* = Site Specific Action Level, derived from source indicated on table

Sources:

NJDEP - FSSG = NJDEP Guidance for Sediment Quality Evaluations, Freshwater Sediment Screening Guidelines (FSSG), 1998

RAIS - 3 = SD EPA R5 ESL Sediment Screening Benchmark, Oak Ridge National Laboratory Risk Assessment Information System (RAIS). <http://risk.lsd.ornl.gov/>

USEPA SSB = USEPA (Mid-Atlantic) Ecological Risk Assessment Freshwater Sediment Screening Benchmarks (SSB). <http://www.epa.gov/reg3hwmd/risk/eco/btag/sbv/fwsed/screenbench.htm>

DOE PRGEE = Preliminary Remediation Goals for Ecological Endpoints, U.S. Department of Energy. ES/ER/TM-162/R2, Efroymsen, R.A., G.W. Suter II, B.E. Sample, D.S. Jones. 1997.

Table A-4

Surface Water - RI Analytical Methods and Criteria Summary
Volume A - Remedial Investigation Report Summary
Hercules Incorporated
Kenvil Works Facility, New Jersey

Analytical Group	Constituent	Units	Analytical Method	Human Health	Aquatic Life	Aquatic Life	Source
				SWQS	Chronic SWQS	Acute SWQS	
VOCS	BROMODICHLOROMETHANE	UG/L	SW8260B	0.55	NS	NS	NJDEP SWQS 2006
VOCS	TETRACHLOROETHYLENE (PCE)	UG/L	SW8260B	0.34	NS	NS	NJDEP SWQS 2006
SVOCS	2,4-DINITROTOLUENE	UG/L	SW8270C	0.11	NS	NS	NJDEP SWQS 2006
SVOCS	2,6-DINITROTOLUENE	UG/L	SW8270C	NS	NS	NS	NA
SVOCS	BENZO(a)ANTHRACENE	UG/L	SW8270C	0.038	NS	NS	NJDEP SWQS 2006
SVOCS	BENZO(a)PYRENE	UG/L	SW8270C	0.0038	NS	NS	NJDEP SWQS 2006
SVOCS	BENZO(b)FLUORANTHENE	UG/L	SW8270C	0.038	NS	NS	NJDEP SWQS 2006
SVOCS	BENZO(g,h,i)PERYLENE	UG/L	SW8270C	195*	NS	NS	Site Specific Screening Level, Calculated using EPA AWQC 1998
SVOCS	BENZO(k)FLUORANTHENE	UG/L	SW8270C	0.38	NS	NS	NJDEP SWQS 2006
SVOCS	bis(2-ETHYLHEXYL) PHTHALATE	UG/L	SW8270C	1.2	NS	NS	NJDEP SWQS 2006
SVOCS	CHRYSENE	UG/L	SW8270C	3.8	NS	NS	NJDEP SWQS 2006
TOTAL METALS	ARSENIC	MG/L	SW6010B	0.000017	NA	NA	NJDEP SWQS 2006
TOTAL METALS	COPPER	MG/L	SW6010B	1.3	NA	NA	NJDEP SWQS 2006
TOTAL METALS	LEAD	MG/L	SW6010B	0.005	NA	NA	NJDEP SWQS 2006
TOTAL METALS	MERCURY	MG/L	SW7470A	0.00005	NA	NA	NJDEP SWQS 2006
TOTAL METALS	SELENIUM	MG/L	SW6010B	0.17	NA	NA	NJDEP SWQS 2006
TOTAL METALS	SILVER	MG/L	SW6010B	0.17	NA	NA	NJDEP SWQS 2006
TOTAL METALS	THALLIUM	MG/L	SW6010B	0.00024	NA	NA	NJDEP SWQS 2006
TOTAL METALS	ZINC	MG/L	SW6010B	7.4	NA	NA	NJDEP SWQS 2006
DISSOLVED METALS	ARSENIC	MG/L	SW6010B	NA	0.15	0.34	NJDEP SWQS 2006
DISSOLVED METALS	COPPER - WESTERN DRAINAGE AREA	MG/L	SW6010B	NA	0.0069*	0.0101*	Site Specific Screening Level, Calculated using NJDEP SWQS 2006
DISSOLVED METALS	COPPER - CENTRAL DRAINAGE AREA	MG/L	SW6010B	NA	0.0074*	0.011*	Site Specific Screening Level, Calculated using NJDEP SWQS 2006
DISSOLVED METALS	COPPER - EASTERN DRAINAGE AREA	MG/L	SW6010B	NA	0.0148*	0.0236*	Site Specific Screening Level, Calculated using NJDEP SWQS 2006
DISSOLVED METALS	COPPER - DUCK POND AND TRIBUTARIES DRAINAGE AREA	MG/L	SW6010B	NA	0.0046*	0.0065*	Site Specific Screening Level, Calculated using NJDEP SWQS 2006
DISSOLVED METALS	COPPER - MISCELLANEOUS PONDS DRAINAGE AREA	MG/L	SW6010B	NA	0.0058*	0.0084*	Site Specific Screening Level, Calculated using NJDEP SWQS 2006

Table A-4

Surface Water - RI Analytical Methods and Criteria Summary
Volume A - Remedial Investigation Report Summary
Hercules Incorporated
Kenvil Works Facility, New Jersey

Analytical Group		Constituent	Units	Analytical Method	Human Health SWQS	Aquatic Life Chronic SWQS	Aquatic Life Acute SWQS	Source
DISSOLVED METALS	LEAD		MG/L	SW6010B	NA	0.0054	0.038	NJDEP SWQS 2006
DISSOLVED METALS	MERCURY		MG/L	SW7470A	NA	0.00077	0.0014	NJDEP SWQS 2006
DISSOLVED METALS	SELENIUM		MG/L	SW6010B	NA	0.005	0.02	NJDEP SWQS 2006
DISSOLVED METALS	SILVER - WESTERN DRAINAGE AREA		MG/L	SW6010B	NA	NS	0.0021*	Site Specific Screening Level, Calculated using NJDEP SWQS 2006
DISSOLVED METALS	SILVER - CENTRAL DRAINAGE AREA		MG/L	SW6010B	NA	NS	0.0025*	Site Specific Screening Level, Calculated using NJDEP SWQS 2006
DISSOLVED METALS	SILVER - EASTERN DRAINAGE AREA		MG/L	SW6010B	NA	NS	0.0099*	Site Specific Screening Level, Calculated using NJDEP SWQS 2006
DISSOLVED METALS	SILVER - DUCK POND AND TRIBUTARIES DRAINAGE AREA		MG/L	SW6010B	NA	NS	0.0009*	Site Specific Screening Level, Calculated using NJDEP SWQS 2006
DISSOLVED METALS	SILVER - MISCELLANEOUS PONDS DRAINAGE AREA		MG/L	SW6010B	NA	NS	0.0015*	Site Specific Screening Level, Calculated using NJDEP SWQS 2006
DISSOLVED METALS	THALLIUM		MG/L	SW6010B	NA	NS	NS	NA
DISSOLVED METALS	ZINC - WESTERN DRAINAGE AREA		MG/L	SW6010B	NA	0.0925*	0.0925*	Site Specific Screening Level, Calculated using NJDEP SWQS 2006
DISSOLVED METALS	ZINC - CENTRAL DRAINAGE AREA		MG/L	SW6010B	NA	0.0998*	0.0998*	Site Specific Screening Level, Calculated using NJDEP SWQS 2006
DISSOLVED METALS	ZINC - EASTERN DRAINAGE AREA		MG/L	SW6010B	NA	0.1982*	0.1982*	Site Specific Screening Level, Calculated using NJDEP SWQS 2006
DISSOLVED METALS	ZINC - DUCK POND AND TRIBUTARIES DRAINAGE AREA		MG/L	SW6010B	NA	0.0621*	0.0621*	Site Specific Screening Level, Calculated using NJDEP SWQS 2006
DISSOLVED METALS	ZINC - MISCELLANEOUS PONDS DRAINAGE AREA		MG/L	SW6010B	NA	0.0781*	0.0781*	Site Specific Screening Level, Calculated using NJDEP SWQS 2006
E&E	2,4,6-TRINITROTOLUENE		UG/L	SW8330	1.1*	NS	NS	Site Specific Screening Level, Calculated using EPA AWQC 1998
E&E	2-AMINO-4,6-DINITROTOLUENE		UG/L	SW8330	6*	NS	NS	Site Specific Screening Level, Calculated using EPA AWQC 1998
E&E	4-AMINO-2,6-DINITROTOLUENE		UG/L	SW8330	6*	NS	NS	Site Specific Screening Level, Calculated using EPA AWQC 1998
E&E	HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE (RDX)		UG/L	SW8330	0.31*	NS	NS	Site Specific Screening Level, Calculated using EPA AWQC 1998
E&E	OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE (HMX)		UG/L	SW8330	1735*	NS	NS	Site Specific Screening Level, Calculated using EPA AWQC 1998

Notes:

VOCS = Volatile organic constituents

E&E = Explosive and energetic constituents

SVOCS = Semi-volatile organic constituents

SWQS = Surface water quality standard

NA = Not applicable

NS = No standard

* = Site specific screening level, derived from source indicated on table

Sources:

NJDEP SWQS = NJDEP Surface Water Quality Standard as specified in N.J.A.C. 7:9B October 2006

AWQC 1998 = Criteria were developed according to 1998 EPA Ambient Water Quality Criteria Derivation Methodology applicable to NJ surface water FW2-NT

Table A-5

Soil - SI Analytical Methods and Criteria Summary
Volume A - Remedial Investigation Report Summary
Hercules Incorporated
Kenvil Works Facility, New Jersey

Analytical Group		Constituent	Units	IGWSCC	Source of IGWSCC	RDCSCC	NRDCSCC	Analytical Method	Source of RDCSCC/NRDCSCC
VOCS	1,1,1-TRICHLOROETHANE		UG/KG	50000	NJSCC 1999	210000	1000000	SW8260A	NJSCC 1999
VOCS	1,1,2,2-TETRACHLOROETHANE		UG/KG	1000	NJSCC 1999	34000	70000	SW8260B	NJSCC 1999
VOCS	1,1,2-TRICHLOROETHANE		UG/KG	1000	NJSCC 1999	22000	420000	SW8260B	NJSCC 1999
VOCS	1,1-DICHLOROETHANE		UG/KG	10000	NJSCC 1999	570000	1000000	SW8260B	NJSCC 1999
VOCS	1,1-DICHLOROETHENE		UG/KG	10000	NJSCC 1999	8000	150000	SW8260A	NJSCC 1999
VOCS	1,2-DICHLOROETHANE		UG/KG	1000	NJSCC 1999	6000	24000	SW8260B	NJSCC 1999
VOCS	1,2-DICHLOROPROPANE		UG/KG	NS	NA	10000	43000	SW8260A	NJSCC 1999
VOCS	2-CHLOROETHYL VINYL ETHER		UG/KG	NS	NA	NS	NS	SW8260B	NA
VOCS	ACETONITRILE		UG/KG	NS	NA	NS	NS	SW8260B	NA
VOCS	ACROLEIN		UG/KG	NS	NA	NS	NS	SW8260B	NA
VOCS	ACRYLONITRILE		UG/KG	1000	NJSCC 1999	1000	5000	SW8260A	NJSCC 1999
VOCS	BENZENE		UG/KG	1000	NJSCC 1999	3000	13000	SW8260B	NJSCC 1999
VOCS	BROMODICHLOROMETHANE		UG/KG	1000	NJSCC 1999	11000	46000	SW8260A	NJSCC 1999
VOCS	BROMOFORM		UG/KG	1000	NJSCC 1999	86000	370000	SW8260B	NJSCC 1999
VOCS	BROMOMETHANE		UG/KG	1000	NJSCC 1999	79000	1000000	SW8260A	NJSCC 1999
VOCS	CARBON TETRACHLORIDE		UG/KG	1000	NJSCC 1999	2000	4000	SW8260A	NJSCC 1999
VOCS	CHLOROBENZENE		UG/KG	1000	NJSCC 1999	37000	680000	SW8260A	NJSCC 1999
VOCS	CHLOROETHANE		UG/KG	NS	NA	NS	NS	SW8260A	NA
VOCS	CHLOROFORM		UG/KG	1000	NJSCC 1999	19000	28000	SW8260A	NJSCC 1999
VOCS	CHLOROMETHANE		UG/KG	10000	NJSCC 1999	520000	1000000	SW8260A	NJSCC 1999
VOCS	cis-1,2-DICHLOROPROPENE		UG/KG	NS	NA	NS	NS	SW8260B	NA
VOCS	cis-1,3-DICHLOROPROPENE		UG/KG	NS	NA	NS	NS	SW8260B	NA
VOCS	DIBROMOCHLOROMETHANE		UG/KG	1000	NJSCC 1999	110000	1000000	SW8260A	NJSCC 1999
VOCS	ETHYLBENZENE		UG/KG	100000	NJSCC 1999	1000000	1000000	SW8260A	NJSCC 1999
VOCS	METHYLENE CHLORIDE		UG/KG	1000	NJSCC 1999	49000	210000	SW8260A	NJSCC 1999
VOCS	TETRACHLOROETHYLENE (PCE)		UG/KG	1000	NJSCC 1999	4000	6000	SW8260A	NJSCC 1999
VOCS	TOLUENE		UG/KG	500000	NJSCC 1999	1000000	1000000	SW8260A	NJSCC 1999
VOCS	trans-1,2-DICHLOROETHENE		UG/KG	50000	NJSCC 1999	1000000	1000000	SW8260A	NJSCC 1999
VOCS	TRICHLOROETHYLENE (TCE)		UG/KG	1000	NJSCC 1999	23000	54000	SW8260A	NJSCC 1999
VOCS	VINYL CHLORIDE		UG/KG	10000	NJSCC 1999	2000	7000	SW8260A	NJSCC 1999
SVOCS	1,2,4-TRICHLOROBENZENE		UG/KG	100000	NJSCC 1999	68000	1200000	SW8270C	NJSCC 1999
SVOCS	1,2-DICHLOROBENZENE		UG/KG	50000	NJSCC 1999	5100000	10000000	SW8270C	NJSCC 1999
SVOCS	1,2-DIPHENYLHYDRAZINE		UG/KG	NS	NA	NS	NS	SW8270C	NA
SVOCS	1,3-DICHLOROBENZENE		UG/KG	100000	NJSCC 1999	5100000	10000000	SW8270C	NJSCC 1999
SVOCS	1,4-DICHLOROBENZENE		UG/KG	100000	NJSCC 1999	570000	10000000	SW8270C	NJSCC 1999
SVOCS	2,2'-OXYBIS(1-CHLORO)PROPANE		UG/KG	NS	NA	NS	NS	SW8270C	NA
SVOCS	2,4,6-TRICHLOROPHENOL		UG/KG	10000	NJSCC 1999	62000	270000	SW8270C	NJSCC 1999
SVOCS	2,4-DICHLOROPHENOL		UG/KG	10000	NJSCC 1999	170000	3100000	SW8270C	NJSCC 1999
SVOCS	2,4-DIMETHYLPHENOL		UG/KG	10000	NJSCC 1999	1100000	10000000	SW8270C	NJSCC 1999
SVOCS	2,4-DINITROPHENOL		UG/KG	10000	NJSCC 1999	110000	2100000	SW8270C	NJSCC 1999
SVOCS	2,4/2,6-DINITROTOLUENE		UG/KG	0.3*	Site Specific Screening Level, Provided by NJDEP June 2003	940*	4200*	SW8270C	Site Specific Screening Level, Provided by NJDEP June 2003
SVOCS	2-CHLORONAPHTHALENE		UG/KG	NS	NA	NS	NS	SW8270C	NA
SVOCS	2-CHLOROPHENOL		UG/KG	10000	NJSCC 1999	280000	5200000	SW8270C	NJSCC 1999
SVOCS	2-NITROPHENOL		UG/KG	NS	NA	NS	NS	SW8270C	NA
SVOCS	3,3'-DICHLOROBENZIDINE		UG/KG	100000	NJSCC 1999	2000	6000	SW8270C	NJSCC 1999
SVOCS	4,6-DINITRO-2-METHYLPHENOL		UG/KG	NS	NA	NS	NS	SW8270C	NA
SVOCS	4-BROMOPHENYL PHENYL ETHER		UG/KG	NS	NA	NS	NS	SW8270C	NA
SVOCS	4-CHLORO-3-METHYLPHENOL		UG/KG	100000	NJSCC 1999	10000000	10000000	SW8270C	NJSCC 1999
SVOCS	4-CHLOROPHENYL PHENYL ETHER		UG/KG	NS	NA	NS	NS	SW8270C	NA
SVOCS	4-NITROPHENOL		UG/KG	NS	NA	NS	NS	SW8270C	NA
SVOCS	ACENAPHTHENE		UG/KG	100000	NJSCC 1999	3400000	10000000	SW8270C	NJSCC 1999

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Hercules Incorporated
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Analytical Group		Constituent	Units	IGWSCC	Source of IGWSCC	RDCSCC	NRDCSCC	Analytical Method	Source of RDCSCC/NRDCSCC
SVOCS	ACENAPHTHYLENE		UG/KG	NS	NA	NS	NS	SW8270C	NA
	ANTHRACENE		UG/KG	100000	NJSCC 1999	10000000	10000000	SW8270C	NJSCC 1999
	BENZIDINE		UG/KG	NS	NA	NS	NS	SW8270C	NA
	BENZO(a)ANTHRACENE		UG/KG	500000	NJSCC 1999	900	4000	SW8270C	NJSCC 1999
	BENZO(a)PYRENE		UG/KG	100000	NJSCC 1999	660	660	SW8270C	NJSCC 1999
	BENZO(b)FLUORANTHENE		UG/KG	50000	NJSCC 1999	900	4000	SW8270C	NJSCC 1999
	BENZO(g,h,i)FLUORANTHENE		UG/KG	NS	NA	NS	NS	SW8270C	NA
	BENZO(g,h,i)PERYLENE		UG/KG	NS	NA	NS	NS	SW8270C	NA
	BENZO(k)FLUORANTHENE		UG/KG	500000	NJSCC 1999	900	4000	SW8270C	NJSCC 1999
	BENZYL BUTYL PHTHALATE		UG/KG	100000	NJSCC 1999	1100000	10000000	SW8270C	NJSCC 1999
	bis(2-CHLOROETHOXY) METHANE		UG/KG	NS	NA	NS	NS	SW8270C	NA
	bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)		UG/KG	10000	NJSCC 1999	660	3000	SW8270C	NJSCC 1999
	bis(2-CHLOROISOPROPYL) ETHER		UG/KG	10000	NJSCC 1999	2300000	10000000	SW8270C	NJSCC 1999
	bis(2-ETHYLHEXYL) PHTHALATE		UG/KG	100000	NJSCC 1999	49000	210000	SW8270C	NJSCC 1999
	CHRYSENE		UG/KG	500000	NJSCC 1999	9000	40000	SW8270C	NJSCC 1999
	DI-n-BUTYL PHTHALATE		UG/KG	100000	NJSCC 1999	5700000	10000000	SW8270C	NJSCC 1999
	DI-n-OCTYLPHthalATE		UG/KG	100000	NJSCC 1999	1100000	10000000	SW8270C	NJSCC 1999
	DIBENZ(a,h)ANTHRACENE		UG/KG	100000	NJSCC 1999	660	660	SW8270C	NJSCC 1999
	DIETHYL PHTHALATE		UG/KG	50000	NJSCC 1999	10000000	10000000	SW8270C	NJSCC 1999
	DIMETHYL PHTHALATE		UG/KG	50000	NJSCC 1999	10000000	10000000	SW8270C	NJSCC 1999
	FLUORANTHENE		UG/KG	100000	NJSCC 1999	2300000	10000000	SW8270C	NJSCC 1999
	FLUORENE		UG/KG	100000	NJSCC 1999	2300000	10000000	SW8270C	NJSCC 1999
	HEXACHLOROBENZENE		UG/KG	100000	NJSCC 1999	660	2000	SW8270C	NJSCC 1999
	HEXACHLOROBUTADIENE		UG/KG	100000	NJSCC 1999	1000	21000	SW8270C	NJSCC 1999
	HEXACHLOROCYCLOPENTADIENE		UG/KG	100000	NJSCC 1999	400000	7300000	SW8270C	NJSCC 1999
	HEXACHLOROETHANE		UG/KG	100000	NJSCC 1999	6000	100000	SW8270C	NJSCC 1999
	INDENO(1,2,3-c,d)PYRENE		UG/KG	500000	NJSCC 1999	900	4000	SW8270C	NJSCC 1999
	ISOPHORONE		UG/KG	50000	NJSCC 1999	1100000	10000000	SW8270C	NJSCC 1999
	N-NITROSODI-n-PROPYLAMINE		UG/KG	10000	NJSCC 1999	660	660	SW8270C	NJSCC 1999
	N-NITROSODIMETHYLAMINE		UG/KG	NS	NA	NS	NS	SW8270C	NA
	N-NITROSODIPHENYLAMINE		UG/KG	100000	NJSCC 1999	140000	600000	SW8270C	NJSCC 1999
	NAPHTHALENE		UG/KG	100000	NJSCC 1999	230000	4200000	SW8270C	NJSCC 1999
	PENTACHLOROPHENOL		UG/KG	100000	NJSCC 1999	6000	24000	SW8270C	NJSCC 1999
	PHENANTHRENE		UG/KG	NS	NA	NS	NS	SW8270C	NA
	PHENOL		UG/KG	50000	NJSCC 1999	10000000	10000000	SW9065	NJSCC 1999
	PYRENE		UG/KG	100000	NJSCC 1999	1700000	10000000	SW8270C	NJSCC 1999
METALS	ANTIMONY		MG/KG	NS	NA	14	340	SW6010B	NJSCC 1999
	ARSENIC		MG/KG	NS	NA	20	20	SW6010B	NJSCC 1999
	BERYLLIUM		MG/KG	NS	NA	2	2	SW6010B	NJSCC 1999
	CADMIUM		MG/KG	NS	NA	39	100	SW6010B	NJSCC 1999
	CHROMIUM, TOTAL		MG/KG	NS	NA	120000	NS	SW6010B	NJSCC 1999
	COPPER		MG/KG	NS	NA	600	600	SW6010B	NJSCC 1999
	LEAD		MG/KG	NS	NA	400	600	SW6010B	NJSCC 1999
	MERCURY		MG/KG	NS	NA	14	270	SW7471A	NJSCC 1999
	NICKEL		MG/KG	NS	NA	250	2400	SW6010B	NJSCC 1999
	SELENIUM		MG/KG	NS	NA	63	3100	SW6010B	NJSCC 1999
	SILVER		MG/KG	NS	NA	110	4100	SW6010B	NJSCC 1999
	THALLIUM		MG/KG	NS	NA	2	2	SW6010B	NJSCC 1999
E&E	ZINC		MG/KG	NS	NA	1500	1500	SW6010B	NJSCC 1999
	1,3,5-TRICHLOROBENZENE		UG/KG	NS	NA	NS	NS	SW8330	NA

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Analytical Group		Constituent	Units	IGWSCC	Source of IGWSCC	RDCSCC	NRDCSCC	Analytical Method	Source of RDCSCC/NRDCSCC
E&E	1,3,5-TRINITROBENZENE	UG/KG	NS	NA		2300000*	10000000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E	1,3-DINITROBENZENE	UG/KG	20*	Site Specific Screening Level, Provided by NJDEP June 2003		7800*	100000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E	2,4,6-TRINITROTOLUENE	UG/KG	40*	Site Specific Screening Level, Provided by NJDEP June 2003		21000*	95000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E	2-AMINO-4,6-DINITROTOLUENE	UG/KG	40*	Site Specific Screening Level, Provided by NJDEP June 2003		4700*	61000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E	2-NITROTOLUENE	UG/KG	NS	NA		780000*	10000000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E	3-NITROTOLUENE	UG/KG	NS	NA		1600000*	10000000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E	4-AMINO-2,6-DINITROTOLUENE	UG/KG	NS	NA		4700*	61000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E	4-NITROTOLUENE	UG/KG	NS	NA		780000*	10000000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E	DIAZODINITROPHENOL	UG/KG	NS	NA		10000000	10000000	SW8330	NJSCC 1999
E&E	HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE (RDX)	UG/KG	NS	NA		5800*	26000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E	NITROBENZENE	UG/KG	10000	NJSCC 1999		39000*	510000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E	NITROCELLULOSE	UG/KG	NS	NA		NS	NS	IAPP	NA
E&E	NITROGLYCERIN	UG/KG	NS	NA		46000*	200000*	SW8332	Site Specific Screening Level, Provided by NJDEP June 2003
E&E	OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE (HMX)	UG/KG	NS	NA		3900000*	10000000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
E&E	PENTAERYTHRITOL TETRANITRATE	UG/KG	NS	NA		NS	NS	SW 8330	NA
E&E	TETRYL	UG/KG	NS	NA		780000*	10000000*	SW8330	Site Specific Screening Level, Provided by NJDEP June 2003
PCBS	PCB-1016 (AROCHLOR 1016)	UG/KG	NS	NA		NS	NS	SW8082	NA
PCBS	PCB-1221 (AROCHLOR 1221)	UG/KG	NS	NA		NS	NS	SW8082	NA
PCBS	PCB-1232 (AROCHLOR 1232)	UG/KG	NS	NA		NS	NS	SW8082	NA
PCBS	PCB-1242 (AROCHLOR 1242)	UG/KG	NS	NA		NS	NS	SW8082	NA
PCBS	PCB-1248 (AROCHLOR 1248)	UG/KG	NS	NA		NS	NS	SW8082	NA
PCBS	PCB-1254 (AROCHLOR 1254)	UG/KG	NS	NA		NS	NS	SW8082	NA
PCBS	PCB-1260 (AROCHLOR 1260)	UG/KG	NS	NA		NS	NS	SW8082	NA
PCBS	TOTAL PCBS	UG/KG	50000	NJSCC 1999		490	2000	SW8082	NJSCC 1999
GENERAL CHEMISTRY	NITROGEN, AMMONIA (AS N)	MG/KG	NS	NA		NS	NS	E350.2	NA
GENERAL CHEMISTRY	pH	PH	NS	NA		NS	NS	SW9045C	NA
GENERAL CHEMISTRY	SOLIDS, PERCENT	PERCENT	NS	NA		NS	NS	D2216	NA

Notes:
VOCS = Volatile organic constituents
SVOCS = Semi-volatile organic constituents
E&E = Explosive and energetic constituents
PCBS = Polychlorinated biphenyls
IGWSCC = Impact to groundwater soil cleanup criteria
RDCSCC = Residential direct contact soil cleanup criteria
NRDCSCC = Non-residential direct contact soil cleanup criteria
NA = Not applicable
NS = No standard
* Site Specific Screening Level = Criteria were provided to Hercules by NJDEP in the June 19, 2003 Correspondence

Source:
NJSCC 1999 = NJDEP Soil Cleanup Criteria last revised on May 12, 1999
May 2007

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Analytical Group	Constituent	Units	LEL	SEL	Analytical Method	Source
VOCS	1,1,1-TRICHLOROETHANE	UG/KG	NS	NS	SW8260B	NA
VOCS	1,1,2,2-TETRACHLOROETHANE	UG/KG	NS	NS	SW8260B	NA
VOCS	1,1,2-TRICHLOROETHANE	UG/KG	NS	NS	SW8260B	NA
VOCS	1,1-DICHLOROETHANE	UG/KG	NS	NS	SW8260B	NA
VOCS	1,1-DICHLOROETHENE	UG/KG	NS	NS	SW8260B	NA
VOCS	1,2-DICHLOROETHANE	UG/KG	NS	NS	SW8260B	NA
VOCS	1,2-DICHLOROPROPANE	UG/KG	NS	NS	SW8260B	NA
VOCS	2-CHLOROETHYL VINYL ETHER	UG/KG	NS	NS	SW8260B	NA
VOCS	ACROLEIN	UG/KG	NS	NS	SW8260B	NA
VOCS	ACRYLONITRILE	UG/KG	NS	NS	SW8260B	NA
VOCS	AMYL ALCOHOL	UG/KG	NS	NS	SW8015B	NA
VOCS	BENZENE	UG/KG	340	NS	SW8260B	NJDEP - FSSG
VOCS	BROMODICHLOROMETHANE	UG/KG	NS	NS	SW8260B	NA
VOCS	BROMOFORM	UG/KG	NS	NS	SW8260B	NA
VOCS	BROMOMETHANE	UG/KG	NS	NS	SW8260B	NA
VOCS	CARBON TETRACHLORIDE	UG/KG	NS	NS	SW8260B	NA
VOCS	CHLOROBENZENE	UG/KG	NS	NS	SW8260B	NA
VOCS	CHLOROETHANE	UG/KG	NS	NS	SW8260B	NA
VOCS	CHLOROFORM	UG/KG	NS	NS	SW8260B	NA
VOCS	CHLOROMETHANE	UG/KG	NS	NS	SW8260B	NA
VOCS	cis-1,2-DICHLOROETHYLENE	UG/KG	NS	NS	SW8260B	NA
VOCS	cis-1,3-DICHLOROPROPENE	UG/KG	NS	NS	SW8260B	NA
VOCS	Di-n-propyl ether (1,1'-oxybis-Propane)	UG/KG	NS	NS	SW8015B	NA
VOCS	DIBROMOCHLOROMETHANE	UG/KG	NS	NS	SW8260B	NA
VOCS	DIETHYL ETHER (ETHYL ETHER)	UG/KG	NS	NS	SW8015B	NA
VOCS	ETHANOL	UG/KG	NS	NS	SW8015B	NA
VOCS	ETHYLBENZENE	UG/KG	1400	NS	SW8260B	NJDEP - FSSG
VOCS	METHANOL	UG/KG	NS	NS	SW8015B	NA
VOCS	METHYLENE CHLORIDE	UG/KG	NS	NS	SW8260B	NA
VOCS	n-BUTYL ETHER	UG/KG	NS	NS	SW8015B	NA
VOCS	TETRACHLOROETHYLENE(PCE)	UG/KG	450	NS	SW8260B	NJDEP - FSSG
VOCS	TOLUENE	UG/KG	2500	NS	SW8260B	NJDEP - FSSG
VOCS	trans-1,2-DICHLOROETHENE	UG/KG	NS	NS	SW8260B	NA
VOCS	trans-1,3-DICHLOROPROPENE	UG/KG	NS	NS	SW8260B	NA
VOCS	TRICHLOROETHYLENE (TCE)	UG/KG	1600	NS	SW8260B	NJDEP - FSSG
VOCS	TRICHLOROFLUOROMETHANE	UG/KG	NS	NS	SW8260B	NA
VOCS	VINYL CHLORIDE	UG/KG	NS	NS	SW8260B	NA
VOCS	XYLENES, TOTAL	UG/KG	120	NS	SW8260B	NJDEP - FSSG
SVOCS	1,2,4-TRICHLOROBENZENE	UG/KG	NS	NS	SW8270C	NA
SVOCS	1,2-DICHLOROBENZENE	UG/KG	NS	NS	SW8270C	NA
SVOCS	1,2-DIPHENYLHYDRAZINE	UG/KG	NS	NS	SW8270C	NA
SVOCS	1,3-DICHLOROBENZENE	UG/KG	NS	NS	SW8270C	NA
SVOCS	1,4-DICHLOROBENZENE	UG/KG	NS	NS	SW8270C	NA
SVOCS	2,4,6-TRICHLOROPHENOL	UG/KG	NS	NS	SW8270C	NA
SVOCS	2,4-DICHLOROPHENOL	UG/KG	NS	NS	SW8270C	NA
SVOCS	2,4-DIMETHYLPHENOL	UG/KG	NS	NS	SW8270C	NA
SVOCS	2,4-DINITROPHENOL	UG/KG	NS	NS	SW8270C	NA
SVOCS	2,4-DINITROTOLUENE	UG/KG	NS	NS	SW8270C	NA
SVOCS	2,6-DINITROTOLUENE	UG/KG	NS	NS	SW8270C	NA

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Analytical Group	Constituent	Units	LEL	SEL	Analytical Method	Source
SVOCS	2-CHLORONAPHTHALENE	UG/KG	NS	NS	SW8270C	NA
SVOCS	2-CHLOROPHENOL	UG/KG	NS	NS	SW8270C	NA
SVOCS	2-NITROPHENOL	UG/KG	NS	NS	SW8270C	NA
SVOCS	3,3'-DICHLOROBENZIDINE	UG/KG	NS	NS	SW8270C	NA
SVOCS	4,6-DINITRO-2-METHYLPHENOL	UG/KG	NS	NS	SW8270C	NA
SVOCS	4-BROMOPHENYL PHENYL ETHER	UG/KG	NS	NS	SW8270C	NA
SVOCS	4-CHLORO-3-METHYLPHENOL	UG/KG	NS	NS	SW8270C	NA
SVOCS	4-CHLOROPHENYL PHENYL ETHER	UG/KG	NS	NS	SW8270C	NA
SVOCS	4-NITROPHENOL	UG/KG	NS	NS	SW8270C	NA
SVOCS	BENZIDINE	UG/KG	NS	NS	SW8270C	NA
SVOCS	BENZO(b)FLUORANTHENE	UG/KG	NS	NS	SW8270C	NA
SVOCS	BENZYL BUTYL PHTHALATE	UG/KG	NS	NS	SW8270C	NA
SVOCS	bis(2-CHLOROETHOXY) METHANE	UG/KG	NS	NS	SW8270C	NA
SVOCS	bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	UG/KG	NS	NS	SW8270C	NA
SVOCS	bis(2-CHLOROISOPROPYL) ETHER	UG/KG	NS	NS	SW8270C	NA
SVOCS	bis(2-ETHYLHEXYL) PHTHALATE	UG/KG	NS	NS	SW8270C	NA
SVOCS	DI-n-BUTYL PHTHALATE	UG/KG	NS	NS	SW8270C	NA
SVOCS	DI-n-OCTYLPHTHALATE	UG/KG	NS	NS	SW8270C	NA
SVOCS	DIETHYL PHTHALATE	UG/KG	NS	NS	SW8270C	NA
SVOCS	DIMETHYL PHTHALATE	UG/KG	NS	NS	SW8270C	NA
SVOCS	HEXACHLOROBENZENE	UG/KG	20	24000	SW8270C	NJDEP - FSSG
SVOCS	HEXACHLOROBUTADIENE	UG/KG	NS	NS	SW8270C	NA
SVOCS	HEXACHLOROCYCLOPENTADIENE	UG/KG	NS	NS	SW8270C	NA
SVOCS	HEXACHLOROETHANE	UG/KG	NS	NS	SW8270C	NA
SVOCS	INDENO(1,2,3-c,d)PYRENE	UG/KG	NS	NS	SW8270C	NA
SVOCS	ISOPHORONE	UG/KG	NS	NS	SW8270C	NA
SVOCS	N-NITROSODI-n-PROPYLAMINE	UG/KG	NS	NS	SW8270C	NA
SVOCS	N-NITROSODIMETHYLAMINE	UG/KG	NS	NS	SW8270C	NA
SVOCS	N-NITROSODIPHENYLAMINE	UG/KG	NS	NS	SW8270C	NA
SVOCS	NITROBENZENE	UG/KG	NS	NS	SW8270C	NA
SVOCS	PENTACHLOROPHENOL	UG/KG	NS	NS	SW8270C	NA
SVOCS	PHENOL	UG/KG	NS	NS	SW8270C	NA
SVOCS - PAHS	ACENAPHTHENE - INTERMITTENT STREAMS	UG/KG	16	9*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	ACENAPHTHENE - PONDS	UG/KG	16	29*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	ACENAPHTHENE - STREAMS	UG/KG	16	9*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	ACENAPHTHENE- WET AREAS	UG/KG	16	25*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	ACENAPHTHYLENE - INTERMITTENT STREAMS	UG/KG	44	11*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	ACENAPHTHYLENE - PONDS	UG/KG	44	38*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	ACENAPHTHYLENE - STREAMS	UG/KG	44	11*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	ACENAPHTHYLENE - WET AREAS	UG/KG	44	33*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	ANTHRACENE - INTERMITTENT STREAMS	UG/KG	220	6400*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	ANTHRACENE - PONDS	UG/KG	220	21809*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	ANTHRACENE - STREAMS	UG/KG	220	6593*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	ANTHRACENE - WET AREAS	UG/KG	220	18827*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(a)ANTHRACENE - INTERMITTENT STREAMS	UG/KG	320	25598*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(a)ANTHRACENE - PONDS	UG/KG	320	87234*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(a)ANTHRACENE - STREAMS	UG/KG	320	26371*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(a)ANTHRACENE - WET AREAS	UG/KG	320	75308*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(a)PYRENE - INTERMITTENT STREAMS	UG/KG	370	24906*	SW8270C	NJDEP - FSSG

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Kenvil Works Facility, New Jersey

Analytical Group	Constituent	Units	LEL	SEL	Analytical Method	Source
SVOCS - PAHS	BENZO(a)PYRENE - PONDS	UG/KG	370	84876*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(a)PYRENE - STREAMS	UG/KG	370	25658*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(a)PYRENE - WET AREAS	UG/KG	370	73273*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(g,h,i)PERYLENE - INTERMITTENT STREAMS	UG/KG	170	5535*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(g,h,i)PERYLENE - PONDS	UG/KG	170	18861*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(g,h,i)PERYLENE - STREAMS	UG/KG	170	5702*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(g,h,i)PERYLENE - WET AREAS	UG/KG	170	16283*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(k)FLUORANTHENE - INTERMITTENT STREAMS	UG/KG	240	23177*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(k)FLUORANTHENE - PONDS	UG/KG	240	78982*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(k)FLUORANTHENE - STREAMS	UG/KG	240	23876*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	BENZO(k)FLUORANTHENE - WET AREAS	UG/KG	240	68185*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	CHRYSENE - INTERMITTENT STREAMS	UG/KG	340	7956*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	CHRYSENE - PONDS	UG/KG	340	27113*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	CHRYSENE - STREAMS	UG/KG	340	8196*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	CHRYSENE - WET AREAS	UG/KG	340	23407*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	DIBENZ(a,h)ANTHRACENE - INTERMITTENT STREAMS	UG/KG	60	2248*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	DIBENZ(a,h)ANTHRACENE - PONDS	UG/KG	60	7662*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	DIBENZ(a,h)ANTHRACENE - STREAMS	UG/KG	60	2316*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	DIBENZ(a,h)ANTHRACENE - WET AREAS	UG/KG	60	6615*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	FLUORANTHENE - INTERMITTENT STREAMS	UG/KG	750	17642*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	FLUORANTHENE - PONDS	UG/KG	750	60121*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	FLUORANTHENE - STREAMS	UG/KG	750	18174*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	FLUORANTHENE - WET AREAS	UG/KG	750	51902*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	FLUORENE - INTERMITTENT STREAMS	UG/KG	190	2767*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	FLUORENE - PONDS	UG/KG	190	9431*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	FLUORENE - STREAMS	UG/KG	190	2851*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	FLUORENE - WET AREAS	UG/KG	190	8141*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	NAPHTHALENE - INTERMITTENT STREAMS	UG/KG	160	36*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	NAPHTHALENE - PONDS	UG/KG	160	124*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	NAPHTHALENE - STREAMS	UG/KG	160	37*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	NAPHTHALENE - WET AREAS	UG/KG	160	107*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	PHENANTHRENE - INTERMITTENT STREAMS	UG/KG	560	16431*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	PHENANTHRENE - PONDS	UG/KG	560	55995*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	PHENANTHRENE - STREAMS	UG/KG	560	16927*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	PHENANTHRENE - WET AREAS	UG/KG	560	48340*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	PYRENE - INTERMITTENT STREAMS	UG/KG	490	14702*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	PYRENE - PONDS	UG/KG	490	50101*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	PYRENE - STREAMS	UG/KG	490	15145*	SW8270C	NJDEP - FSSG
SVOCS - PAHS	PYRENE - WET AREAS	UG/KG	490	43251*	SW8270C	NJDEP - FSSG
METALS	ANTIMONY	MG/KG	NS	NS	SW6010B	NA
METALS	ARSENIC	MG/KG	6	33	SW6010B	NJDEP - FSSG
METALS	BERYLLIUM	MG/KG	NS	NS	SW6010B	NA
METALS	CADMIUM	MG/KG	0.6	10	SW6010B	NJDEP - FSSG
METALS	CHROMIUM, TOTAL	MG/KG	26	110	SW6010B	NJDEP - FSSG
METALS	COPPER	MG/KG	16	110	SW6010B	NJDEP - FSSG
METALS	LEAD	MG/KG	31	250	SW6010B	NJDEP - FSSG
METALS	MERCURY	MG/KG	0.2	2	SW7471A	NJDEP - FSSG
METALS	NICKEL	MG/KG	16	75	SW6010B	NJDEP - FSSG
METALS	SELENIUM	MG/KG	NS	NS	SW6010B	NA

Table A-6

Sediment - SI Analytical Methods and Criteria Summary
Volume A - Remedial Investigation Report Summary
Hercules Incorporated
Kenvil Works Facility, New Jersey

Analytical Group		Constituent	Units	LEL	SEL	Analytical Method	Source
METALS	SILVER		MG/KG	1	4	SW6010B	NJDEP - FSSG
METALS	THALLIUM		MG/KG	NS	NS	SW6010B	NA
METALS	ZINC		MG/KG	120	820	SW6010B	NJDEP - FSSG
E&E	1,2-DINITROBENZENE		UG/KG	NS	NS	SW8330	NA
E&E	1,3,5-TRINITROBENZENE		UG/KG	NS	NS	SW8330	NA
E&E	1,3-DINITROBENZENE		UG/KG	NS	NS	SW8330	NA
E&E	1,4-DINITROBENZENE		UG/KG	NS	NS	SW8330	NA
E&E	2,4,6-TRINITROTOLUENE		UG/KG	NS	NS	SW8330	NA
E&E	2,4-DINITROTOLUENE		UG/KG	NS	NS	SW8330	NA
E&E	2,6-DINITROTOLUENE		UG/KG	NS	NS	SW8330	NA
E&E	2-AMINO-4,6-DINITROTOLUENE		UG/KG	NS	NS	SW8330	NA
E&E	2-NITROTOLUENE		UG/KG	NS	NS	SW8330	NA
E&E	3-NITROTOLUENE		UG/KG	NS	NS	SW8330	NA
E&E	4-AMINO-2,6-DINITROTOLUENE		UG/KG	NS	NS	SW8330	NA
E&E	4-NITROTOLUENE		UG/KG	NS	NS	SW8330	NA
E&E	HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE (RDX)		UG/KG	NS	NS	SW8330	NA
E&E	NITROBENZENE		UG/KG	NS	NS	SW8330	NA
E&E	NITROCELLULOSE		MG/KG	NS	NS	IAAP	NA
E&E	NITROGLYCERIN		UG/KG	NS	NS	SW8330	NA
E&E	OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE (HMX)		UG/KG	NS	NS	SW8330	NA
E&E	PENTAERYTHRITOL TETRANITRATE		UG/KG	NS	NS	SW8330	NA
E&E	PERCHLORATE		MG/KG	NS	NS	E314.0	NA
E&E	TETRYL		UG/KG	NS	NS	SW8330	NA
GENERAL CHEMISTRY	MOISTURE, PERCENT		%W/W	NS	NS	E160.3	NA
GENERAL CHEMISTRY	GRAIN SIZE		% PASSING	NS	NS	D422	NA
GENERAL CHEMISTRY	SOLIDS, PERCENT		%W/W	NS	NS	SOLID	NA
GENERAL CHEMISTRY	TOTAL ORGANIC CARBON		MG/KG	NS	NS	LYDKHN	NA

Notes:

VOCS = Volatile organic constituents

SVOCS = Semi-volatile organic constituents

PAHS = Polynuclear aromatic hydrocarbons

SVOCS - PAHS = SEL values for SVOCS - PAHs were calculated based on site specific TOC levels as specified in the NJDEP Guidance for Sediment Quality Evaluations

E&E = Explosive and energetic constituent

NA = Not applicable

NS = No standard

LEL = NJDEP Freshwater Sediment Screening Guidelines (FSSG) lowest effects level

SEL = NJDEP FSSG severe effects level

Source:

NJDEP - FSSG = NJDEP Guidance for Sediment Quality Evaluations, Freshwater Sediment Screening Guidelines (FSSG), 1998

Table A-7

Physical and Chemical Properties of Constituents of Concern
Volume A - Remedial Investigation Report Summary
Hercules Incorporated
Kenvil Works Facility, New Jersey

Analytical Group	Constituents	Media Analyzed During the RI	Media Where Detected above PQL	Media Where Detected Above Applicable Criteria	Pure State	Mobility to Water (Aqueous Solubility)	Mobility to Air (Volatility)	Affinity to Soil (Sorption)	Summary
VOCs	ACRYLONITRILE	SO	--	--	Liquid	The mobility of VOCs to water varies widely as a group with solubility, VOCs detected at the Kenvil Facility have limited solubilities in the range of 0.02% to 1%.	VOCs have a high mobility to air and, will evaporate relatively quickly when exposed to the atmosphere. In the vadose zone, a significant portion of these constituents will partition to the vapor phase and mix with soil vapor.	As with most organic compounds, VOCs have a strong affinity to organic soil.	When released into the environment, VOCs are most likely to sorb to soil but will readily enter the vapor phase when exposed to air. Limited solubility allows these compounds to also appear in ground and surface water at concentrations of concern. VOC data accumulated during the Kenvil SI and RI are consistent with this expected distribution. Only a limited amount of VOCs were detected at the Facility. Exceedances were only observed in soil, surface water and groundwater.
	BENZENE	GW SO	SO	SO					
	BROMODICHLOROMETHANE	SW	--	--					
	CHLOROBENZENE	SO	--	--					
	CIS-1,2-DICHLOROETHYLENE	GW	--	--					
	ETHYLBENZENE	GW SO	--	--					
	METHYLENE CHLORIDE	SO	SO	--					
	TERT-BUTYL METHYL ETHER	GW SO	--	--					
	TETRACHLOROETHYLENE(PCE)	GW SD SO SW	SD SO SW	SW					
	TOLUENE	GW SO	--	--					
SVOCs	TRICHLOROETHYLENE (TCE)	GW	GW	GW					
	XYLENES, TOTAL	GW SO	--	--					
	1,2,4-TRICHLOROBENZENE	SO	--	--	Pure state varies with compound, most are solid at ambient temperatures. Exceptions include substituted benzenes (e.g.1,2-dichlorobenzene) and ethers (e.g. 4-chlorophenyl phenyl ether). Several compounds such as 2,4-dimethylphenol, have melting points close to ambient temperature and may exist as a liquid or solid.	Mobility to water (based on aqueous solubility) varies with compound. Most SVOCs have very limited solubilities, as low as a fraction of a part per billion (ppb). Exceptions include compounds with the polar phenol group (e.g. 2,4-dichlorophenol and 4-nitrophenol). Typically these phenol compounds have limited solubilities around 3% peaking at about 8% for pure phenol.	SVOCs have low mobility to air, they do not enter the vapor phase readily.	SVOCs have a high affinity to soil, characterized by strong sorption and low mobility.	When released into the environment, SVOCs are likely to sorb to soil and stay close to the source if not physically moved. While aqueous solubilities for these compounds are very low, so too are the surface and groundwater criteria and occasional exceedances are observed. This is most likely to occur close to the source because once dissolved SVOCs move away from an area of higher concentration they are likely to return to the sorbed phase. SVOC data accumulated during the Kenvil SI and RI are consistent with this expected distribution. While SVOC exceedances of applicable criteria were observed in all media, soil is most impacted.
	1,2-DICHLOROBENZENE	SO	--	--					
	1,2-DIPHENYLHYDRAZINE	SO	--	--					
	1,3-DICHLOROBENZENE	SO	--	--					
	1,4-DICHLOROBENZENE	SO	--	--					
	1-METHYLNAPHTHALENE	GW SO	--	--					
	2,4,6-TRICHLOROPHENOL	SO	--	--					
	2,4/2,6-DINITROTOLUENE	GW SD SO SW	GW SD SO SW	GW SD SO					
	2,4-DICHLOROPHENOL	SO	--	--					
	2,4-DIMETHYLPHENOL	SO	--	--					
	2,4-DINITROPHENOL	SO	SO	--					
	2,4-DINITROTOLUENE	GW SD SW	GW SD SW	GW SD SW					
	2,6-DINITROTOLUENE	GW SD SW	GW SD SW	--					
	2-CHLORONAPHTHALENE	SO	--	--					
	2-CHLOROPHENOL	SO	--	--					
	2-METHYLNAPHTHALENE	GW SO	--	--					
	2-NITROPHENOL	SO	--	--					
	3,3'-DICHLOROBENZIDINE	SO	--	--					
	4,6-DINITRO-2-METHYLPHENOL	SO	--	--					
	4-BROMOPHENYL PHENYL ETHER	SO	--	--					
	4-CHLORO-3-METHYLPHENOL	SO	--	--					
	4-CHLOROPHENYL PHENYL ETHER	SO	--	--					
	4-NITROPHENOL	SO	SO	--					
	ACENAPHTHENE	GW SD SO	SD SO	SD					
	ACENAPHTHYLENE	GW SD SO	SD SO	SD					
	ANTHRACENE	GW SD SO	SD SO	SD					
	BENZIDINE	SO	--	--					
	BENZO(a)ANTHRACENE	GW SD SO SW	GW SD SO	GW SD SO					
	BENZO(a)PYRENE	GW SD SO SW	GW SD SO SW	GW SD SO SW					
	BENZO(b)FLUORANTHENE	GW SO SW	GW SO SW	SO SW					
	BENZO(g,h,i)PERYLENE	GW SD SO SW	GW SD SO SW	SD					
	BENZO(k)FLUORANTHENE	GW SD SO SW	GW SD SO	GW SD SO					
	BENZYL BUTYL PHTHALATE	SO	SO	--					
	BIS(2-CHLOROETHOXY) METHANE	SO	--	--					
	BIS(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	SO	--	--					
	BIS(2-CHLOROISOPROPYL) ETHER	SO	--	--					
	BIS(2-ETHYLHEXYL) PHTHALATE	GW SO SW	SO	--					
	CHRYSENE	GW SD SO SW	GW SD SO SW	GW SD SO					
	DIBENZ(a,h)ANTHRACENE	GW SD SO	GW SD SO	GW SD SO					
	DIETHYL PHTHALATE	SO	SO	--					
	DIMETHYL PHTHALATE	SO	--	--					
	DI-N-BUTYL PHTHALATE	SO	SO	SO					
	DI-N-OCTYLPHTHALATE	SO	--	--					
	FLUORANTHENE	GW SD SO	GW SD SO	SD					
	FLUORENE	GW SD SO	SD SO	SD					
	HEXACHLOROBENZENE	SO	--	--					
	HEXACHLOROBUTADIENE	SO	--	--					
	HEXACHLOROCYCLOPENTADIENE	SO	--	--					
	HEXACHLOROETHANE	SO	--	--					

Table A-7

Physical and Chemical Properties of Constituents of Concern
Volume A - Remedial Investigation Report Summary
Hercules Incorporated
Kenvil Works Facility, New Jersey

Analytical Group	Constituents	Media Analyzed During the RI	Media Where Detected above PQL	Media Where Detected Above Applicable Criteria	Pure State	Mobility to Water (Aqueous Solubility)	Mobility to Air (Volatility)	Affinity to Soil (Sorption)	Summary
SVOCs (continued)	INDENO(1,2,3-C,D)PYRENE	GW SO	GW SO	GW SO	See Page 1	See Page 1	See Page 1	See Page 1	See Page 1
	ISOPHORONE	SO	--	--					
	NAPHTHALENE	GW SD SO	SD SO	SD					
	N-NITROSODIMETHYLAMINE	SO	--	--					
	N-NITROSODI-N-PROPYLAMINE	SO	--	--					
	N-NITROSODIPHENYLAMINE	SO	SO	SO					
	PENTACHLOROPHENOL	SO	--	--					
	PHENANTHRENE	GW SD SO	SD SO	--					
	PHENOL	SO	SO	--					
	PYRENE	GW SD SO	GW SD SO	--					
Metals	ANTIMONY	GW SO	GW SO	GW SO	Solids, except for mercury which exists as a liquid at ambient temperatures.	The mobility to water and solubility of metals is largely pH dependant. In acidic water, where pH is low, most metals are more soluble and therefore more mobile.	Metals have very low mobility to air at ambient temperatures.	Like solubility, sorption of metals to soils is also pH dependent with stronger binding to soil at higher pH. In general, metals are less mobile (both less soluble and more strongly bound to soil) with increasing pH.	When released into the environment, metals may exist in pure solid phase, sorbed to soil or dissolved in water. Relative partitioning between these phases is largely dependent on pH and other geochemical conditions. The observed distrubution of metals at the Facility is consistant with this and reflective of the varying condions across the site. For example, higher metals concentrations in surface water are observed with lower pH values.
	ARSENIC	GW SD SO SW	GW SD SO SW	GW SD SO SW					
	BERYLLIUM	GW SO	GW SO	GW SO					
	CADMIUM	GW SD SO	SD SO	SD SO					
	CHROMIUM, TOTAL	GW SD	GW SD	GW SD					
	COPPER	GW SD SO SW	GW SD SO SW	SD SO SW					
	LEAD	GW SD SO SW	GW SD SO SW	GW SD SO SW					
	MERCURY	GW SD SO SW	SD SO SW	SD SO SW					
	NICKEL	GW SD SO	GW SD SO	SD					
	SELENIUM	GW SO SW	SO SW	SW					
	SILVER	SD SO SW	SD SO SW	SD					
	THALLIUM	GW SO SW	GW SO SW	GW SO SW					
	ZINC	GW SD SO SW	GW SD SO SW	SD SO SW					
E&E	1,3,5-TRINITROBENZENE	GW SD SO	GW SO	--	Solids with the exceptions of 2- and 3-nitrotoluene, nitrobenzene and nitroglycerin which are liquids at ambient temperatures.	Mobility to water varies by compound with aqueous solubility. Solubilities vary over a large range from limited solubility (e.g. 4-amino-2,6-dinoitrotoluene at around 0.004%) to highly soluble (e.g. perchlorate at around 20%). 2,4,6-trinitrotoluene (TNT) has a solubility of around 0.01% and nitroglycerin has as solubility of around 0.1%.	Mobility to air is limited for most energetics and explosives compounds. Most will not evaporate easily when exposed to air. Exceptions include relatively low molecular weight nitroaromatic compounds such as 2-, 3-, and 4-nitrotoluene which volatize more readily.	Energetics and explosives do not typically have a strong affinity for soil.	When E&E compounds are released into the environment, their mobility is governed first by their solubility. If sufficiently soluble, they will dissolve into soil moisture and infiltrating rain water and move downward towards the groundwater table. Once dissolved, E&E compounds are likely to stay dissolved due to a weak affinity for soil. This is consistant with the observed distribution of E&E compounds at the Facility reflected by the selection of five E&E compounds as frequent exceedance constituents (FECs) for groundwater.
	1,3-DINITROBENZENE	SO	SO	SO					
	2,4,6-TRINITROTOLUENE	GW SD SO SW	GW SD SO SW	GW SD SO SW					
	2-AMINO-4,6-DINITROTOLUENE	GW SD SO SW	GW SD SO SW	GW SD SO SW					
	2-NITROTOLUENE	GW SO	GW	--					
	3-NITROTOLUENE	GW SO	GW	SD					
	4-AMINO-2,6-DINITROTOLUENE	GW SD SO SW	GW SD SO SW	GW SD SO SW					
	4-NITROTOLUENE	GW SO	GW	--					
	DIAZODINITROPHENOL	SO	--	--					
	HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE (RDX)	GW SD SO SW	GW SD SO SW	GW SD SO SW					
	NITROBENZENE	SD SO	SD	SD					
	NITROCELLULOSE	SD SO	SD SO	SO					
	NITROGLYCERIN	GW SD SO	GW SD SO	GW SO					
	OCTAHYDRO-1,3,5,7-TETRANITRO-1,3,5,7-TETRAZOCINE (HMX)	GW SD SO SW	GW SO SW	--					
	PENTAERYTHRITOL TETRANITRATE	SD SO	SD	--					
	PERCHLORATE	GW	GW	GW					
	TETRYL	SD SO	--	--					
PCBs	PCB-1016 (AROCHLOR 1016)	GW SO	--	--*	Liquid	Mobility to water and solubilities are very low for PCBs. Solubilities are typically in the range of 200 ppb to a fraction of a ppb.	Mobility to air is typically very limited. PCB do not volatilize easily at ambient temperatures.	PCBs have a high affinity for soil as they sorb strongly to organic soil.	When released into the environment, PCBs are likely to sorb to the soil and stay close to the source if not physically moved. While aqueous solubilities for these compounds are very low, so too are the surface and groundwater criteria and occasional exceedances are observed. This is most likely to occur close to the source because once dissolved PCBs move away from an area of higher concentration they are likely to return to the sorbed phase. Data accumulated during the Kenvil SI and RI are consistent with this expected distribution with the majority of PBC impact observed in soil.
	PCB-1221 (AROCHLOR 1221)	GW SO	--	--*					
	PCB-1232 (AROCHLOR 1232)	GW SO	--	--*					
	PCB-1242 (AROCHLOR 1242)	GW SO	SO	--*					
	PCB-1248 (AROCHLOR 1248)	GW SO	SO	--*					
	PCB-1254 (AROCHLOR 1254)	GW SO	GW SO	--*					
	PCB-1260 (AROCHLOR 1260)	GW SO	SO	--*					
	TOTAL PCBs			GW SO					
		GW SO	GW SO						

NOTES:
All samples were analyzed for a media-specific suite of constituents based on the analytical results of the samples collected during the media-specific SIs (i.e., Soils-SI, GW-SI, SW/SD-SI). The media-specific RI analyte lists are comprised of any constituent identified at concentrations exceeding the applicable cleanup criteria in the media-specific SIs. Tables A-1 through A-4 present the RI specific analytical sampling requirements for soil, groundwater, sediment, and surface water, respectively.

A shaded cell indicates that the constituent is a frequent exceedance constituent (FEC) in that media.

Bold indicates that this E&E compound was a primary product manufactured at the Facility. Other E&E compounds were either manufacturing by-products or product of natural degradation in the environment.

* = Individual PCBs were not compared to cleanup criteria

-- = not detected

SO = soil

SD = sediment

GW = groundwater

SW = surface water

Table A-8

**Preliminary On-Site Human Health Receptor Analysis - Current Facility Use
Volume A - Remedial Investigation Report Summary
Hercules Incorporated
Kenvil Works Facility, New Jersey**

Page 1 of 1

Media	Criteria Exceedance	Exposure Route	Potential Receptor	Pathway Complete?	Engineered Controls
Soil	Yes	Dermal Contact Ingestion Inhalation	Site Worker	Yes. Site Workers could contact soil.	Strict adherence to health and safety plan and use of personal protective equipment prevent exposure for site workers.
			Hunter	Yes. Hunters could contact soil.	Hunters receive hazard communication training and are restricted from entering areas likely to have constituents in the soil.
			Trespasser	No. Trespassing on the site is discouraged by a fence, prominently displayed "No Trespassing" signs, and security personnel.	NA
Groundwater	Yes	Dermal Contact Ingestion	Site Worker	Yes. Groundwater samples will be collected by site workers.	Strict adherence to health and safety plan and use of personal protective equipment prevent exposure for site workers.
			Hunter	No. Hunters will not contact groundwater	NA
			Trespasser	No. Trespassing on the site is discouraged by a fence, prominently displayed "No Trespassing" signs, and security personnel.	NA
Sediment	Yes	Dermal Contact Ingestion	Site Worker	Yes. Site Workers could contact sediment.	Strict adherence to health and safety plan and use of personal protective equipment prevent exposure for site workers.
			Hunter	Yes. Hunters could contact sediment.	Hunters receive hazard communication training and are restricted from entering areas likely to have constituents in the sediment.
			Trespasser	No. Trespassing on the site is discouraged by a fence, prominently displayed "No Trespassing" signs, and security personnel.	NA
Surface Water	Yes	Dermal Contact Ingestion	Site Worker	Yes. Site Workers could contact surface water.	Strict adherence to health and safety plan and use of personal protective equipment prevent exposure for site workers.
			Hunter	Yes. Hunters could contact surface water.	Hunters receive hazard communication training and are restricted from entering areas likely to have constituents in the surface water.
			Trespasser	No. Trespassing on the site is discouraged by a fence, prominently displayed "No Trespassing" signs, and security personnel.	NA

Table A-9

**Preliminary Off-Site Human Health Receptor Analysis - Current Facility Use
Volume A - Remedial Investigation Report Summary
Hercules Incorporated
Kenvil Works Facility, New Jersey**

Page 1 of 1

Media	Criteria Exceedance	Exposure Route	Potential Receptor	Pathway Complete?	Engineered Controls
Soil	No	Dermal Contact Ingestion Inhalation	Resident	No. No constituents present above applicable cleanup criteria.	NA
			Recreational User	No. No constituents present above applicable cleanup criteria.	NA
Groundwater	Possible*	Dermal Contact Ingestion	Residential User	Inconclusive. Additional investigations warranted	NA
Sediment	No	Dermal Contact Ingestion	Recreational User	No. No constituents present above applicable cleanup criteria.	NA
Surface Water	No	Dermal Contact Ingestion	Recreational User	No. No constituents present above applicable cleanup criteria.	NA

*Deliniation of groundwater plume underlying the southwestern portion of the Facility is not complete. Additional investigations are planned in 2007 to deliniate this plume.

APPENDICES

APPENDIX D

Agenda
Hercules Kenvil Works Facility
Remedial Investigation Report
Triad Approach Meeting
Meeting Number 1 (10/18/06)

- **Meet and greet (9:00 – 9:15)**
- **Site history (9:15 – 9:45)**
- **Site tour (9:45 – 10:30)**
- **Previous actions (10:30 – 12:00)**
- **Lunch (12:00 – 1:00)**
- **Remedial Investigation Work Plan (1:00 – 1:30)**
- **Remedial Investigation Field Effort (1:30 – 2:00)**
- **Remedial Investigation Report (2:00 – 2:45)**
- **Summation (2:45 – 3:15)**

**Hercules Kenvil Works Facility
Remedial Investigation Report
Triad Approach Meeting Minutes
Meeting Number 1 (10/18/06)
Rev. 2 - (11/6/06)**

The following document presents the meeting minutes from the first triad approach meeting (meeting) held to discuss the development, submission, and subsequent review of the remedial investigation report (RIR) performed at the Hercules Kenvil Works Facility (facility). The primary objective of this meeting was to familiarize Donna Gaffigan (NJDEP Case Manager) with the facility and key members of the project team. It is anticipated that future meetings will focus more heavily on detailed technical issues concerning the RIR.

Attendees:

Jim Bevis (Hercules)
Joe Keller (Hercules)
Donna Gaffigan (NJDEP)
Sophia Li (MWH)
Ed Meeks (SAIC)

Topics Discussed:

Site History

A general history of the facility was presented. Items discussed included:

- Facility operated from 1871 to 1996.
- DuPont and others owned and operated the facility until 1912. Hercules was formed from DuPont in 1912 as part of an antitrust suit. Hercules operated the facility from 1913 to 1995. Alliant Tech Systems (Alliant) purchased the Hercules Aerospace Division and began operating the facility in 1995. In December 1996 Alliant ceased manufacturing at the facility and moved the Kenvil operations to Radford, Virginia. Hercules retained ownership of the property and managed environmental activities from January 1996 to the present.
- Primary products manufactured included; nitroglycerin (NG), trinitrotoluene (TNT), pentaethritol tetranitrate (PETN), dynamite, diazodintrophenol (DDNP), smokeless gunpowder, and nitrocellulose based rocket propellant.
- Fly ash and bottom ash (historic fill) was imported to the facility, likely from iron foundries located in Dover, New Jersey, for rapid facility expansion to meet production needs of World War I (WW I). The facility is believed to have possessed a total of four powerhouses with associated coal fired boilers that supported previous manufacturing operations. One large primary powerhouse (located in the Maintenance Area) and three smaller support powerhouses

servicing the more remote sections of the facility (Dynamite, NG, and Storage Areas). Two of the small powerhouses (Storage and Dynamite Areas) are believed to have been operational only during the WW I era (1917 to 1920). The small powerhouse servicing the NG Area is believed to have been operational from the late 1800's to approximately 1920. It is probable that fly ash and bottom ash derived from the facility's powerhouses was added to the historic fill imported to the facility.

- Explosions, fires, and historic facility redevelopment activities are the primary initial contaminate distribution mechanisms resulting in a highly heterogeneous subsurface.

Site Tour

A lengthy and detailed site tour that included viewing each of the former operational areas was given. Several stops were made at the large complex areas of concern (AOCs) to allow greater discussion. The large complex AOCs included the Old Burning Grounds and the two large disposal areas. In addition to the investigation activities a brief discussion was held concerning the process of recycling concrete staged on-site from demolition activities.

Following the site tour a demonstration of the EX-PRAY™ explosive test kit (EX-PRAY) was given. EX-PRAY is a very sensitive colorimetric field test that has the ability to identify a wide range of explosive constituents at nanogram levels. EX-PRAY is used on every solid matrix sample (i.e. soil and sediment) collected at the facility.

Previous Actions

An overview of the previous environmental activities performed at the site was discussed. The overview consisted primarily of the general activities performed, significant conclusions, and shifts in investigation strategy. Activities discussed included:

- Preliminary Assessment (PA) – the first activity to identify AOCs at the facility. The PA strategy proposed investigation and remediation be completed on an former manufacturing area by former manufacturing area basis (i.e. Dynamite, NG, Maintenance, etc.) until efforts were completed site-wide.
- Soils Site Investigation (SI) – determined if further action (FA) was required or a no further action (NFA) determination was supported at each of the approximately 1,200 AOCs identified at the facility. Approximately 500 AOCs were recommended and accepted as requiring NFA, as documented in the letter from Paul Harvey (NJDEP Case Manager) dated June 27, 2005. The Soils SI proposed that site-wide media specific site investigations be performed to give an understanding of the primary site-wide environmental drivers could be identified and addressed in a more efficient manner.

- Surface Water/Sediment SI – identified portions of the facility’s surface water bodies that required FA or NFA. It was determined that a baseline ecological assessment was not necessary and a remedial investigation of ecological receptors compliant with the intentions of N.J.A.C 7:26E-4.7 is required.
- Groundwater SI – determined if FA or NFA was required for portions of the facility’s groundwater regime. Due to the fine grained nature of the sediment underlying the facility it was determined during the groundwater SI field activities that Geoprobe TM or Hydro-punch TM technologies are not appropriate for collection of groundwater samples for metals analyses. It was also determined that the facility was not a source area for the regional trichloroethylene (TCE) plume underlying portions of Roxbury Township.
- Additionally, the Soils, Surface Water/Sediment, and Groundwater SI’s served as the basis for identifying the media-specific lists of contaminants of concern (COC) used in the remedial investigation (RI). The (COC) lists were based on each media specific constituent identified at a concentration exceeding the applicable regulatory criteria (i.e. the Soils SI determined the COC list for soil samples collected as part of the RI).

Remedial Investigation Work Plan

The Remedial Investigation Work Plan (RIWP) was submitted to the NJDEP in August 2005 and subsequently revised in June, 2006. The RIWP was revised in 2006 to shift the RI from an area specific (i.e. Area I) multi media investigation to a site-wide (Areas I, II, and III) multi media investigation intended to be completed in a single phase. Both the initial and revised RIWP were approved by the NJDEP. The following are key components of the RIWP:

- Introduced the application of the triad approach for all RI activities. The key element of the triad approach is to involve the NJDEP early in the decision making process so that decisions could be made quickly and in an efficient manner that satisfies applicable regulations.
- Introduced the grid sampling approach for the investigation of soils. Due the complex nature of the facility’s history (i.e. explosions, fires, and historic development activities) the soils are extremely heterogeneous and grid sampling was determined to be the most effective means to accomplish the objective of an RI. The selected grid is based on a maximum of 250-foot spacing between sampling locations placed over the entire former manufacturing area.
- Segregated the facility into three investigation areas. The initial RIWP proposed investigating each area separately. The revised RIWP incorporated all the three areas into a single phase of investigation. The areas incorporated the following former manufacturing areas.

Area I – B-Line, Finishing, Storage, and the eastern portion of the Development Area.

Area II – NG, PETN, TNT, and Dynamite Areas.

Area III – A-Line, Maintenance, DDNP, Ammonia-Nitrate (AN), and the western portion of the Development Area.

Remedial Investigation Field Effort

Field efforts for the RI began in October 2005 and continued until September 2006. The initial field efforts performed in 2005 focused primarily on monitoring well installations and groundwater sampling of the existing monitoring well network. Field work was suspended from the middle of December 2005 until the middle of March 2006 due to winter weather. Field efforts performed in 2006 involved all media (soils, surface water/sediment, and groundwater). The following sampling techniques were utilized:

- Soil samples were primarily collected with a Geoprobe TM equipped with a macro core sampling device. Samples collected from disposal areas were collected via test pit excavations performed with a tracked excavator. Test pits were used for disposal areas to allow a more detailed evaluation of the subsurface. Samples located on the topographic ridges inaccessible by either the Geoprobe TM or tracked excavator were collected with a stainless steel hand auger and soil coring device.
- Surface water samples were collected as a grab sample with a laboratory provided glass jar attached to a sampling rod for all locations except Duck Pond and Shooting Pond. Surface water samples collected from Duck Pond and Shooting Pond were collected with a discrete depth sampler and composited (one aliquot from the top, middle, and bottom of the water column) into a single sample compliant with NJDEP Field Sampling Procedures Manual and the Technical Requirements for Site Remediation. Duck Pond and Shooting Pond are the only water bodies on-site with sufficient depth to have a potential stratified water column requiring the composite sampling.
- Sediment samples were collected with either a stainless steel hand auger and soil coring device or a hand Geoprobe TM. The hand auger and soil coring device were used to collect samples to an approximate maximum depth of 2 to 3 feet below top of sediment. The hand Geoprobe TM was used to collect samples at depths greater than 3-feet below top of sediment. Loose consistency of the sediment caused the hand auger and soil coring device to become ineffective below 2 to 3-feet below top of sediment.

- Groundwater samples were collected from monitoring wells with a bladder pump using low flow sampling techniques.
- Groundwater safety screening sampling was performed in the areas of facility that handled nitroglycerin (NG) prior to installing monitoring wells by conventional methods. Sampling activities were performed remotely for safety reasons with a modified Waterloo Profiler TM and analyzed for E&E constituents only.
- Additional groundwater samples were collected in the southwestern portion of the facility to gain a greater understanding of the energetic and explosive (E&E) constituents identified during the groundwater safety screening and monitoring well sampling activities. Groundwater samples were collected with a cone penetrometer and analyzed for E&E constituents only. This effort was beyond the scope of the RIWP but deemed necessary by the project team and approved verbally by Paul Harvey (former NJDEP Case Manager).
- Monitoring wells completed to depths less than 25-feet below grade were installed using a hollow-stem auger equipped drilling rig. Monitoring wells installed to depths greater than 25-feet were installed using a mud rotary equipped drilling rig. Heaving sands were encountered at approximately 25-feet below grade and mud rotary drilling techniques were required.

Remedial Investigation Report

The development and estimated completion of remedial investigation report (RIR) was discussed. The following items concerning the RIR were discussed:

- Hercules intends to complete and submit the RIR before the end of December 2006.
- Hercules would like to continue using the triad approach throughout the development and review of the RIR. Frequent interaction and opinion from the NJDEP is desired so that a regulatory compliant RIR can be developed in an efficient manner.
- The RIR will present a very large amount of data (several thousand samples analyzed for a comprehensive suite of analytes). To facilitate ease of use and review Hercules intends to divide the RIR into five volumes each detailing a single media. Each volume is intended to be as comprehensive as practical regarding a single media, however, cross referencing between volumes will likely be required. The five volumes are as follows:
 - **Volume A – Executive Summary.** This volume will provide the key information and conclusions that unite the independent volumes into a single report.

- **Volume B – Soil RIR.**
- **Volume C – Groundwater RIR.**
- **Volume D – Sediment RIR.**
- **Volume E – Surface Water RIR.**
- The ecological component of the RIR will be performed in early to middle 2007 and be submitted as an addendum. It was determined that due to the amount of data presented in the RIR it would be more efficient to finalize the RIR prior to initiating ecological activities.
- A brief review of rough draft figures and tables intended for use in Volume – III – Groundwater RIR was performed. The review was focused toward format and data presentation as opposed to detailed technical discussion.

Action Items:

- Donna Gaffigan requested electronic copies of the Soils, Groundwater, Surface Water/Sediment SI reports. These were provided on 10/20/06.
- Donna Gaffigan requested a list of all regulatory criteria anticipated for use in the RIR that was not derived by the NJDEP (i.e. EPA Region III RBC). These were provided on 10/20/06.
- The team determined that tables referencing monitoring wells should also present the wells screened intervals. Tables referencing clean up criteria should present the source of the information (i.e. NJDEP or USEPA).
- Establish a routine weekly meeting schedule to discuss RIR development. The proposed date and time is Monday afternoons at 3 PM.
- Document triad meetings with minutes and distribute them to the team as draft prior to finalization. The meeting minutes will be included as an attachment to the RIR.
- Determine if there is a benefit to give the site tour to the rest of the NJDEP case team once Ms. Gaffigan has assembled the team.

Agenda
Hercules Kenvil Works Facility
Remedial Investigation Report
Triad Approach Meeting
Meeting Number 2 (10/31/06)

Please find a list of topics we would like to cover tomorrow at the 10:00 AM Kenvil Triad Teleconference. This will be our second triad meeting and first via teleconference. We would like to try and keep the meeting to one hour if possible.

Call in number:

(800)–742–8686 Meeting Number:2222789. Call the 800 number and you will be prompted for the meeting number. After you dial the meeting number you will be placed into the conference room.

Introductions:

Introduce the team to Jim Kealy (NJDEP)

Triad Approach Meeting Minutes (10/18/06) Comments:

Discuss any comments the team has concerning the Draft Triad Approach Meeting Notes, Meeting Number 1 (10/18/06). The draft meeting notes were distributed on 10/27/06 and a copy is attached.

Diazodintrophenol (DDNP) Ponds Investigation:

We are experiencing significant difficulty synthesizing a DDNP laboratory standard. We were able to locate only one supplier willing to provide a standard and they are encountering delays producing the standard. DDNP is a primary explosive and extremely sensitive and dangerous. We believe a standard will likely be developed within several weeks but the laboratory will require an additional several weeks to perform the necessary QA/QC prior to accepting samples. We anticipate performing 10 test pits (4 at the corners and 1 in the center of each pond) to delineate the boundary and determine if residual contamination is present. We would like to include the results of the DDNP Ponds Investigation but will not be able to obtain the results in time for inclusion into the draft remedial investigation report (RIR) prior to its availability for discussion with the NJDEP at the end of this year. Our proposal is to discuss the results of the DDNP pond investigation after the draft RIR through the use of the triad approach and include the results in the Final RIR as a complete document submitted to the NJDEP.

Surface Water/Sediment Exceedance Figure Presentation:

Due to the size of the facility (approximately 1,200 acres) and the narrow width (approximately 5 to 10-feet) of the vast majority of streams present it is not feasible to provide legible contour figures of constituent concentrations at a site-wide scale that best demonstrates the relationship of the various streams. Our proposal is to provide a color coded system that highlights segments of the streams that through laboratory analysis of samples has identified constituents exceeding the media specific criteria. The concentration of the constituent will be presented on the figure. Additionally, a composite figure will be presented that highlights all the segments of the streams that have identified constituents exceeding the media specific criteria.

Groundwater/Surface Water Exceedance Figure Presentation:

Groundwater and surface water have been determined to be hydraulically connected at the facility. We propose to present both surface water and groundwater sample results on

Frequent exceedance constituents (FECs):

FECs are identified for each media to facilitate and focus the site-wide understanding of key media-specific constituent concentration quality standard exceedances. FECs are generally defined as those constituents with significant percentages of detected concentrations above the corresponding media-specific quality standards (determined by the number of exceedances divided by the total number of analysis for a specific constituent). The FEC concept was developed to provide a tool to assist RIR reviewers with assimilating an enormous amount of data in a timely and efficient manner. The concept will also be useful in a similar manner during development of the Remedial Action Selection Report (RASR) to identify what constituents will drive remedy selection. The FEC concept was not developed to provide a mechanism to eliminate from future remedial action selection or compliance attainment any constituents with exceedances above media-specific quality standards. The basis for establishing the specific percentage of exceedances above which a constituent is considered an FEC varies from media to media but generally follows the rationale that by setting the percentage at an appropriate level, the nature and extent of the FECs thereby defined will reasonably represent the overall sitewide nature and extent of exceedances in that media. We propose to develop composite figures for each media presenting the location of all exceedances and individual constituent specific exceedance figures for the identified FECs.

Teleconference Improvements:

Any suggestions to improve the triad approach teleconferences.

Schedule Next Meeting:

Propose next triad approach teleconference Tuesday November 11, 2006.

**Hercules Kenvil Works Facility
Remedial Investigation Report
Triad Approach Meeting Minutes
Meeting Number 2 (10/31/06)
Rev. 0 - (11/6/06)**

The following document presents the meeting minutes from the second triad approach meeting (meeting) held to discuss the development, submission, and subsequent review of the remedial investigation report (RIR) for the Hercules Kenvil Works Facility (facility). The objective of this meeting was to familiarize Jim Kealy (NJDEP Technical Team Member) with the key members of the project team and begin discussions concerning the content of the RIR.

Attendees:

Jim Bevis (Hercules)
Joe Keller (Hercules)
Donna Gaffigan (NJDEP)
Jim Kealy (NJDEP)
Sophia Li (MWH)
Chrissy Weber (MWH)
Ed Meeks (SAIC)

Topics Discussed:

Introductions

Jim Bevis introduced the Hercules/SAIC/MWH RIR team to Jim Kealy (NJDEP).

Triad Approach Meeting Minutes (10/18/06) Comments

Discussed comments the team provided concerning the Draft Triad Approach Meeting Notes (10/18/06). The comments were collected from the group and the Draft Triad Approach Meeting Minutes Notes (10/18/06) was revised and distributed to the group on 11/6/06.

Diazodintrophenol (DDNP) Ponds Investigation

We are experiencing significant difficulty synthesizing a DDNP laboratory standard. We were able to locate only one supplier willing to provide a standard and they are encountering delays producing the standard. DDNP is a primary explosive and extremely sensitive and dangerous. We believe a standard will likely be developed within several weeks but the laboratory will require an additional several weeks to perform the necessary QA/QC prior to accepting samples. We anticipate performing 10 test pits (4 at the corners and 1 in the center of each pond) to delineate the boundary and determine if

residual contamination is present. We would like to include the results of the DDNP Ponds Investigation but will not be able to obtain the results in time for inclusion into the draft remedial investigation report (RIR) prior to its availability for discussion with the NJDEP at the end of this year. It was established that Hercules and the NJDEP will discuss the results of the DDNP pond investigation concurrently with the draft RIR through the use of the triad approach and include the results in the Final RIR as a complete document submitted to the NJDEP.

Frequent exceedance constituents (FECs)

FECs are identified for each media to facilitate and focus the site-wide understanding of key media-specific constituent concentration quality standard exceedances. FECs are generally defined as those constituents with significant percentages of detected concentrations above the corresponding media-specific quality standards (determined by the number of exceedances divided by the total number of analysis for a specific constituent). The FEC concept was developed to provide a tool to assist RIR reviewers with assimilating an enormous amount of data in a timely and efficient manner. The concept will also be useful in a similar manner during development of the Remedial Action Selection Report (RASR) to identify what constituents will drive remedy selection. The FEC concept was not developed to provide a mechanism to eliminate from future remedial action selection or compliance attainment any constituents with exceedances above media-specific quality standards. The basis for establishing the specific percentage of exceedances above which a constituent is considered an FEC varies from media to media but generally follows the rationale that by setting the percentage at an appropriate level, the nature and extent of the FECs thereby defined will reasonably represent the overall site-wide nature and extent of exceedances in that media. It was decided to develop composite figures for each media presenting the location of all exceedances and individual constituent specific exceedance figures for the identified FECs.

Surface Water/Sediment Exceedance Figure Presentation

Due to the size of the facility (approximately 1,200 acres) and the narrow width (approximately 5 to 10-feet) of the vast majority of streams present it is not feasible to provide legible contour figures of constituent concentrations at a site-wide scale that best demonstrates the relationship of the various streams. It was decided to develop a color coded system that highlights segments of the streams that through laboratory analysis of samples has identified constituents exceeding the media specific criteria. The concentration of the constituent will be presented on the FEC figures. Additionally, a composite figure will be presented that highlights all the segments of the streams that have identified constituents exceeding the media specific criteria.

Groundwater/Surface Water Exceedance Figure Presentation

Groundwater and surface water have been determined to be hydraulically connected at the facility. It was decided to present both surface water and groundwater sample results on the media-specific figures in the following manner:

- Groundwater figures will present posting boxes for each groundwater and surface water sample location detailing the list of constituents found at concentrations exceeding the applicable media-specific quality standards where a relationship between the two media has been identified. Surface water sample locations that detect concentrations of constituents exceeding the surface water quality criteria where a relationship has not been identified will appear as a highlighted symbol without constituent posting boxes.
- Surface water figures will present posting boxes for each surface water and groundwater sample location detailing the list of constituents found at concentrations exceeding the applicable media-specific quality standards where a relationship between the two media has been identified. Groundwater sample locations that detect concentrations of constituents exceeding the groundwater quality criteria where a relationship has not been identified will appear as a highlighted symbol without constituent posting boxes.

Teleconference Improvements:

It was decided that moving forward it would be helpful to distribute maps, as appropriate, for discussing data and making decisions. Initially, the maps will be distributed electronically as pdf files that do not require sophisticated software.

Action Items:

- Schedule a site tour for Jim Kealy (NJDEP) and Marc Romanell (NJDEP) on November 14, 2006. The site tour will be similar to the tour given to Donna Gaffigan (NJDEP) with a greater focus on the technical issues that are anticipated to be encountered developing the RIR. Details of the site tour will be discussed in the November 8, 2006 triad approach teleconference.
- Review the Diazodintrophenol (DDNP) analytical method presented in the Analytical Quality Assurance Project Plan (AQAPP – MWH 2006) and open discussions with the NJDEP Office of Quality Assurance (OQA) to confirm the previously approved method remains valid.

Agenda
Hercules Kenvil Works Facility
Remedial Investigation Report
Triad Approach Meeting
Meeting Number 3 (11/8/06)

Call in number:

(888)–742–8686 Meeting Number:2222789. Call the 888 number and you will be prompted for the meeting number. After you dial the meeting number you will be placed into the conference room.

Triad Approach Meeting Minutes (10/31/06) Comments:

Discuss any comments the team has concerning the Draft Triad Approach Meeting Notes, Meeting Number 2 (10/31/06). The draft meeting notes were distributed on 11/7/06 and a copy is attached.

Site Visit:

A second site tour is scheduled for Tuesday November 14, 2006 at 9:00 AM to introduce the facility to Jim Kealy (NJDEP) and Marc Romanell (NJDEP). The following is a proposed agenda for the site tour:

- Site History
- Site Tour
- Previous Actions Performed
- Remedial Investigation Field Effort
- Selection of FECs
- Review and Discuss Draft RIR Figures

Frequent Exceedance Constituent (FEC) Selection:

As discussed in the October 31, 2006 teleconference, FECs are identified for each media to facilitate and focus the site-wide understanding of key media-specific constituent concentration quality standard exceedances. FECs are generally defined as those constituents with significant percentages of detected concentrations above the corresponding media-specific quality standards (determined by the number of exceedances divided by the total number of analysis for a specific constituent). Media-specific tables presenting the information that will be used to select FECs are attached. This information is draft and may not represent the final information incorporated into

the RIR. Our intention is to share this information with the NJDEP so that a detailed discussion of the selection of FECs can be incorporated into the site visit on November 14, 2006.

Soil/Groundwater Exceedance Figure Presentation:

A composite figure will be presented that highlights each sample location that identified constituents at concentrations exceeding the applicable cleanup criteria. Constituent specific FEC figures will be presented that display the detected concentration or method detection limit for each sample location. The FEC figures will then be contoured using linear regression to illustrate areas that detected concentrations of constituents exceeding the applicable cleanup criteria(s).

Teleconference Improvements:

Any suggestions to improve the triad approach teleconferences.

Schedule Next Meeting:

The next triad approach meeting is scheduled for Tuesday November 14, 2006 at 9:00 AM. The meeting will be held at the Hercules Kenvil Works Facility. Please contact either Jim Bevis or Ed Meeks if directions to the facility are required.

**Hercules Kenvil Works Facility
Remedial Investigation Report
Triad Approach Meeting Minutes
Meeting Number 3 (11/8/06)
Rev. 0 - (11/13/06)**

The following document presents the meeting minutes from the third triad approach meeting (meeting) held to discuss the development, submission, and subsequent review of the remedial investigation report (RIR) for the Hercules Kenvil Works Facility (facility).

Attendees:

Jim Bevis (Hercules)
Joe Keller (Hercules)
Donna Gaffigan (NJDEP)
Jim Kealy (NJDEP)
Marc Romanell (NJDEP)
Sophia Li (MWH)
Chrissy Weber (MWH)
Ed Meeks (SAIC)

Topics Discussed:

Triad Approach Meeting Minutes (10/31/06) Comments

The meeting minutes were distributed on November 7, 2006 and it was decided to give the team several days to review the notes prior to discussing comments. The meeting notes will be discussed during the next triad meeting.

Site Visit

The second site tour scheduled for Tuesday November 14, 2006 at 9:00 AM was confirmed. The agenda for the site visit was distributed on November 13, 2006.

Frequent Exceedance Constituent (FEC) Selection

Media-specific tables presenting the information that will be used to select FECs were distributed to the team. The information distributed is draft and may not represent the

final information incorporated into the RIR. A detailed discussion of the selection of FECs will be incorporated into the site visit on November 14, 2006.

Soil Exceedance Figure Presentation

It was decided to present a composite soil figure that highlights each sample location that identified constituents at concentrations exceeding the soil cleanup criteria (Residential Direct Contact Soil Cleanup Criteria and Non-Residential Direct Contact Soil Cleanup Criteria). Constituent specific FEC figures will be presented that display the detected concentration or method detection limit for each sample location. The FEC figures will then be contoured using linear regression to illustrate areas that detected concentrations of constituents exceeding the soil cleanup criteria.

Agenda
Hercules Kenvil Works Facility
Remedial Investigation Report
Triad Approach Meeting
Meeting Number 4 (11/14/06)

- **Meet and greet (9:00 – 9:15)**
- **Site history (9:15 – 9:45)**
- **Site tour (9:45 – 12:00)**
- **Lunch (12:00 – 1:00)**
- **NG Cleanup Criteria Selection (1:00 – 1:30)**
- **FEC Selection (1:30 – 2:00)**
- **Review/Discuss Draft RIR Figures (2:00 – 3:00)**
- **Summation (3:00 – 3:15)**

**Hercules Kenvil Works Facility
Remedial Investigation Report
Triad Approach Meeting Minutes
Meeting Number 4 (11/14/06)
Rev. 3 - (12/11/06)**

The following document presents the meeting minutes from the fourth triad approach meeting held to discuss the development, submission, and subsequent review of the remedial investigation report (RIR) for the Hercules Kenvil Works Facility (facility). The meeting was held at the facility with the intention of including a detailed site tour. Interactions of the triad team are fluid between each respective organization (Hercules, NJDEP, SAIC, and MWH) and focused toward completing the RIR.

Attendees:

Jim Bevis (Hercules)
Joe Keller (Hercules)
Donna Gaffigan (NJDEP)
Jim Kealy (NJDEP)
Chrissy Weber (MWH)
Ed Meeks (SAIC)

Topics Discussed:

Site History

The general facility history was presented to the meeting attendees. A description of the facility history is presented in the Triad Approach Meeting Notes (10/18/06). The intent of the site history discussion was to ensure the majority of the triad team is equally versed in the facility history for future consideration during data interpretation efforts.

Site Tour

A two hour detailed site tour that included viewing each of the former operational areas was given. Special emphasis was given to the 2,4,6-Trinitrotoluene (TNT) Area because TNT and its breakdown products have been identified at concentrations exceeding the applicable groundwater quality standards within this area. Several stops were made at the following locations:

Former TNT refined graining house (Bldg 666) – This former structure was inspected to demonstrate the effects explosions had on the distribution of constituents (Bldg 666 detonated during the World War I period). TNT was

observed in the surficial soils and the team was afforded an opportunity to closely inspect the material.

Former TNT red water lagoon – The remaining exposed section of the former TNT red water lagoon was observed. Portions of the former lagoon have been historically backfilled with concrete debris and rubble. Red stained soils derived from the previous use of the lagoon were noted.

Former narrow gauge rail bed – The team traversed a typical rail bed that runs through the Dynamite Area marsh. The objective of this stop was to demonstrate the use of historic fill and view the previous modifications made to the wet areas in the early 1900's.

Old Burning Grounds – The remnants of the Old Burning Grounds (OBG) were partially traversed. The OBG represents a large complex area of concern (AOC) with a long former operational history. Previous activities performed at the OBG were discussed.

Nitroglycerin (NG) Groundwater Quality Standard (GWQS) Selection

A table presenting the GWQS selected for comparison to the laboratory analytical results was forwarded to the NJDEP on October 20, 2006. In all cases an established NJDEP GWQS was selected. In the event an established NJDEP GWQS was not available an existing alternative criteria was selected from a nationally recognized source (i.e. USEPA).

The NJDEP does not currently have an established GWQS for NG. Therefore, the USEPA Region IX Preliminary Remediation Goals (PRG) and USEPA Region III Risk Based Concentration (RBC) for tap water were selected for use in comparison of NG results in groundwater (4.8 ug/l) and presented to the NJDEP on October 20, 2006. The PRG was published in October 2004 and the RBC was published on April 11, 2006.

The USEPA Region III updated the RBC table on October 31, 2006. The RBC tap water concentration for NG was changed from 4.8 ug/l to 620 ug/l. The concentration was changed based on using a oral reference dose instead of an oral cancer slope factor in the formula used to calculate RBC's. NG has not been determined to be a carcinogen; therefore, an oral reference dose is more appropriate.

The October 31, 2006 NG RBC value of 620 ug/l represents the most recent GWQS and Hercules would like to use this value to evaluate detected concentrations of NG identified in groundwater. The team decided to include the October 31, 2006 NG RBC value in the GWQS table that will be reviewed by the NJDEP Office of Quality Assurance for applicability.

Frequent Exceedance Constituent (FEC) Selection

Media specific tables (i.e. soil, groundwater, etc.) presenting the information used to select FECs were distributed and discussed. Each media specific table contained the constituents detected through laboratory analyses of samples, the number of analyses performed for each constituent, and the relative frequency each constituent was found at concentrations exceeding the applicable regulatory criteria. The following items were discussed:

- Care must be taken to not solely focus on FECs. The distribution of all constituents detected at concentrations exceeding the applicable regulatory criteria will be reviewed to determine if a multi-media connection is present or that possible constituent specific clusters are identified. In particular, attention should be given to the possibility that a grouping of a small number of exceedances of a single constituent, while possibly having a small overall percentage of exceedances wrt the total number of samples collected, could pose a particular concern warranting detailed or specific evaluation. Volume A of the RIR will address the multi-media connections and constituent specific clusters.
- All constituents that do not have an established NJDEP standard will have an asterisk placed adjacent to the constituent name. This will allow reviewers of the RIR to quickly identify constituents with a site-specific cleanup standard.
- A review of the distribution of Arsenic, 2,4/2,6-Dinitrotoluene (DNT), and TNT was performed to determine if these constituents should be added as FECs for sediment figures. Specifically, these constituents were reviewed to determine if a soil/sediment relationship exists. It was determined that Arsenic will be added as an FEC for the Sediment RIR. 2,4/2,6-DNT and TNT will not be added as FEC's for the Sediment RIR. 2,4/2,6-DNT and TNT were not frequently detected in the sediment samples and no significant soil/sediment relationship was identified. Any soil/sediment relationship regarding 2,4/2,6-DNT and TNT will be addressed in the text.
- RDX was reviewed to determine if this constituent should be added to the FEC list for surface water based on a possible connection between surface water and groundwater. It was determined not to add RDX as a FEC for the Surface Water RIR. RDX was not detected frequently in the surface water samples and no significant surface water/groundwater relationship was identified. Any surface water/groundwater relationship regarding RDX will be addressed in the text.
- Benzo(b)fluoranthene was not selected as a sediment FEC for inclusion into the RIR. The NJDEP does not currently publish a Freshwater Sediment Screening Guideline for Benzo(b)fluoranthene and an alternate sediment screening value was selected from the Oak Ridge National Laboratory Risk Assessment

Information System (RAIS) as part of the RIR development process. The analytes selected for laboratory analysis of sediment samples during the RI were selected prior to locating the alternate sediment screening value and Benzo(b)fluoranthene was not selected. Comparison of the Benzo(b)fluoranthene analysis performed during the SI to the alternate sediment screening value identified a high relative exceedance value (56.7% of all samples). However, since no new information was collected during the RI it was determined not to include Benzo(b)fluoranthene as a FEC in the RIR.

The results of the Arsenic, DNT, TNT, and RDX FEC review will be discussed at the next triad teleconference scheduled for November 28, 2006.

Review/Discuss Draft RIR Figures

The following draft figures were reviewed and discussed:

- Groundwater Elevation Contour Map
- Groundwater TNT Exceedance Figure
- Groundwater E&E Composite Exceedance Figure
- Surface Water Total Lead Exceedance Figure
- Sediment Lead Exceedance Figure
- Sediment Total Metal Composite Exceedance Figure
- Soil Areas II/III Arsenic Exceedance Figure
- Soil Areas II/III SVOC Composite Exceedance Figure
- Soil Areas II/III E&E Composite Exceedance Figure

It was determined that the format and data presentation of figures is acceptable.

Additional Discussions:

The following additional topics were discussed:

- Table format is acceptable. The tables will be submitted to the NJDEP unfolded and bound in a manner to limit overall thickness as best possible.
- The results of the DDNP investigation will likely be an addendum following delivery of the RIR due to difficulties in obtaining standards for QA/QC. It is anticipated that the laboratory will be prepared to accept samples for DDNP analysis in late December. Tentatively, field sampling for DDNP is scheduled for December 19 & 20, 2006
- The RIR does not include the SI groundwater and surface water results because these media are highly mobile with more dynamic changes than sediment or soil. Surface water results are used to define the segments of streams where RI efforts were performed.

Agenda
Hercules Kenvil Works Facility
Remedial Investigation Report
Triad Approach Meeting
Meeting Number 5 (11/28/06)

Call in number:

(888)–742–8686 Meeting Number: 2222789. Call the 888 number and you will be prompted for the meeting number. After you dial the meeting number you will be placed into the conference room.

Triad Approach Meeting Minutes (11/8/06 & 11/14/06) Comments:

Discuss comments the team has concerning the Draft Triad Approach Meeting Notes for Meeting Number 3 (11/8/06) and Meeting Number 4 (11/14/06). The draft meeting notes are attached.

Use of Soil Impact to Groundwater Criteria:

Hercules believes that the groundwater sampling performed during the remedial investigation (RI) is sufficient to determine the potential influence the facility's soil may have on groundwater quality and use of the New Jersey Department of Environmental Protection (NJDEP) Impact to Groundwater Soil Cleanup Criteria (IGWSCC) is not warranted. Hercules would like to compare the soil sampling results to the Residential Direct Contact Soil Cleanup Criteria (RDCSCC) and Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC).

Delivery Schedule for Remedial Investigation Report (RIR):

Hercules would like to submit the RIR to the NJDEP as soon as practical. It is believed that Volume C - Groundwater and Volume D -Sediment of the RIR will be completed and submitted to the NJDEP prior to the end of 2006. Volume A – RI Summary, Volume B – Soil, and Volume E – Surface Water will be finalized and submitted to the NJDEP prior to the end of January 2007.

Schedule Next Meeting:

Determine date and time for the next triad approach teleconference.

**Hercules Kenvil Works Facility
Remedial Investigation Report
Triad Approach Meeting Minutes
Meeting Number 5 (11/28/06)
Rev. 0 – (12/12/06)**

The following document presents the meeting minutes from the fifth triad approach meeting held to discuss the development, submission, and subsequent review of the remedial investigation report (RIR) for the Hercules Kenvil Works Facility (facility). Interactions of the triad team are fluid between each respective organization (Hercules, NJDEP, SAIC, and MWH) and focused toward completing the RIR.

Attendees:

Jim Bevis (Hercules)
Marc Romanell (NJDEP)
Donna Gaffigan (NJDEP)
Jim Kealy (NJDEP)
Chrissy Weber (MWH)
Ed Meeks (SAIC)

Topics Discussed:

Triad Approach Meeting Minutes (11/8/06 & 11/14/06) Comments:

The meeting minutes were distributed on November 27, 2006 and discussed. Comments were collected from the group and the meeting minutes were revised. The revised meeting minutes were distributed to the team on December 11, 2006.

Use of Soil Impact to Groundwater Criteria:

It was determined that the New Jersey Department of Environmental Protection (NJDEP) Impact to Groundwater Soil Cleanup Criteria (IGWSCC) will be used in conjunction with the Residential Direct Contact Soil Cleanup Criteria (RDCSCC) and Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) for the comparison of soil sample results.

Delivery Schedule for Remedial Investigation Report (RIR):

Hercules intends to submit the RIR to the NJDEP as soon as practical. It is believed that Volume D -Sediment of the RIR will be completed and submitted to the NJDEP prior to the end of 2006. Volume A – RI Summary, Volume B – Soil, Volume C – Groundwater, and Volume E – Surface Water will be finalized and submitted to the NJDEP prior to the end of February 2007.

Agenda
Hercules Kenvil Works Facility
Remedial Investigation Report
Triad Approach Meeting
Meeting Number 6 (12/12/06)

Call in number:

(888)–742–8686 Meeting Number: 2222789. Call the 888 number and you will be prompted for the meeting number. After you dial the meeting number you will be placed into the conference room.

Triad Approach Meeting Minutes (11/28/06) Comments:

Discuss comments the team has concerning the Draft Triad Approach Meeting Notes for Meeting Number 5 (11/28/06). The Draft Triad Approach Meeting Notes for Meeting Number 5 (11/28/06) are attached.

Selection of RIR Criteria:

Hercules would like to discuss the possibility of using the regulatory comparison criteria provided to the NJDEP on 10/20/06 and revised on 12/7/06 to account for updates to the criteria by the NJDEP (Surface Water Quality Standards – October 2006) and the USEPA Region III (Risk Based Concentrations – October 2006). In all cases an established NJDEP criterion was first sought for use with each detected constituent per media. In the event an established NJDEP criterion was not available for a detected constituent, an existing alternative criterion was selected from a nationally recognized source (i.e. USEPA).

Hercules would like to quickly establish a known set of regulatory comparison criteria so that the reporting effort can be advanced efficiently without significant modifications to adjust for changes during development of the RIR. Hercules also understands that site-specific criterion are required to be developed for constituents without established NJDEP criterion but would like to defer this task to the remedial alternatives selection report (RASR). Development of the site-specific criterion may require a significant effort by the NJDEP and the time between submittal of the RIR and RASR would likely be sufficient to complete this task.

Hercules intends to include a statement that indicates site-specific criterion will be developed for detected constituents without an established NJDEP criterion and will be addressed in the RASR.

Diazodinitrophenol (DDNP) Pond Sampling

Hercules intends to sample the former DDNP ponds as described in the Triad Approach Meeting Notes for Meeting 2 (10/31/06) on December 19 & 20, 2006. The laboratory is currently performing the method detection limit study and believes they will ready to accept samples by December 19, 2006.

Schedule Next Meeting

Determine date and time for the next triad approach teleconference.

**Hercules Kenvil Works Facility
Remedial Investigation Report
Triad Approach Meeting Minutes
Meeting Number 6 (12/12/06)
Rev. 0 – (5/1/07)**

The following document presents the meeting minutes from the sixth triad approach meeting held to discuss the development, submission, and subsequent review of the remedial investigation report (RIR) for the Hercules Kenvil Works Facility (facility). Interactions of the triad team are fluid between each respective organization (Hercules, NJDEP, SAIC, and MWH) and focused toward completing the RIR.

Attendees:

Jim Bevis (Hercules)
Marc Romanell (NJDEP)
Donna Gaffigan (NJDEP)
Jim Kealy (NJDEP)
Chrissy Weber (MWH)
Ed Meeks (SAIC)

Topics Discussed:

Selection of RIR Criteria:

It was determined that it is acceptable to use alternate criteria for comparison to detected constituents without established NJDEP criteria. The intent of using the alternate criteria is to provide a screening level indication for the evaluation of potential environmental influence of detected constituents that are without an established NJDEP criteria or where a method calculation following NJDEP guidance could not be performed. It is anticipated that the NJDEP will provide site specific criterion for detected constituents without a currently available NJDEP criteria that will be included in the forthcoming remedial alternative selection report (RASR).

In all cases, established NJDEP criteria will first be sought or calculated using NJDEP guidance. In the event an established NJDEP criterion is not available or can be calculated using NJDEP guidance, an existing alternate criterion will be selected or calculated based on nationally recognized sources.

Each media specific volume of the RIR will provide a table that identifies the source of each comparison criteria selected.

Diazodinitrophenol (DDNP) Pond Sampling:

Upon completion of the method detection limit study by the laboratory (GPL Laboratories), Hercules will sample the DDNP ponds as described in the Triad Approach Meeting Notes for Meeting 2 (10/31/06). It is anticipated sampling activities will begin on December 19th and be concluded on December 20, 2006.

Agenda
Hercules Kenvil Works Facility
Remedial Investigation
Triad Approach Meeting
Meeting Number 7 (3/29/07)

Call in number:

(800)–366–7242 Meeting Number: 597651. Call the 800 number and you will be prompted for the meeting number. After you dial the meeting number you will be placed into the conference room.

Screening Risk Assessment Tasks Review:

Hercules would like to present and discuss the anticipated screening risk assessment tasks to be performed. It is anticipated that the screening risk assessment tasks will be implemented in the second quarter 2007 and are attached to the agenda.

Nitroglycerin Groundwater Screening Level Criteria:

Hercules recently discovered the USEPA made a typographical error in the October 2006 update to their Risk Based Criterion (RBC) table concerning the reference dose (RfD) for nitroglycerin (NG). The effects of the incorrect RfD caused the USEPA to revise the NG RBC values on December 29, 2006. Specifically, the revised NG Tap Water RBC was reduced from 620 ug/l to 3.7 ug/l.

Hercules used the Tap Water RBC for NG as an alternate screening criterion in the Groundwater (GW) Remedial Investigation Report (RIR) which was submitted to the NJDEP prior to discovering the USEPA revised the value. The NG Tap Water RBC was selected to provide a screening level indication for the potential environmental influence of this constituent because there is not a currently established NJDEP GW Quality Standard for NG. No other media (soils, surface water, or sediment) are affected by the USEPA revision.

Hercules proposes to revise the tables and figures affected by the USEPA revision and submit them to the NDJEP as an addendum to the GW RIR. Additionally, Hercules is evaluating several laboratories to determine if it possible to achieve an NG detection limit of 3.7 ug/l for aqueous samples.

Schedule Next Meeting:

Determine date and time for the next triad approach teleconference.

**Hercules Kenvil Works Facility
Remedial Investigation Report
Triad Approach Meeting Minutes
Meeting Number 7 (3/29/07)
Rev. 0 – (4/10/07)**

The following document presents the meeting minutes from the seventh triad approach meeting held via teleconference to discuss the development, submission, and subsequent review of the remedial investigation report (RIR) for the Hercules Incorporated (Hercules) Kenvil Works Facility (facility). Interactions of the triad team are fluid between each respective organization (Hercules, NJDEP, and SAIC) and focused toward completing the RIR.

Attendees:

Jim Bevis (Hercules)
Donna Gaffigan (NJDEP)
Jim Kealy (NJDEP)
Nancy Hamill (NJDEP)
Ed Meeks (SAIC)

Topics Discussed:

Screening Risk Assessment Task Review

The proposed screening risk assessment tasks were discussed and are included as Attachment A. It was determined that the screening risk assessment tasks were acceptable and will be implemented in the second quarter 2007. It is anticipated that the findings of the screening risk assessment will be reported to the NJDEP in the third quarter 2007.

NJDEP recommended the following efforts be considered for the screening risk assessment:

- Involve resources from the Natural Heritage Program.
- Review Raritan and Picatinny Arsenals ecological risk assessment information concerning energetic and explosive (E&E) constituents. (Jim Kealy and Nancy Hamill will assist Hercules with locating the information).
- Evaluate the use of the United States Environmental Protection Agency (USEPA) Ecological Soil Screening Levels (SSL).
- Evaluate the possibility of collecting samples from a selected reference wetland for comparison to wetlands within the former operational areas of the facility.

- Coordinate field efforts to allow NJDEP to be present during the qualitative habitat survey.
- High level human health risk assessment is not required for upland areas by the NJDEP since the soil cleanup criteria address human exposure.

Nitroglycerin Groundwater Screening Level Criteria

Hercules recently discovered the USEPA made a typographical error in the October 2006 update to their Risk Based Criterion (RBC) table concerning the reference dose (RfD) for nitroglycerin (NG). The effects of the incorrect RfD caused the USEPA to revise the NG RBC values on December 29, 2006. Specifically, the revised NG Tap Water RBC was reduced from 620 ug/l to 3.7 ug/l.

Hercules used the Tap Water RBC for NG as an alternate screening criterion in the Groundwater (GW) Remedial Investigation Report (RIR) which was submitted to the NJDEP prior to discovering the USEPA revised the value. The NG Tap Water RBC was selected to provide a screening level indication for the potential environmental influence of this constituent because there is no NJDEP GW Quality Standard currently established for NG. No other media (soils, surface water, or sediment) are affected by the USEPA revision.

It was initially determined that Hercules would resubmit the figures and tables affected by the USEPA typographical error. However, in a subsequent teleconference between Ed Meeks (SAIC) and Donna Gaffigan on April 5, 2007 it was concluded that Hercules will document the effect of the USEPA typographical error in a letter to the NJDEP and revise the figures and tables later as part of additional groundwater sampling efforts to be conducted in 2007. The letter to the NJDEP will identify the names of all remedial investigation groundwater sampling locations where concentrations of NG now exceed the 3.7 ug/l Tap Water RBC that were not identified in the Groundwater Remedial Investigation Report.

The additional groundwater sampling efforts will be focused on providing additional characterization of the E&E plume underlying southwestern portion of facility.

Attachment A
Screening Risk Assessment Tasks
Hercules Kenvil Works Facility
Kenvil, New Jersey

Task No.	Task Description	Objective/Purpose of Task
	Human Health Risk Assessment Related Task	
1	Develop high level human health assessment (optional)	Review the Remedial Investigation Reports and provide a high level summary of potential human health concerns. Identify recommended future actions necessary to complete a human health risk assessment.
	Ecological Risk Assessment Related Tasks	
2	Develop Site-wide conceptual site model	Characterize the way ecological receptors may come in contact with the contamination at the site to define the potential exposure pathways.
3	Perform a qualitative habitat survey of the site area for both aquatic and terrestrial environments.	The habitat assessment will be used to identify sensitive ecological habitats that exists on site that may require evaluation as part of the ecological risk assessment.
4	Develop a list of sediment and surface water guidelines that can be applied across the site for protection of ecological health and communicate these to NJDEP.	Fill gaps in the NJ ecological sediment and surface water benchmarks to make the ecological evaluation more complete.
5	Spatially evaluate areas that are above sediment guidelines within the aquatic environment by developing site-specific hazard quotients (HQs).	Identify aquatic areas that do not pose an ecological risk. Identify aquatic areas that may require further evaluation to determine if there is an unacceptable ecological risk.
6	Wetland function and value analysis	Perform evaluation of an example on-site wetland affected with site-specific constituents and compare its function and value to a nearby reference wetland that is not contaminated to evaluate if the site related contamination is affecting the wetlands.
7	Develop a list of soil guidelines that can be applied across the site for protection of ecological health and communicate these to NJDEP.	Fill gaps in the NJ ecological soil benchmarks to make the ecological evaluation more complete.
8	Spatially evaluate areas of ecological risk within the upland (terrestrial) environment by developing site-specific ecological hazard quotients.	Identify terrestrial areas that do not pose an ecological risk. Identify terrestrial areas that may require further evaluation to determine if there is an unacceptable ecological risk.
	Report Preparation Task	
9	Develop a screening risk assessment report in accordance with applicable NJDEP and USEPA guidance.	Document results of the human health high level summary (if performed) and ecological risk assessment. Define areas that can be developed for future use without further action. Define areas where additional action may need to be considered before development for future use may occur.

APPENDIX H



State of New Jersey

Department of Environmental Protection

Richard J. Codey
Acting Governor

Bradley M. Campbell
Commissioner

James Bevis, Site Manager
Hercules Incorporated
Research Center
500 Hercules Road
Wilmington, DE 19808-1599

JUN 27 2005

Dear Mr. Bevis:

Re: Revised Soils Site Investigation Report Dated May 2004
Surface Water/Sediment Site Investigation Report Dated November 2004
Hercules Kenvil Plant Site, Roxbury Township, Morris County

The Department has reviewed the above referenced site investigation reports submitted by MWH Americas for the Hercules Kenvil plant site. These reports are hereby approved.

The draft Ground Water Site Investigation report will be discussed at our meeting to be scheduled in early July. After the meeting comments will be issued on this report and Hercules will have 30 days to modify it. Upon the Department's approval of the modified ground water report, Hercules will be required to submit a remedial investigation work plan.

Should you have any questions concerning this letter, please contact me at (609) 633-0714.

Sincerely,

Paul Harvey, Case Manager
Bureau of Case Management

C:

Ed Meeks, MWH



State of New Jersey

Department of Environmental Protection

Richard J. Codey
Acting Governor

Bradley M. Campbell
Commissioner

AUG 10 2005

James Bevis, Site Manager
Hercules Incorporated
Research Center
500 Hercules Road
Wilmington, DE 19808-1599

Dear Mr. Bevis:

Re: Revised Ground Water Site Investigation Report Dated July 2005
Hercules Kenvil Plant Site
Roxbury Township, Morris County

The Department has reviewed the above referenced revised site investigation report submitted by MWH Americas for the Hercules Kenvil Plant site. This report is hereby approved.

Within sixty (60) days of receipt of this letter, Hercules shall submit a draft phase I remedial investigation work plan for the Department's review and approval.

Should you have any questions concerning this letter, please contact me at (609) 633-0714.

Sincerely,

Paul Harvey, Case Manager
Bureau of Case Management

C: Ed Meeks, MWH



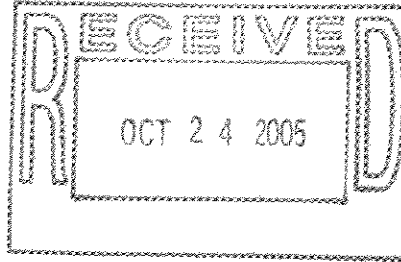
State of New Jersey

Department of Environmental Protection

Richard J. Codey
Acting Governor

Bradley M. Campbell
Commissioner

James Bevis, Site Manager
Hercules Incorporated
Research Center
500 Hercules Road
Wilmington, DE 19808-1599



OCT 21 2005

Dear Mr. Bevis:

Re: Revised Remedial Investigation Work Plan Dated September 30, 2005
Hercules Kenvil Plant Site
Roxbury Township, Morris County

The Department has reviewed the above referenced modifications to the Remedial Investigation Work Plan (RIWP) contained in the MWH Americas letter dated September 30, 2005. The modifications are acceptable and the Department hereby approves the RIWP.

Should you have any questions concerning this letter, please contact me at (609) 633-0714.

Sincerely,

Paul Harvey, Case Manager
Bureau of Case Management

C: Ed Meeks, MWH



State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JON S. CORZINE
Governor

LISA P. JACKSON
Commissioner

JUL 11 2006

James Bevis, Site Manager
Hercules Incorporated
Research Center
500 Hercules Road
Wilmington, DE 19808-1599

JUL 14 2006

Dear Mr. Bevis:

Re: Site-Wide Remedial Investigation Work Plan Dated June 2006
Hercules Kenvil Plant Site
Roxbury Township, Morris County

The Department has reviewed the above referenced remedial investigation work plan (RIWP) which covers the entire site. The Area I RIWP was approved by the Department on October 21, 2005. This new work plan is an extension of the Area I RIWP since Hercules has decided to complete the remedial investigation for the whole site in one expedited phase. The new RIWP covers Areas I, II and III encompassing the whole site. This work plan is hereby approved.

Should you have any questions concerning this letter, please contact Roman Luzecky at (609) 633-1477.

Sincerely,

Paul Harvey, Case Manager
Bureau of Case Management

APPENDIX J

SITE BACKGROUND

A detailed description of the Facility's physical characteristics (Section 1.0), history (Section 2.0), geology and hydrogeology (Section 3.0), and drainage areas (Section 4.0) are provided below. A summary of previous investigations is also included (Section 5.0).

1.0 PHYSICAL DESCRIPTION

The approximately 1,200-acre Facility is located on Howard Boulevard, about 0.5 miles northwest of the center of Kenvil, in Morris County, New Jersey. Figure A-1 illustrates the location with respect to Roxbury Township. The site is approximately 13,000 feet long by 5,000 feet wide. Eight hundred of the 1,200 total acres were developed for former plant use, and the remaining 400 acres are undeveloped areas between process units and around the perimeter of the Facility; these undeveloped areas acted as a buffer between the former active portions of the Facility and the surrounding community. Regionally, the Facility is approximately 40 miles west of New York City and 30 miles east of the Delaware Water Gap.

The site is bounded by the New Jersey Transit Railway to the north, by Berkshire Road to the southeast, by Route 46 to the south, and by Howard Boulevard to the southeast. The acreage north of Howard Boulevard and Conrail railroad is mostly undeveloped. Residential and commercial properties predominate southeast of Berkshire Road and Route 46. Two small lakes are present immediately south of the Facility.

The former production areas are centrally located within the Facility in a relatively flat area with a slight slope extending to Howard Boulevard on the northwest side and a topographic ridge on the southeast side that separates the production area from the Berkshire Valley area. The undeveloped areas are covered with mature trees, and the former operation areas are covered with grass, weeds or young trees. The property contains several wet areas and has one major pond, known as "Duck Pond", which is approximately 9 acres in size.

Currently, all buildings and structures at the Facility have been demolished to grade except for several one-story structures in Area III, the wastewater treatment plant, a guard shack at the northern gate, and a guard shack and a small office building at the southern gate. These one-story structures have been used to store vehicles and light machinery such as backhoes and excavators. The wastewater treatment plant is currently inactive.

Based on the former operations and Facility layout, the Facility was divided into 3 remedial areas and further subdivided into 13 former operational areas (Figure A-3), including:

Area I - RI, areas north and east of Powder Mill Road (B-Line, Finishing, Storage, eastern portions of Development, and portions of Miscellaneous/Offsite former operational areas);

Area II - RI, areas south and west of Mule Barn Road (NG, PETN, TNT, Dynamite, and portions of Miscellaneous/Offsite former operational areas); and

Area III - RI, central portions of the Facility (A-Line, Maintenance, AN, Diazo, Western Development, and portions of Miscellaneous/Offsite former operational areas).

2.0 FACILITY HISTORY

The Facility began operation in 1871 and operated until December 31, 1996. The Facility initially was utilized for the manufacture of dynamite to support iron ore mining operations in the surrounding area. Manufacturing activities were limited to the southwestern area of the Facility in a small section of the current NG, TNT, and Dynamite Areas. Portions of the A-Line and Maintenance Areas were also used in support roles such as finished product storage (A-Line) and maintenance activities (Maintenance Area). These areas were either located on the western ridge, adjacent to the western ridge, or on well drained elevated ground. The Facility was operated by various companies until 1912 when Hercules became the sole owner.

In the years leading up to and including peak war time production years (predominately World War I, and to a lesser extent World War II, Korea, and Vietnam), Hercules

expanded its manufacturing operations to meet the growing economic need for explosives and propellants. The Facility expanded its manufacturing operations to encompass approximately 800 acres including PETN, B-Line, AN, Finishing, Storage, Development, and Diazo areas. Many support areas were also developed including office space, plant laboratories, maintenance areas, power houses, mixed acid areas, drum storage areas, the water supply system, a wastewater treatment plant (WWTP), warehouses and miscellaneous production and support buildings. Hercules hired as many as 6,000 employees from around the country to meet the rapidly increasing need for E&E compounds.

Over its history, the Facility has produced a variety of explosives and specialty products. Propellants and E&E, such as TNT and smokeless powder and later ANFO were produced for both military and commercial applications. Additionally, specialty products such as initiating materials, ingredients for medical applications, and materials for actuating devices were produced.

In the final years of Facility operation, smokeless powder was the primary product, and was produced by Alliant under a facility lease agreement from 1995 to 1996. The facility ceased operation in 1996. During the time Alliant operated the Facility, Hercules entered into a voluntary agreement with the State of New Jersey to investigate the contamination level at the TNT area. Hercules re-acquired control of the Facility on January 1, 1997 and, as the property owner, remains responsible for the remediation and closure of the Facility for sale or reuse.

2.1. FACILITY OPERATIONAL PRACTICES

A summary of the primary historic operational practices employed at the Facility during its operation, expansion, and redevelopment activities is provided below:

- Importation and emplacement of historic fill;
- Explosions and accidental and intentional fires;
- Land disposal;
- Liquid waste conveyance; and

- Accidents and spills during general Facility operations.

Historic Fill: Hercules imported potentially large quantities of historic fill from local available sources to support expansion activities. Surface elevations in many portions of the Facility were in close proximity to the water table and were unsuitable for industrial development. Historic fill (consisting of fly ash, bottom ash, and slag derived from the combustion of coal) largely imported from off-site sources, was used to increase grade, eliminate shallow ponds/wet areas, improve drainage, and increase compatibility of the soils to allow construction of large manufacturing complexes. Historic fill was also used extensively for establishing both narrow gauge and standard gauge rail beds which were used to transport materials.

The historic fill is believed to have possessed metal and PAH constituents prior to entering the Facility. The former iron foundries located in Dover, New Jersey, approximately four miles east of the Facility, are thought to have been the primary source of historic fill based on their location and extensive use of coal, although documentation of the source is not available. Due to the very short period (1912 to 1914) of the large scale Facility expansion, other unknown sources of historic fill may have been secured. It is likely that historic fill from on-site Facility boilers were added to the imported historic fill but represented a very small fraction of the total historic fill emplaced.

The Facility is believed to have possessed a total of four powerhouse sites with associated coal fired boilers that supported previous manufacturing operations. Prior to the large World War I expansion the powerhouses were relatively small (typically two boilers per powerhouse) and provided steam for areas immediately adjacent to the individual powerhouses. The small powerhouses were located in the Dynamite, NG, Storage, and Maintenance former operational areas. The Maintenance Area power house was divided into two structures, each believed to have two boilers. A total of ten small boilers are believed to have been present at the Facility prior to the World War I expansion. The exact dates of construction or operation of the four small power houses are not known but may have extended from the late 1800's through the end of World War I (1918). Following World War I and after the major Facility expansion was complete the four

small boilers were dismantled and replaced by a single large central powerhouse that produced both steam and electricity, and was located in the Maintenance Area.

Explosions: In most cases, explosions were limited to single operational units (e.g. C13 – 666 Refined TNT Graining House); although these were very destructive events, they were limited in their deleterious effect. The primary exception occurred in 1940 when approximately 300,000 pounds of smokeless gunpowder exploded at a single unit. This explosion triggered secondary explosions in other operational areas, caused by the shock wave and hot debris thrown out by the force of the initial detonation. Ultimately, the 1940 explosion encompassed nearly the entire manufacturing area of the Facility and caused 51 deaths and more than 200 casualties. This was reportedly the worst explosive manufacturing facility disaster in US history and caused the Facility to abruptly halt operations.

Photographs in Attachment A display the destructive force of the 1940 explosion; disturbed ground surfaces, shattered structures, and scattered debris are readily apparent on these photographs. Other historic explosions, although not as widespread, also spread destructive debris in an unregulated and heterogeneous manner.

Fires: Historically, fires were the result of accidents, a means of intentionally decontaminating structures contaminated with E&E constituents, or destroying off-specification E&E constituents. Uncontrolled fires resulting from accidents and production upsets were most frequent from 1871 until the 1950s when more advanced manufacturing process controls were incorporated. Fires were of critical concern for the Facility because the nature of the E&E constituents released tremendous energy that could result in multiple operations becoming involved.

Fire was an industry standard to thermally decontaminate structures with E&E constituents. Thermal decontamination of structures containing residual E&E constituents was performed at the Facility up to 1996 when the Facility ceased operations. After 1996, all of the approximately 300 existing structures were demolished without using thermal decontamination.

Thermal decontamination involved emplacing scrap wood or similar combustible material into a structure in such a manner that all surfaces of the structure would be exposed to either direct flame or temperatures in excess of the thermal decomposition temperature of the E&E constituents. The fires would be allowed to burn until all combustible materials were consumed. It was assumed that non-combustible materials (e.g. masonry and steel) were subjected to sufficient heat that thermal decomposition of E&E constituents was complete. Photographs in Attachment B present a typical thermal decontamination of a structure contaminated with E&E constituents. Those photographs were not taken at the Facility, but still reflect the same type of methods and procedures used at the Facility.

Nearly all large E&E manufacturing facilities used open burning as a safe means of destroying off-specification E&E constituents. Due to the tremendous energy stored within the E&E constituents, it has long been an industry standard that land disposal was not appropriate. Typically, burning grounds were located a safe distance from current manufacturing operations and within close proximity to a supply of water (i.e. ponds or fire hydrants). In some instances, not all combustible constituents, including E&E, were consumed by fire.

Land Disposal: Methods of disposal for unused or off-specification materials have changed considerably since the Facility began operation in the 1871. It wasn't until the 1970's with the promulgation of environmental regulations that disposal of unwanted materials were considered a priority for manufacturing facilities.

The majority of land disposal is believed to have occurred at two large disposal sites known as M8-1 and N6-1. It is believed these areas were used for disposal of unwanted materials from 1919 until the 1970's. However, it is suspected that smaller scale disposal occurred randomly in the past but there are no records available to identify the locations. Approximately 20 small disposal sites were identified as part of site investigation and demolition activities. The small disposal sites appear to represent former low lying areas and are often associated with historic fill deposition.

Liquid Waste Conveyance: Historically conveyance systems such as unlined shallow ditches, trenches, ponds, underground pipes, and spray fields were used at the Facility to convey liquid wastes to the surface water drainage systems. It is anticipated that the majority of ditches and trenches were less than 2-feet in total depth. The existing surface water drainage systems were in turn used to dilute the liquid wastes and carry them off-site. The practice of using unlined shallow ditches and trenches is believed to have been used from 1871 until the mid 1970's with the promulgation of the Resource Conservation and Recovery Act (RCRA). After the mid 1970's, the majority of the ditches and trenches were replaced with underground piping. The liquid wastes were treated via two permitted spray fields from the mid 1970's until 1985. In 1985, a WWTP was constructed to treat liquid wastes generated at the Facility.

It is believed the primary liquid wastes generated at the Facility were spent acids (nitric and sulfuric acids) from the nitration process of E&E constituents and wash down waters from routine operations. Until the late 1800's there was not an established method to recover spent acids from nitrating E&E constituents. Following the late 1800's an economical method of recovering spent acids was developed and they were no longer considered a waste material. The facility was only nitrating NG within the boundaries of the NG Area prior to the late 1800's. It is standard industry procedure at E&E manufacturing facilities to routinely wash down the interior of the structures with water to remove residual accumulations of E&E constituents. The intent of washing the interior of the structures was to prevent substantial accumulations of E&E constituents, increasing safety for personnel working within the structures.

Very few historic unlined ditches or trenches were identified during the site investigation process. Numerous attempts were made to locate the historic waste conveyance systems, but the lack of documentation of these activities, re-grading efforts performed during subsequent redevelopment activities, and the use of underground piping to replace ditches and trenches in the mid 1970's have removed the evidence of their existence due to their shallow depth.

Accidents and Spills during General Facility Operations: Accidents and spills occurred at the Facility during general Facility operations. The number of accidents and spills likely increased during peak war times when large marginally trained work forces were needed and expansion activities were implemented.

Accidents and spills predominately occurred during transportation of raw and finished products within the Facility. Transportation was accomplished primarily through narrow gauge rail, although mule drawn buggies, hand operated buggies (angel buggies), standard gauge rail, vehicles, and piping/gutters were also utilized. To a lesser extent, accidents and spills occurred within manufacturing structures during operation of machinery (e.g. mixers, packers, cutters, presses), maintenance activities, and from mechanical failures.

It was standard industry procedure to thoroughly clean up any spills involving E&E constituents. Therefore, it is believed that primarily non E&E constituents may have been released in this manner.

3.0 REGIONAL AND SITE-SPECIFIC GEOLOGY AND HYDROGEOLOGY

3.1. REGIONAL GEOLOGY

The Facility is located in the New Jersey Highlands physiographic province of north-central New Jersey. This area is characterized by broad, elevated ridges separated by long, narrow valleys. Areas of higher elevation (i.e. ridges) are underlain by Proterozoic crystalline metamorphic bedrock that has been intricately deformed by folding and faulting. Prominent faults in the vicinity of the Facility include the Longwood Valley Fault, the Berkshire Valley Fault, and the Picatinny Fault (Bedrock Geologic Map, Figure A-J-1, provided at the end of this section). These faults resulted from several periods of Paleozoic and Mesozoic deformation. Faults and fold axes are generally oriented in a southwest to northeast direction. This causes topographic features such as ridges and valleys to also be oriented in a southwest to northeast direction.

The lithologies in the valleys and lower slopes of the ridges consist of unconsolidated Quaternary glacial deposits, alluvium and colluvium. The valley-fill thins towards the ridges with an average thickness of approximately 20-ft. and is bounded by bedrock ridges, composed primarily of Precambrian granitoid gneiss. The depth to bedrock is the greatest in the center of the valley, averaging between 100 and 200-ft below ground surface (bgs). A layer of colluvium and weathered bedrock, generally less than 10-ft thick, is present on some hillsides in the area. The colluvium is composed of unstratified and unsorted bedrock boulders, cobbles, and pebbles in an orange-brown, silty-sand matrix. The weathered bedrock ranges from sandy saprolite to a rubble of angular cobbles and boulders.

The valleys are comprised of three unconsolidated sedimentary units; upper outwash deposits, lacustrine deposits, and a basal unit. The upper outwash deposit consists of sand and gravel outwash, terminal moraine deposits, and a minimal to moderate amount of silt and clay. The upper outwash is underlain by a middle confining unit that consists of fine grained lacustrine deposits, and a minimal amount of glacial till and weathered bedrock (adjacent to ridges). The basal unit is comprised of coarse sand and gravel glacial outwash and is underlain by a discontinuous confining unit that contains clay and till. Paleozoic bedrock of varying thicknesses including conglomerate, sandstone, shale, and carbonate underlie the unconsolidated sediments.

Figures presenting the Bedrock Geologic Map (Figure A-J-1), Bedrock Surficial Geologic Map (Figure A-J-2), and Regional Geologic Cross Section (Figure A-J-3) are provided at the end of this section.

3.1.1 Bedrock Geologic Units

The Byram Intrusive Suite of the Proterozoic age forms the ridges of Mine Hill southeast of the Facility and Mount Arlington/Mooney Mountain northwest of the Facility. The bedrock of the Byram Intrusive Suite predominantly consists of light-colored granite gneisses.

The Hardyston Formation and the Leithsville Formation of the Cambrian age are present in the subsurface within the valleys between Mine Hill and Mooney Mountain. The Hardyston Formation consists of quartzite and conglomerate. The Leithsville Formation contains dolomite, dolomitic shale, and interbedded sandstone. The Hardyston Formation occurs throughout most of Long Valley, in Morris County, and is overlain by bedrock of the Leithsville Formation. These formations are overlain by glacial deposits in the vicinity of the Facility.

Beds of Silurian age sandstone and conglomerate of the Green Pond Conglomerate form a minor ridge, Green Pond Ridge, which divides Long Valley into two parts in the vicinity of the Facility. The ridge is present along the southeastern boundary of the plant. The Green Pond Conglomerate is oriented in a southwest to northeast direction and continues in the subsurface beneath the overlying glacial deposits away from the Facility.

Undifferentiated sedimentary rocks of Silurian and Devonian age consisting of shale and sandstone are present north of the Facility within the Berkshire Valley.

3.1.2 Glacial Deposits

Three Pleistocene age glacial geologic units, known as valley-fill, are present in the area:

- Upper outwash deposit consisting of sand and gravel;
- Middle lacustrine unit consisting of fine sand, silt, and clay; and,
- Basal fluvial and deltaic sand and gravel unit.

The upper outwash unit occurs at the ground surface and extends to an average depth of approximately 60-ft bgs and ranges in thickness from approximately 50-ft near the ridges to 100-ft in the valley. The middle lacustrine unit occurs at a depth of approximately 30 to 200-ft bgs and is approximately 75-ft thick. The top of the basal sand and gravel unit occurs at and within the vicinity of the Facility at a depth of approximately 200-ft bgs and is approximately 50-ft thick.

The valley-fill deposits are locally overlain by terminal moraine deposits resulting from the most recent Pleistocene glaciation event, the Wisconsin Glaciation. The Wisconsin

Glaciation began approximately 80,000 years ago and reached its maximum extent in New Jersey about 18,000 years ago and began its retreat about 11,000 years ago. Terminal moraine deposits, which were formed at the furthest advance of the glacial front, are a distinctive topographic feature extending across northern New Jersey and through the northern portion of the Facility. The terminal moraine deposits are composed of poorly-sorted gravel and boulders interstratified with well-sorted sand, silt and clay. Boulders as large as 10-ft in diameter are present in the terminal moraine deposits in the vicinity of the Facility.

3.2. SITE-SPECIFIC GEOLOGY

The site-specific geologic description is primarily based on monitoring well installation logs (Appendix A of Volume C-Groundwater) and cross sections (Figures C-2 through C-6 of Volume C-Groundwater) that were developed during the RI. Thirty-six shallow and deep monitoring wells were installed throughout the Facility during the RI to assess groundwater quality (Figure C-1 of Volume C-Groundwater). Twenty-two shallow monitoring wells were installed to a maximum depth of 32-ft bgs and 14 deep monitoring wells were installed to a maximum depth of 64-ft bgs.

As part of the northern New Jersey Highlands physiographic province, the Facility is characteristic of the ridge-valley geology of this region. As shown in the Regional Geologic Cross Section (Figure A-J-3, provided at the end of this section), the Facility is located in the western portion of Long Valley bounded by Mount Arlington and Mine Hill. The Facility has two ridges which run in the southwest to northeast direction, bounding the valley of the Facility in the eastern and western directions. Three major regional faults are present at the Facility; Longwood Valley Fault, Berkshire Valley Fault and Picatinny Fault (Figure A-J-1, provided at the end of this report section). The faults run parallel to the ridges across the Facility in a southwestern to northeastern direction. The ridges located on the Facility are not intersected by any known faults.

The majority of the developed areas of the Facility are located within the valley between the two prominent ridges with the exception of the northernmost portion of Area II

(TNT, PETN and NG Areas) and Miscellaneous/Offsite, which are located on the ridges. Consistent with regional geology, the Facility valley consists of typical glacial till including the following unconsolidated and bedrock units encountered during monitoring well installation:

- Terminal moraine deposits (upper-valley fill aquifer) consisting of poorly sorted pebbles, cobbles and boulders, interstratified with sand and gravel units. The terminal moraine deposits typically overlay the upper outwash sediments and are distinguished by elevated and irregular land surfaces. The terminal moraine deposits were encountered during installation of new monitoring wells MW-7PD and MW-OB3D in Area I (Development and Storage) and MW-35D in Area III (A-Line) at depths ranging from 11 to 39-ft bgs. Terminal moraine deposits were likely encountered during well installation of historic monitoring wells in the same area. However, historic monitoring wells logs were incomplete or unavailable for all historic monitoring wells;
- Upper sand and gravel outwash unit (upper-valley fill aquifer) primarily consisting of sand and gravel, with minimal to moderate silt and clay, was encountered throughout the Facility, with the exception of the ridges. The upper outwash unit was generally present from the ground surface, where terminal moraine deposits are absent, to depths greater than 60-ft bgs. The unit ranges in thickness from approximately 50 to 100-ft. The upper outwash unit was found to be saturated at all locations and represents the water table aquifer at the Facility;
- Middle lacustrine deposit unit (upper valley-fill confining unit) consisting of fine sand, silt and clay, was encountered from 35 to 50-ft bgs in northwestern and central portions of Area II (Dynamite and NG) and Miscellaneous/Offsite and acts as a confining unit. The average thickness of this unit is estimated to be 75-ft;
- Basal fluvial and deltaic sand and gravel unit (lower-valley fill aquifer) was not encountered during RI field efforts. However, the basal fluvial and deltaic sand and gravel unit is expected to be present below the middle lacustrine deposit unit; and,
- Bedrock units were encountered in Areas I and II only on or immediately adjacent to the ridges. Quartzite and sandstone bedrock units were encountered in the Miscellaneous/Offsite, and western portion of Area II (TNT) at MW-47, MW-28D, and MW-32D at depths of 20, 48, and 55-ft bgs respectively. Bedrock units were also encountered in the southeastern portion of Area I (B-Line) at MW-27D at a depth of 29-ft bgs. The bedrock lithologies are typical of the Hardyston Formation. Inspection of the Facility's ridges identified meta-conglomerate and sandstone believed to be associated

with the Green Pond Conglomerate. Due to deformation caused by faulting and folding, the bedrock units are expected to be present between 100 and 250-ft bgs in the valley and approximately 20-ft bgs near the ridges.

3.3. REGIONAL HYDROGEOLOGY

Three primary aquifers are present in the New Jersey Highlands physiographic province of north central New Jersey, which includes Morris, Sussex, Warren, Somerset, and Hunterdon Counties. The valley-fill and carbonate rock aquifer system consists of an UVFA, an upper confining unit, a lower valley-fill aquifer, discontinuous lower and Paleozoic bedrock confining units that act as a continuous basal confining unit, and a carbonate rock aquifer (presented on Figure A-J-4 Regional Hydrogeologic Cross Section, provided at the end of this report section).

The UVFA consists of sand and gravel outwash, locally present terminal moraine deposits, and a minimal to moderate amount of silt and clay. The UVFA averages 50 to 100-ft in thickness, depending on proximity to the ridges or valley. The UVFA is underlain by a confining unit that consists of fine grained lacustrine deposits, a minimal amount of glacial till and weathered bedrock adjacent to the ridges, and averages 50 to 75-ft in thickness.

The lacustrine deposits are underlain by coarse sand and gravel glacial outwash, which represent the LVFA. The LVFA has an average thickness of 30 to 80-ft. The LVFA is underlain by a discontinuous confining unit that contains clay and till and averages 50-ft in thickness. The lower confining unit is interrupted by Paleozoic bedrock of varying thickness and lithology including conglomerate, sandstone, shale, and carbonate. The Paleozoic bedrock, along with the lower confining unit, act as a continuous confining unit that underlies the LVFA.

The carbonate rock aquifer is primarily composed of the Leithsville Formation and underlies the lower valley-fill confining unit in the majority of valleys. The Leithsville Formation contains several faults, has a relatively high permeability and is generally hundreds of feet in thickness.

The occurrence and movement of groundwater in the region varies according to the geologic materials present. In the bedrock geologic units, groundwater occurs principally within secondary porosity features (i.e., fractures, bedding planes, and zones of shearing and faulting). The primary porosity of these rocks can be minimal. The availability of water from wells drilled in these bedrock formations is dependent upon the size and frequency of fractures encountered in any particular well. The yield of large-diameter supply wells located within the bedrock formations in Morris County reportedly range from 4 to 400 gallons per minute (gpm) with a median range of 25 to 50 gpm. The majority of water supply wells are completed in the Leithsville Formation.

The UVFA and LVFA form the most significant sources of water in the region due to their high porosity. Yield of large-diameter wells reportedly range from 20 to 20,000 gpm with a median range between 200 to 500 gpm. Groundwater occurs under unconfined conditions (i.e. water table) in the UVFA and locally confined in the LVFA.

The UVFA and LVFA occur throughout the valleys in the vicinity of the Facility. The aquifers receive recharge from direct infiltration of precipitation, infiltration from surface water bodies, and from subsurface discharge from adjacent bedrock formations. Groundwater flow in the sand and gravel aquifers is largely controlled by the topography and locations of the major stream drainage systems. Local groundwater flows from the topographic high areas and discharges into the streams in low-lying parts of the valley.

The permeability of the UVFA and LVFA is greater than that of the surrounding bedrock. The bedrock formations act as semi-permeable boundaries. Groundwater generally flows in the direction of the valley and trends either to the northeast or southwest. The ridge composed of sandstone and conglomerate of the Green Pond Conglomerate divides the valley into two parts, and locally acts as a northeast to southwest boundary to groundwater flow.

3.4. SITE-SPECIFIC HYDROGEOLOGY

The site hydrogeology description is based on the results and interpretation of two synoptic DTW monitoring events conducted on August 16 and September 21, 2006.

These synoptic DTW measurement events were conducted in order to calculate groundwater elevations and develop potentiometric surface contour maps and to account for groundwater/surface water interaction. To facilitate the understanding of the groundwater-surface water relationship, 15 staff gauges were installed in the Facility's surface water bodies on August 17, 2006.

DTW measurements were collected from 73 of 75 UVFA monitoring wells/piezometers located throughout the Facility during the August 16, 2006 event. The September 21, 2006 event also collected DTW measurements the 73 monitoring wells/piezometers and also from 15 staff gauges installed on August 17, 2006. DTW could not be collected from two wells, MW-5P and MW-22, due to damage incurred during demolition efforts. Three monitoring wells, OB-3, MW-9P, and MW-10, and two staff gauge elevations, SG-2 and SG-13, were not used on the potentiometric surface maps because of anomalous data that was considered inconsistent with site conditions. Furthermore, OB-3, MW-9P, and MW-10 are historic monitoring wells and information that could have been used to perform a correction of the acquired data (such as construction specifications or a valid survey) could not be located. SG-13 is most likely recharged from surface water runoff/precipitation and may have been isolated from the overall groundwater table because of low precipitation. SG-2 is most likely a perched water body with slow infiltration rates causing it to be either poorly connected or possibly isolated from the groundwater table.

Tables C-8 and C-9 of Volume C-Groundwater present DTW measurements and calculated groundwater elevations. These two tables also include a summary of information regarding the construction of monitoring wells. Figures C-7 and C-8 of Volume C-Groundwater present the groundwater potentiometric surface contour maps for August and September 2006 respectively. Appendix I of Volume C-Groundwater presents the contour map reporting form, required by NJDEP under the TRSR for groundwater contour map submittals.

3.4.1 Facility Groundwater Description and Flow Directions

The UVFA, upper confining unit (lacustrine unit), and bedrock were encountered at the Facility during monitoring well installation. The UVFA is an unconfined, unconsolidated aquifer that averages 50 to 100-ft thick and is composed primarily of an upper outwash unit of sand, gravel, and some silt and clay; groundwater is consistently encountered in this unit between 2 to 34-ft bgs, with an average depth of 8-ft bgs.

The aquifer receives recharge from direct infiltration of precipitation, infiltration from surface water bodies, and from subsurface discharge from adjacent bedrock formations. Groundwater flows from the topographic high areas and discharges into the streams in low-lying parts of the valley. Flow patterns in the UVFA are controlled by the effects of surface-water features, aquifer boundaries, and topography; most groundwater in the UVFA discharges to streams. Figure C-7 of Volume C-Groundwater presents the groundwater potentiometric surface contour map for August 2006. Figure C-8 of Volume C-Groundwater presents the groundwater potentiometric surface contour map for September 2006. Figure C-8 is also presented in Volume A-RI Summary as Figure A-5.

The two topographic ridges bounding the eastern and western portions of the Facility are comprised of bedrock units and act as horizontal no flow boundaries for the unconsolidated aquifer. Groundwater originating or entering the Facility within the unconsolidated aquifer is contained horizontally between these two topographic ridges and groundwater flow trends overall from northeast to southwest.

A groundwater flow divide is present in the vicinity of Duck Pond in Area I. The divide is primarily on the southeastern side of Duck Pond with groundwater flowing to either the southwest, toward Areas II and III, or the southeast, toward MW-10. Groundwater flowing to the southwest migrates through the valley toward Area II (Dynamite). Groundwater in Areas II and III flows gradually through the low lying portions of the Facility and discharges to the unnamed pond in Dynamite, the streams in Miscellaneous/Offsite, or join a regional groundwater flow system south of the Facility. Groundwater flowing to the southeast trends toward MW-10 and MW-OB3D and

ultimately migrates offsite. Groundwater south of Duck Pond generally flows toward the south and southwest. Groundwater north of Duck Pond generally flows from Duck Pond to the north to northeast. Groundwater to the west of Duck Pond generally flows west to east. Groundwater to the east of Duck Pond generally flows east to southeast. This groundwater flow divide may be attributed to the groundwater/surface water interaction between Duck Pond and Shooting Pond and the topographic features of the Facility.

The surface water elevation in Shooting Pond (an artificial man-made water body) is elevated relative to surrounding water bodies, resulting in recharge to groundwater in a radial pattern. Shooting Pond flows into Duck Pond via a small ditch due to its higher surface water elevation. Near Shooting Pond, groundwater flows to the north, due to the higher surface water elevations of Shooting Pond and Duck Pond. To the southeast of Duck Pond, groundwater tends to flow toward the east, due to Duck Pond recharging groundwater and the topography sloping towards MW-10.

The northern portions of the Facility contain remnants of a terminal moraine that creates a region of undulating higher elevations. In the vicinity of SG-1 in Area I (Storage), groundwater flows into the Facility from offsite and moves either southwest towards MW-2 or south toward OB-2. Due to the groundwater divide near Duck Pond, groundwater that is flowing southwest from SG-1 is redirected toward the east, in the direction of MW-OB3D.

3.4.2 Groundwater Utilization

Large groundwater production wells are present regionally in the valley-fill aquifers that are composed of highly porous sand and gravel. Groundwater occurs in these deposits under unconfined conditions throughout large areas, and under confined and semi-confined conditions where bounded by impermeable clays. The aquifers are recharged through infiltration of precipitation, infiltration through surface water and discharge from bedrock groundwater. Yields of large-diameter wells reportedly range from 20 to 2,000 gpm with a median range between 200 to 500 gpm (Roux, 1993).

In the bedrock geologic units, groundwater occurs principally within fractures, bedding planes, and zones of shearing and faulting. The availability of water from wells drilled in these bedrock formations is dependent upon the size and frequency of fractures encountered in any particular well. The yield of large-diameter supply wells located within the bedrock formations in Morris County reportedly range from 4 to 400 gpm with a median range of 25 to 50 gpm (Roux, 1993).

A large regional chlorinated solvent plume is present at the Facility and in the southern portions of the Facility (Miscellaneous/Offsite Area). The primary contaminants include PCE, TCE, and cis-1,2-Dichloroethylene. The chlorinated solvent plume has not been attributed to historic operations performed at the Facility. Private wells are present in the residences in the area where the plume underlies. Residents were informed by NJDEP of the existence of this plume and filters were installed to alleviate the contamination.

3.4.3 Hydraulic Gradient

The average horizontal groundwater hydraulic gradient varies significantly between the higher topography in the vicinities of the Area II (TNT) and Area I (Duck Pond and SG-1) to the flatter portions of the Facility in Area I (Finishing), Area II (Dynamite), and Area III (Maintenance). The hydraulic gradient east of Duck Pond is calculated to be 0.0015 (MW-9 and MW-OB3D). The hydraulic gradient in the vicinity of Duck Pond is 0.0156 (MW-3A and MW-4). The highest hydraulic gradient present at the Facility is in the northern TNT Area, which is calculated to be 0.0432, between MW-47 and MW-43 and is largely attributed to the significant topographic change in this area.

A small change in vertical hydraulic gradient is apparent between the shallow and deep monitoring well clusters. Shallow monitoring wells were installed to a maximum depth of 32-ft bgs and deep monitoring wells were installed to a maximum depth of 64-ft bgs within the UVFA.

Up-gradient areas (topographically high regions) are recharge zones and potentiometric head is higher in the shallow versus deep wells, indicating a downward gradient. This downward gradient is illustrated by well cluster MW-12 and MW-12D. MW-12 and

MW-12D are located in a topographic high, near Duck Pond, and the groundwater elevation in MW-12 is 738.80-ft. mean sea level (MSL) (September 2006) contrasted with the groundwater elevation in MW-12D of 733.85-ft. MSL (September 2006), indicating a downward gradient of 0.097.

Down-gradient areas (topographically low regions) are discharge zones and potentiometric head is lower in the shallow versus deep wells, indicating an upward gradient. This upward gradient is illustrated by well cluster MW-28 and MW-28D. MW-28 and MW-28D are located in a topographic low, in the southern TNT Area, and the groundwater elevation in MW-28D is 720.16-ft. MSL (September 2006) contrasted with the groundwater elevation in MW-28 of 718.07-ft. MSL (September 2006), indicating an upward gradient of 0.068.

The average vertical gradient varies slightly between the topographically high and low regions. All monitoring well clusters were used in order to calculate the average vertical gradient with the exception of MW-7P and MW-7PD. MW-7P is a historic monitoring well and information concerning construction could not be located. For monitoring well clusters that exhibit a downward gradient (topographically high regions), the average downward vertical gradient was calculated to be 0.1595. For monitoring well clusters that exhibit an upward gradient (topographically low regions), the average upward vertical gradient was calculated to be 0.0262.

4.0 DRAINAGE AREA DESCRIPTION

The Facility has a diverse network of surface water drainage systems, which are comprised of both natural and anthropogenic features. To facilitate the site-wide surface water site and remedial investigations, five primary drainage areas were identified and are presented on Figure A-J-5:

- Western Drainage Area;
- Central Drainage Area;
- Eastern Drainage Area;
- Duck Pond and Tributaries Drainage Area; and,

- Miscellaneous Ponds.

Western Drainage Area

The Western Drainage Area originates with two streams flowing into the southwest corner of the Facility (Figure A-J-5). The first stream flows easterly from Howard Boulevard, approximately 300-ft. north of the intersection of Howard Boulevard and Route 46, and is derived from surface water runoff from Howard Boulevard and the adjacent shopping center. The second stream flows north from Route 46 approximately 1,000-ft. east from the intersection of Howard Boulevard and Route 46. These two streams converge within a drainage swale and flow north. The primary channel turns east and is joined by the Central and Eastern Drainage Areas. From the confluence of the Central, Western and Eastern Drainage Areas, the channel flows southward and exits the Facility at Route 46, approximately 300-ft. west of the intersection of Route 46 and Hercules Road. This is the only location where surface water exits the Facility. The channels and the majority of the tributaries of the Western Drainage Area are perennial streams, carrying surface water throughout the year. Only two tributaries in the northwest section of the Western Drainage Area are intermittent and dependent on precipitation events.

Central Drainage Area

The Central Drainage Area is formed by an off-site stream that flows in a generally southerly direction from Howard Boulevard (Figure A-J-5). The stream enters the Facility near the existing Morris County Municipal Utilities Authority (MCMUA) water pump station, flows into the Miscellaneous/Offsite Area and continues through the TNT, PETN, NG, and Dynamite Areas, respectively. Its primary on-site tributary flows from the A-Line Area into the Dynamite Area. Other tributaries consist of smaller streams and former process ditches. Segments of the main stream and tributaries are intermittent and dependent on precipitation events. A weir is located in the southern down-gradient portion of the Dynamite Area adjacent to Patrol Road within this drainage area. The weir restricts the flow of sediment from the former manufacturing operations historically performed up-gradient. The Central Drainage Area converges into the Western and

Eastern Drainage Areas within the Miscellaneous/Offsite Area, in the southern portion of the site. The confluence was used to justify the separation of the Western, Central, and Eastern drainage systems for discussion purposes.

Eastern Drainage Area

The Eastern Drainage Area is formed by an offsite stream that flows onto the Facility south of the New Jersey Transit Railway (located along the northern boundary of the Facility) and just north of the Construction and Demolition (C&D) Landfill (Figure A-J-5). The stream flows southwest through the Development Area to Powder Mill Road, where it is then piped underground along the road, flowing through the Finishing Area in a southerly direction. The pipe crosses under Powder Mill Road, emerging above ground near the wastewater treatment plant, and continues southwest through the Maintenance Area and into the Dynamite Area. Tributaries include former process ditches from the B-Line Area and the Maintenance Area. The main channel is perennial and the tributaries are intermittent. A weir is located in the southern down-gradient portion of the Dynamite Area adjacent to Patrol Road within this drainage area. The weir restricts the flow of sediment from the former manufacturing operations historically performed up-gradient. The Eastern Drainage Area converges into the Western and Central Drainage Areas within the Miscellaneous/Offsite Area, in the southern portion of the site. The confluence was used to justify the separation of the Western, Central, and Eastern drainage systems for discussion purposes.

Duck Pond and Its Tributaries

Duck Pond encompasses nearly 9-acres and is the largest surface water body at the Facility (Figure A-J-5). Duck Pond is a closed system with two inlets and no outlets, and originates within the Facility boundary. One inlet originates near the C&D Landfill and flows east through the Development Area, where it discharges into Duck Pond. The second inlet originates at Shooting Pond and discharges via a small stream to the northeast corner of Duck Pond. Shooting Pond is the deepest surface water body at the Facility, approximately 15-ft. deep in the center. Shooting Pond is secured with a sheet

pile wall along its western shore and is armored along its eastern shore with rip-rap. Duck Pond and Shooting Pond are perennial surface water bodies. The tributaries to Duck Pond and Shooting Pond are seasonally intermittent and can be dry during the summer months.

Miscellaneous Ponds

There are 16 miscellaneous ponds at the Facility; 11 are located in the Storage Area, two in the Development Area, two in the NG Area, and one in the Miscellaneous/Offsite Area (Figure A-J-5). All are labeled miscellaneous because there are no inlets or outlets at any of these ponds. The miscellaneous ponds are seasonally intermittent and can be dry during the summer months.

4.1. SURFACE WATER FEATURE TYPES

Four surface water feature types were identified to be present at the Facility. The surface water feature types include the following:

- Intermittent Streams;
- Ponds;
- Streams; and,
- Wetland Areas.

Many of the drainage systems incorporate combinations of the above listed surface water feature types. However, each drainage system may not possess all of the identified surface water feature types.

4.1.1 Streams

Streams are characterized as channelized bodies of water that flow through the Facility. They are generally less than 5-ft. wide and less than 2-ft. deep. Streams generally are perennial and are dry only during periods of severe drought. The base flow of these surface water bodies originates from groundwater and precipitation.

4.1.2 Intermittent Streams

Intermittent streams are similar to streams except that they are typically smaller and do not contain water throughout the year, a consequence of being primarily influenced by rainfall. Typically, the intermittent streams act as tributaries to the streams during seasonal periods of high precipitation. Many former process ditches are classified as intermittent streams.

4.1.3 Ponds

Ponds are characterized as depressions within the ground surface that retain surface water. The majority of the ponds at the Facility (with the exception of Duck Pond and Shooting Pond) are generally less than 50-ft. in diameter and less than 2-ft. deep. Most of the site ponds fluctuate significantly in water level, due to variations in seasonal precipitation. Duck Pond and Shooting Pond have been historically modified during site development, and are much larger and deeper than the majority of the ponds at the Facility, and warrant their own drainage system as discussed in Section 4.0.

4.1.4 Wetland Areas

Wetland areas of the Facility are typically low lying areas that are frequently saturated and often contain some degree of seasonal surface water. The term wetland areas is not intended to imply delineated wetlands. Delineated wetlands are classified in a letter of interpretation (LOI) approved by NJDEP on June 14, 2002. The LOI was prepared in accordance with N.J.A.C. 7:7A-8.3 and is presented as Appendix C of Volume E-Surface Water.

4.2. SURFACE WATER/GROUNDWATER INTERACTION

Prior to the RI, detailed information did not exist concerning the surface water/groundwater interaction at the Facility. However, staff gauges placed in Duck Pond, Shooting Pond, the unnamed pond within the Dynamite Area, and various streams and Miscellaneous Ponds located throughout the Facility (Figure C-1, Volume C-Groundwater) indicate that groundwater interacts differently with each pond or stream

(Figures C-7 and C-8, Volume C-Groundwater). Duck Pond appears to receive groundwater discharge along its western section and recharges groundwater along its northern, southern, and eastern sections. Shooting Pond appears to recharge groundwater in all directions due to elevated topography. The unnamed pond in the Dynamite Area appears to primarily receive groundwater discharge from the northern, southern and eastern directions. The streams and Miscellaneous Ponds either receive groundwater discharge or recharge groundwater depending on the elevations of surface water and groundwater.

5.0 PREVIOUS INVESTIGATION SUMMARY

This section summarizes the previous investigations conducted at the Facility, including the Preliminary Assessment (PA), the preliminary SI of the TNT Area, site-wide investigation development activities, and the subsequent site-wide SIs.

5.1. PRELIMINARY ASSESSMENT

A PA of the Facility was conducted by Roux in December of 1993. The objective of the PA was to provide background information for the Facility and identify areas of potential concern. The PA activities included file review, aerial photograph review, employee interviews, site inspection and geophysical surveys. A facility-wide grid system was also established during the PA (Section 5.4.3).

The data compiled in the PA Report were reviewed by MWH and utilized to guide the development of the Soils - SI. However, many AOCs have been identified since the PA report was completed and thus were not included in the report, and further developmental efforts were required to fully identify all of the AOCs at the Facility.

5.2. PRELIMINARY SI OF THE TNT AREA

A preliminary SI was conducted by Roux in the TNT Area of the Facility in the fall of 1997. The objective of the Preliminary TNT SI was to maintain the RA schedule compliance and to obtain an initial indication of TNT Area constituents of concern. The activities included sampling a number of AOCs within the TNT Area. The data

generated during the Preliminary TNT - SI was used to modify the Phase I – SSI for the TNT Area. As previously agreed with NJDEP, analytical data for the TNT area was used as part of the Soil – SI to determine AOCs that were suitable to be reserved for the RI.

5.3. FACILITY-WIDE INVESTIGATION DEVELOPMENT ACTIVITIES

Facility-wide investigation development activities were conducted to plan the facility-wide SI efforts in support of ISRA requirement. As a function of the information development process described in the following sections, the number of AOCs increased by approximately 46% over those originally identified and presented in the PA. As agreed with the NJDEP, these additional AOCs, largely comprised of remnant facility structures obscured by structural degradation and/or soil and vegetation overgrowth, were added to the overall facility-wide SI effort.

5.4. HISTORICAL MAP/REVIEW DIGITIZATION

A historic map and document search was conducted in October 1997 wherein 120 maps were identified and selected as representing the most significant sources of land use history information for the Facility. The historic maps were then digitized and the information represented on the maps was used to create the facility-wide base map.

5.4.1 Site Reconnaissance/Survey

Based on the results of the historic map review, a site reconnaissance was conducted in 3rd quarter of 1998. The purpose of the site reconnaissance was to field-verify facility AOCs and to survey their locations using GPS and conventional surveying techniques. Surveyed AOCs were documented via digital photography and log book descriptions, and compiled into a facility information database compatible with NJDEP Geographic Information System (GIS) requirements.

5.4.2 Base Map Development

Following the site reconnaissance, a facility-wide base map was developed. The base map was constructed utilizing the various data sets generated during the previous facility

information development phases. The facility base map was developed in a N.J.A.C. 7:26E-1 et seq. required format and was used to develop figures to present the RI results.

5.4.3 Facility Grid System

An alphanumeric grid system was previously developed for the Facility and was utilized in the SI/RI to aid in site location and sample identification. The grid is a uniform size of 500-ft by 500-ft with alphabetic designations established along the east-west axis and numeric designations established along the north-south axis. The grid node designations were utilized in the alpha-numeric code system in the SI/RI to uniquely identify and locate each sample.

5.5. UNDEVELOPED AREA PRELIMINARY ASSESSMENT/SITE INVESTIGATION (PA/SI)

A PA/SI was conducted in the outlying portions of the Facility that had never been utilized for manufacturing or support activities conducted at the Facility. The objective of the Undeveloped Area PA/SI was to accelerate the ISRA closure process for portions of the site that were not likely to be impacted by historic operations. This investigation utilized both random and biased sampling to identify areas requiring further investigation, and potentially remediation, as described by Technical Requirements. The results of this investigation identified five isolated areas requiring further investigation. Four of the areas are less than 100-square feet (sq. ft.) and one area is approximately 900-sq. ft.

5.6. SITE-WIDE SITE INVESTIGATIONS

The primary objective of the facility-wide media-specific SIs, as described in N.J.A.C. 7:26E-3.3, was to determine on a facility-wide basis, and in a manageable and cost effective manner, if there are any contaminants present within the Facility at concentrations exceeding any of the applicable clean-up standards. Media-specific SIs were performed by MWH from November 1998 to September 2002 (field activities) and were based on the findings of previous investigations and development activities described above in Sections 5.1 through 5.5 above.

5.6.1 Soils-SI

Approximately 5,200 field screening and 1,900 analytical samples were collected during the Soils-SI from approximately 1,200 AOCs. Field soil screening methods were used to bias the collection of analytical samples sent to an independent laboratory for analysis. Screening data was used to evaluate, at a minimum, E&E constituents by colorimetric methods, VOCs utilizing a photoionization/flame ionization detector (PID), and Metals utilizing X-Ray fluorescence (XRF) spectrophotometry. Analytical sample collection was based on screening results, field conditions, or knowledge of history where site screening results were inconclusive. Each soil sample submitted for analytical analyses was analyzed for portions of the PP +40 list.

Analytical results of the soil samples were compared to the NJDEP NJSCC, specifically the RDCSCC, NRDCSCC, and IGWSCC (NJSCC 1999). Key findings are summarized below:

- Beryllium was identified at background concentrations (ranging from 0.64 mg/kg to 2.8 mg/kg) exceeding the RDCSCC. The detection of Beryllium within the range specified above exceeding the RDCSCC represents natural conditions and does not warrant additional investigation;
- The results of the laboratory analysis identified 5 VOCs (Acrylonitrile, Benzene, Chlorobenzene, Methylene Chloride, and TCE), 16 SVOCs (Benzyl Butyl Phthalate, Bis(2-Ethylhexyl)phthalate, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Chrysene, Dibenz(a,h)anthracene, 1,4-Dichlorobenzene, Diethyl Phthalate, Di-n-butyl Phthalate, 2,4-Dinitrophenol, 2,4/2,6-Dinitrotoluene, Indeno(1,2,3-c,d)pyrene, N-Nitrosodiphenylamine, and N-Nitrosodi-n-propylamine), 12 Metal constituents (Antimony, Arsenic, Beryllium, Cadmium, Copper, Lead, Mercury, Nickel, Selenium, Silver, Thallium, and Zinc), 8 E&E constituents (2-Amino-4,6-Dinitrotoluene, 4-Amino-2,6-Dinitrotoluene, 1,3-Dinitrobenzene, 2,4/2,6-Dinitrotoluene, Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine, Nitroglycerin, Hexahydro-1,3,5-Trinitro-1,3,5-Triazine, and 2,4,6-Trinitrotoluene), and Total PCBs as having exceeded the NJSCC at least once at the Facility; and,
- Based on the analytical results compared to the NJSCC, the 1,211 AOCs located at the Facility were placed into two groups; those requiring no further action (NFA) and those requiring further action (FA). The results of the AOC categorization yielded 517 AOCs recommended for NFA and 694 AOCs

requiring FA. Included in the 694 AOCs requiring FA, 34 AOCs were suitable for Single Phase Remediation, 43 AOCs were Reserved for RI, 19 AOCs require confirmation sampling, and one AOC was inadvertently missed during the field investigation. The total number of AOCs investigated, site-wide, during the Soils – SI was 1,211 AOCs.

The Soil-SI report was submitted to the NJDEP in May 2004 and approved in June 2005. The Soils-SI is provided in Appendix A.

5.6.2 GW-SI

A total of 157 groundwater samples were collected from 89 sample locations primarily including temporary points, and to a lesser extent monitoring wells. Each groundwater sample location was biased to the AOC location within each Facility base map grid determined to have the highest soil contamination level based on the results of the Soils-SI. Additionally, groundwater sample locations were placed approximately every 300 linear ft. along the southern boundary of Facility operations in the down-gradient groundwater flow direction to determine if groundwater contaminants were migrating off the facility property. Each groundwater sample submitted for analytical analyses was analyzed for the PP +40 list and general chemistry.

The analytical results of groundwater samples collected during the GW-SI were compared to the NJDEP GWQS (N.J.A.C. 7:9C, January 1993). The samples were divided into shallow (collected 0 – 30-ft. bgs) and deep samples (30 – 50-ft. bgs). Key findings are summarized below:

- Horizontal groundwater flow diverges at the Facility in the region of Duck Pond. North of Duck Pond the groundwater flows to the north. South of Duck Pond the groundwater flows toward the south. The vast majority of the Facility's former manufacturing operations and groundwater sample locations were located south of Duck Pond;
- The results of the laboratory analysis identified 3 VOCs (cis-1,2-Dichloroethylene, PCE, and TCE), 2 SVOCs (Bis(2-ethylhexyl) phthalate and 2,4/2,6-Dinitrotoluene), and 12 Metal constituents (Antimony, Arsenic, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Thallium, and Zinc) at concentrations exceeding the GWQS at least once at the Facility;

- There were no significant site-wide plumes identified;
- The detected concentrations of metal constituents exceeding the GWQS are believed to be attributed to the highly turbid samples collected using Geoprobe™ sampling techniques and it is not likely representative of actual groundwater quality. Additional investigation is required to determine groundwater quality regarding Metal constituents;
- The detected concentrations of PCE, TCE, and cis-1,2-Dichloroethylene exceeding the GWQS in the Miscellaneous/Offsite Area are not attributed to historic facility operations. A large regional chlorinated VOC plume underlies the town Kenvil and the southern portions of the Facility. The chlorinated VOC plume is derived from off-site sources and has not been attributed to historic operations performed at the Facility;
- The detected concentrations of PCE and TCE exceeding the GWQS within the Maintenance, B-Line, Finishing, and Storage Areas are likely a result of historic manufacturing operations. The number of detections and their respective concentrations indicate that the presence of PCE and TCE is a localized situation. Down-gradient groundwater sample analysis determined the PCE and TCE are contained within the former operational areas of the Facility;
- The detected concentrations of Bis(2-ethylhexyl) Phthalate exceeding the GWQS is likely a result of historic manufacturing operations; and,
- NG was not detected at concentrations that would likely indicate the presence of a potential free phase source in the former NG manufacturing/handling areas.

The GW-SI report was submitted to the NJDEP in July 2005 and was approved in August 2005. The GW-SI is provided in Appendix B.

5.6.3 SW/SD-SI

A total of 157 sediment samples and 120 surface water samples were collected at each stream and surface water body with the potential to have been impacted by historic Facility operations. Each surface water and sediment sample submitted for analytical analyses was analyzed for the PP +40 list and general chemistry.

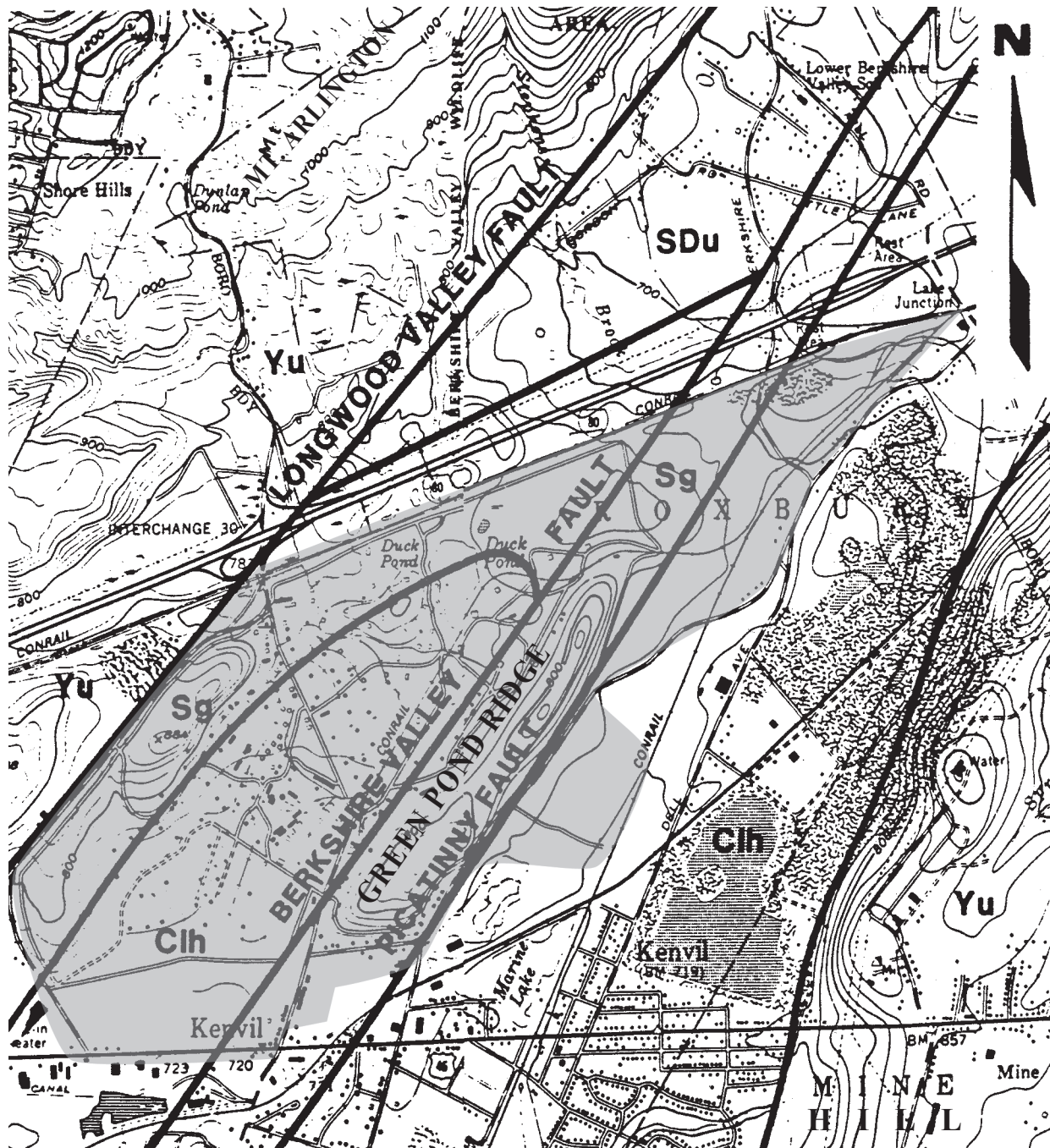
The analytical results were compared to a compilation of criteria, including NJDEP SWQS N.J.A.C. 7:9B (August 2004), USEPA CFR Title 40 Protection of the

Environment Part 131 Water Quality Standards Sub Part D (40 CFR 131.36) Federally Promulgated Water Quality Standards – Toxics Criteria (Surface Water Aquatic Life Evaluation), and NJDEP Sediment Quality Evaluations FSSG LEL and SEL (November 1998). Key findings are summarized below:

- There were no site-related constituents with an established FSSG (LEL or SEL) or SWQC (Human Health) exiting the Facility. Constituents identified in the surface water and sediment samples at concentrations exceeding the FSSG or SWQC (Human Health) adjacent to the only surface water/sediment discharge point (SD/SD-E16-01) are attributed to impacts from Route 46. Similar effects are seen at all the SW/SD inflow points adjacent to roads (Route 46 and Howard Boulevard) and the New Jersey Transit Trail;
- The results of the laboratory analysis of the surface water samples identified 2 VOCs (Bromodichloromethane and PCE), 7 SVOCs (Bis(2-ethylhexyl) phthalate, 2,4-Dinitrotoluene, Benzo(a)pyrene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(g,h,i)perylene), Benzo(k)fluoranthene, and Chrysene), and 8 Metal constituents (Arsenic, Copper, Lead, Mercury, Selenium, Silver, and Zinc) at concentrations exceeding the SWQS at least once at the Facility;
- The results of the laboratory analysis of the sediment samples identified 1 VOC (PCE), 14 SVOCs (Acenaphthene, Acenaphthylene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Chrysene, Dibenze(a,h)anthracene, Fluoranthene, Fluorene, Naphthalene, Phenanthrene, and Pyrene), and 9 Metal constituents (Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Silver, and Zinc) at concentrations exceeding either the LEL or SEL at least once at the Facility;
- The detected concentrations of PCE within the Western Drainage System are not attributed to historic Facility operations. A large regional chlorinated VOC plume underlies the Facility in the region of the Western Drainage System. The chlorinated VOC plume is derived from off-site sources and has not been attributed to historic operations performed at the Facility. The NJDEP conducted a groundwater investigation of the southern portion of the Facility in March 1999 and concluded the Facility was not a source area to the regional plume;
- The detected concentrations of SVOC constituents within the surface water and sediment samples are comprised primarily of PAH constituents. The SVOC PAH constituents are likely associated with the historically common practice of using fly ash as fill material (historic fill) to improve the grade of the Facility and recover unusable land;

- The detected concentrations of total and dissolved Metal constituents are likely associated with the historically common practice of using fly ash as fill material (historic fill) to improve the grade of the Facility and recover unusable land;
- The single detection of Bromodichloromethane is attributed to chlorine treated potable water from a leaking water supply main and is not associated with the former manufacturing processes. Since the time of this investigation, the Facility has dismantled the water distribution system in the Western Drainage Area and further potable water cannot enter the surface water;
- The two detections of Bis(2-ethylhexyl)phthalate present at a concentration exceeding the SWQC (Human Health) within The Central Drainage System and Duck Pond and Tributaries Drainage System are likely a result of historic manufacturing operations; and,
- The single detection of 2,4-Dinitrotoluene present at a concentration exceeding the SWQC (Human Health) within the Central Drainage System is likely a result of historic manufacturing operations.

The SW/SD-SI was submitted to the NJDEP in November 2004 and approved in June 2005. The SW/SD-SI is provided in Appendix C.



LEGEND

SDu	UNDIFFERENTIATED SILURIAN AND DEVONIAN UNITS
Sg	GREEN POND FORMATION
Clh	LEITHSVILLE AND HARDYSTON FORMATION
Yu	PROTEROZOIC BEDROCK UNITS

Shaded Area = Kenvil Works Facility

GEOLOGY ADAPTED FROM HERMAN ET AL (1991)

Source...Modified from: U.S.G.S. Stanhope, NJ, Quadrangle 1954 7.5. Minutes Series (Topographic). Photorevised 1981, and U.S.G.S. Dover, NJ, Quadrangle 1954 7.5 Minute Series (Topographic). Photorevised 1981.

VOLUME A - REMEDIAL INVESTIGATION REPORT SUMMARY
HERCULES INCORPORATED
KENVIL WORKS FACILITY

BEDROCK GEOLOGIC MAP



FIGURE A-J-1



LEGEND

Qtm	TERMINAL MORaine DEPOSITS
Qso	UPPER SAND AND GRAVEL OUTWASH
Sg	GREEN POND FORMATION
Yu	PROTEROZOIC BEDROCK UNITS

Shaded Area = Kenvil Works Facility

GEOLOGY ADAPTED FROM HERMAN ET AL (1991) AND STANFORD (1989)

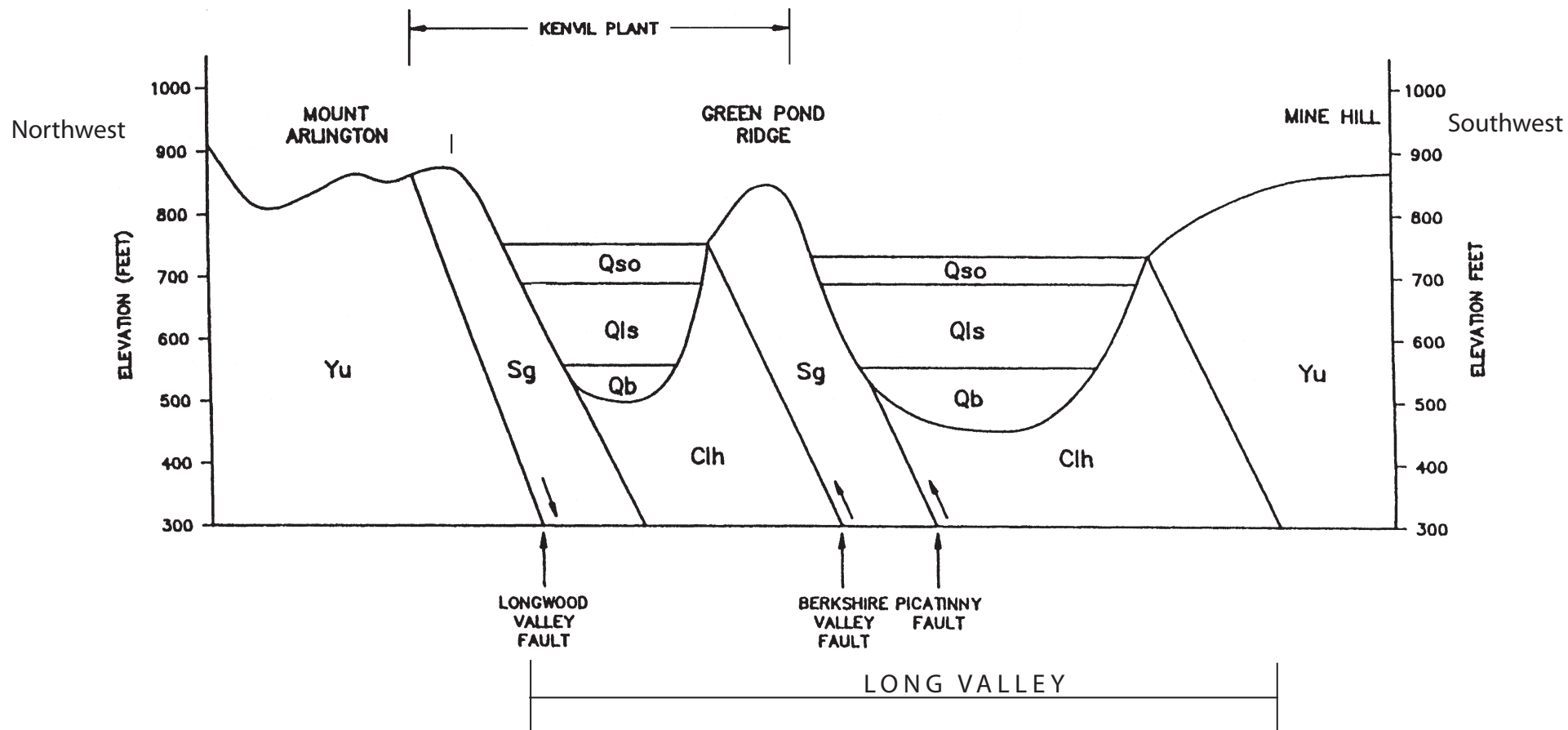
Source...Modified from: U.S.G.S. Stanhope, NJ, Quadrangle 1954 7.5. Minutes Series (Topographic). Photorevised 1981, and U.S.G.S. Dover, NJ, Quadrangle 1954 7.5 Minute Series (Topographic). Photorevised 1981.

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HERCULES INCORPORATED
KENVIL WORKS FACILITY

BEDROCK SURFICIAL GEOLOGIC MAP



FIGURE A-J-2



LEGEND

GLACIAL VALLEY-FILL GEOLOGIC UNITS

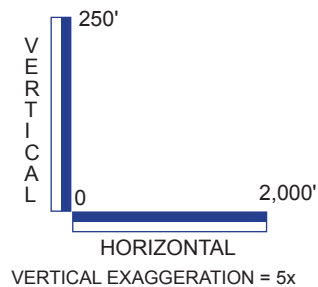
Qso UPPER SAND AND GRAVEL OUTWASH
 Qls MIDDLE LACUSTRINE DEPOSITS
 Qb BASAL SAND AND GRAVEL

BEDROCK GEOLOGIC UNITS

Sg GREEN POND FORMATION
 Clh LEITHSVILLE AND HARDYSTON FORMATIONS
 Yu PROTEROZOIC BEDROCK

GEOLOGY ADAPTED FROM HERMAN ET AL (1991) AND STANFORD (1989)

Source... Modified from: ROUX Associates, Inc.

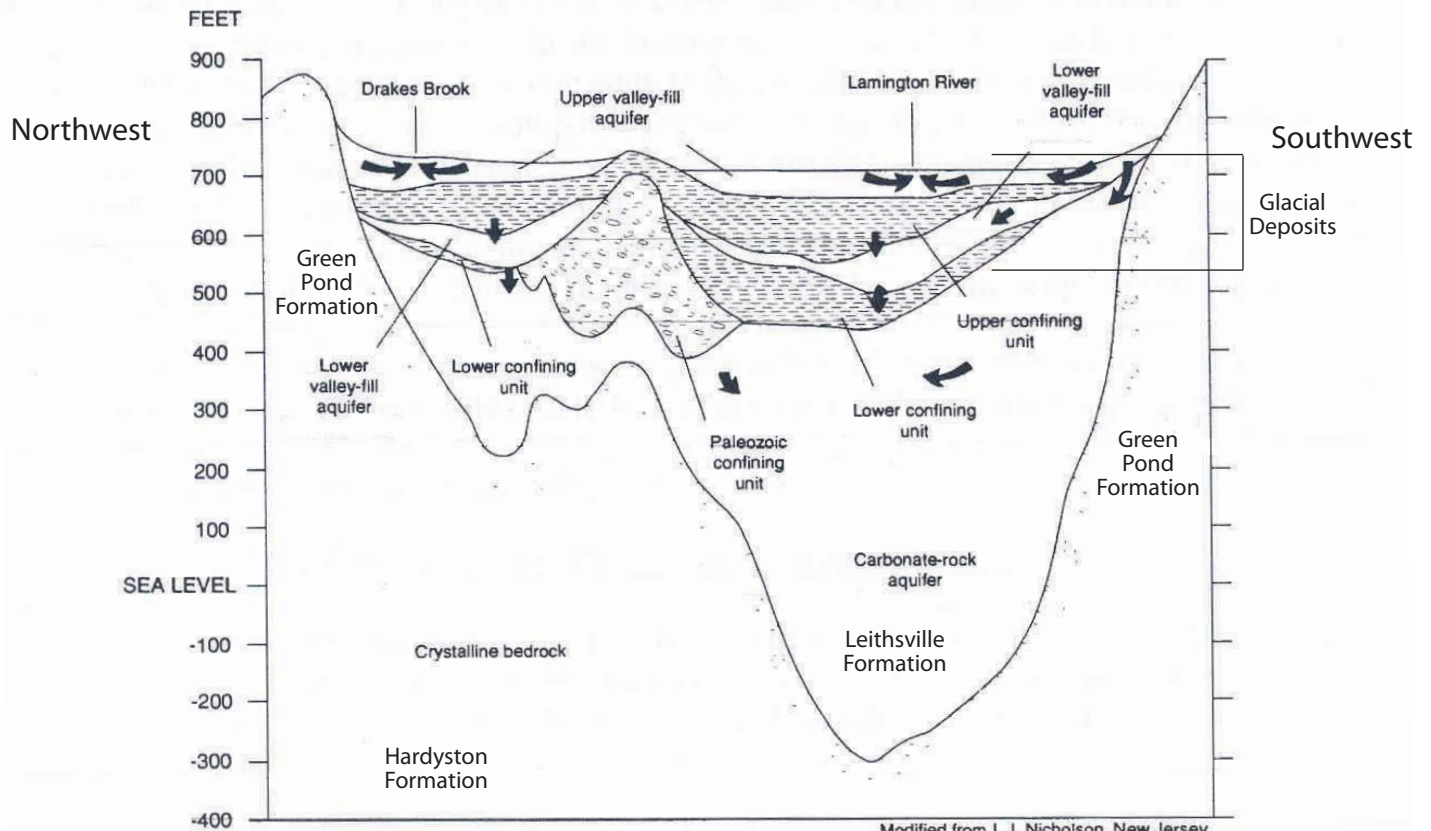


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 HERCULES INCORPORATED
 KENVIL WORKS FACILITY, NEW JERSEY

REGIONAL GEOLOGIC CROSS SECTION



FIGURE A-J-3

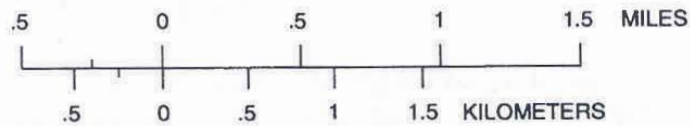


Modified from L.J. Nicholson, New Jersey Geological Survey, written commun., 1990, and Robert Canace, New Jersey Geological Survey, written commun., 1990

EXPLANATION



GENERALIZED DIRECTION OF GROUND-WATER FLOW--Thicknesses of units shown reflect discretized values used in model



Vertical Exaggeration X11

Note: This illustration shows the regional hydrogeologic cross section approximately three miles south of the Kenvil Facility.

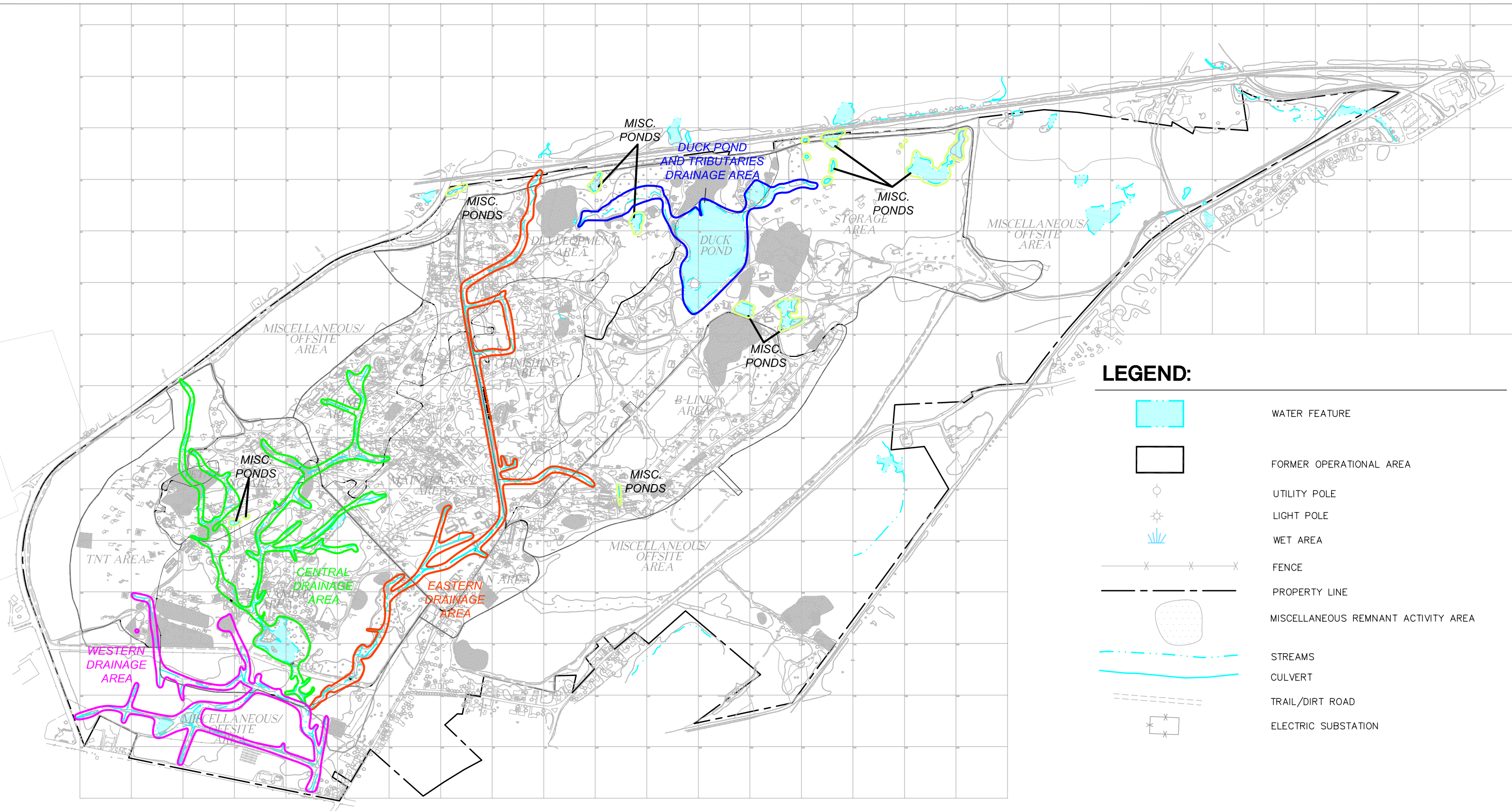
VOLUME A - REMEDIAL INVESTIGATION REPORT SUMMARY
HERCULES INCORPORATED
KENVIL WORKS FACILITY

REGIONAL HYDROGEOLOGIC CROSS SECTION



FIGURE A-J-4

S:\IND PROJECTS\Hercules-1267015\Kenvil\2111224_27_25 Area_L\11_R\15.0 Figures\Vol A\2111365-02.dwg



LEGEND:

	WATER FEATURE
	FORMER OPERATIONAL AREA
	UTILITY POLE
	LIGHT POLE
	WET AREA
	FENCE
	PROPERTY LINE
	MISCELLANEOUS REMNANT ACTIVITY AREA
	STREAMS
	CULVERT
	TRAIL/DIRT ROAD
	ELECTRIC SUBSTATION

SOURCE:

1. SITE RECONNAISSANCE AND GPS SURVEY CONDUCTED BY MWH FROM MARCH TO JUNE 1998. SURVEY CONTROL PROVIDED BY PAUL J. EMILIUS JR., GEOD CORPORATION, N.J. LICENSE NO. 37186.
2. PLANIMETRIC MAP PREPARED BY ATLANTIS AERIAL SURVEY COMPANY, INC. FROM PHOTOGRAPHY DATED 3/18/95. GROUND CONTROL PROVIDED BY EDWARD F. SECCO P.L.S. N.J. LICENSE NO. 18607.
3. KENVIL WORKS FACILITY SITE HISTORICAL MAPS PROVIDED BY HERCULES INCORPORATED.

NOTES:

1. THESE FILES ARE IN THE NORTH AMERICAN DATUM 1983 NEW JERSEY STATE PLANE COORDINATE SYSTEM. THE TOPOGRAPHIC FILE REFERENCES THE NORTH AMERICAN VERTICAL DATUM 1988.
2. THE BOUNDARY LINE AS DELINEATED IS APPROXIMATE AND HAS BEEN DIGITIZED FROM A MAP ENTITLED "HERCULES INCORPORATED, KENVIL PLANT PROPERTY MAP, PLANT 080, ACCOUNT 9500, CLASSIFICATION 21045, FILE CODE 5WE REVISION 1" REVISED TO JUNE 11, 1970 PROVIDED BY REPRESENTATIVES OF HERCULES, INC., AND THE TAX MAP OF THE TOWNSHIP OF ROXBURY AND NOT FROM AN ACTUAL FIELD SURVEY OR WITH THE BENEFIT OF A TITLE SEARCH.



0 250 500 1000
SCALE: FEET
1"=1000'

VOLUME A - REMEDIAL INVESTIGATION REPORT SUMARY HERCULES INCORPORATED KENVIL WORKS FACILITY, NEW JERSEY

SITE WIDE DRAINAGE AREAS



FIGURE A-J-5

Client: Hercules Incorporated Site Name: Kenvil Works Facility Site Location: Kenvil, New Jersey	
Photo Number: 1 Remedial Area: Area I Former Operational Area: Development Comments: Photograph taken from center of Facility Grid F9 facing northeast toward Development Area. Immediate foreground is the approximate center of explosion. Complete destruction of all structures adjacent to the blast area and heavy damage to nearby barricaded structure. Ground surface heavily disturbed by force of explosion and large volume of debris evident.	
Photo Number: 2 Remedial Area: Area III Former Operational Area: A-Line Comments: Photograph taken from Facility Grid G9 facing northwest toward A-Line. Complete destruction of nearly all structures in this section of A-Line. Ground surface heavily disturbed by force of explosion and large volume of debris evident. Shock wave from explosion removed leaves from trees present within the saddle of the ridge west of A-Line.	

Client:	Hercules Incorporated		
Site Name:	Kenvil Works Facility	Site Location:	Kenvil, New Jersey
Photo Number: 3			
Remedial Area: Area II			
Former Operational Area: NG			
Comments: Photograph taken from northwest portion of Facility Grid G10 facing west-southwest toward NG Area. Heavily damaged and destroyed structures evident. Ground surface heavily disturbed by force of explosion and large volume of debris evident.			

Client: Hercules Incorporated	
Site Name: Kenvil Works Facility	Site Location: Kenvil, New Jersey
Photo Number: 1	
Comments: Photograph not taken at Facility, it is intended to illustrate the thermal decontamination process. Structures are filled with combustible materials (i.e., scrap wood) and ignited.	
Photo Number: 2	
Comments: Photograph not taken at Facility, it is intended to illustrate the thermal decontamination process. Personnel in front of the structure are using a fire hose to keep adjacent areas wet to reduce the potential for the fire to spread.	

Client: Hercules Incorporated Site Name: Kenvil Works Facility Site Location: Kenvil, New Jersey	
Photo Number: 3 Comments: Photograph not taken at Facility, it is intended to illustrate the thermal decontamination process. Personnel are using fire hoses to keep the flame from the fire controlled. Puddles of water present in the bottom left section of the photograph illustrate the amount of water used to keep adjacent areas wet to reduce the potential for the fire to spread.	
Photo Number: 4 Comments: Photograph not taken at Facility, it is intended to illustrate the thermal decontamination process. Fire is allowed to burn until as much combustible material is consumed as possible.	

APPENDIX K



April 10, 2007

Mrs. Donna Gaffigan
Bureau of Case Management
New Jersey Department of Environmental Protection
401 East State Street
P.O. Box 028
Trenton, NJ 08625

**RE: USEPA Nitroglycerin Tap Water RBC Typographical Error
Hercules Incorporated Kenvil Works Facility, Kenvil, New Jersey
ISRA Case #: 04632**

Dear Mrs. Gaffigan:

Hercules Incorporated (Hercules) recently discovered the United States Environmental Protection Agency (USEPA) made a typographical error in the October 2006 update to their Risk Based Criterion (RBC) table concerning the reference dose (RfD) for nitroglycerin (NG). The effects of the incorrect RfD caused the USEPA to revise the NG RBC values on December 29, 2006. Specifically, the revised NG Tap Water RBC was reduced from 620 ug/l to 3.7 ug/l.

Hercules used the Tap Water RBC of 620 ug/l for NG as an alternate screening criterion in the Groundwater (GW) Remedial Investigation Report (RIR) which was submitted to the NJDEP on February 26, 2007 prior to discovering the USEPA revised the value. The NG Tap Water RBC was selected to provide a screening level indication for the potential environmental influence of this constituent because there is no NJDEP GW Quality Standard currently established for NG. No other media (soils, surface water, or sediment) are affected by the USEPA revision.

The following table identifies the GW sample locations that based on the USEPA revision detected NG at concentrations exceeding 3.7 ug/l that were not identified in the GW RIR.

Sample Location	Sample Depth (feet below grade)	Detected Concentration
CPT-4	40	130 J
MW-19	13 – 15	210 JB
MW-28D	44.6 – 46.6	330 JB
MW-29D	57 – 59	120 J

J – Estimated value, constituent detected at a concentration above the method detection limit (MDL) but below the limit of quantification (LOQ).

B – Constituent also detected in the associated laboratory blank.

Hercules requests that revisions to the figures and tables presented in the GW RIR be revised to reflect the lower USEPA NG Tap Water RBC of 3.7 ug/l as part of future data collection and reporting activities to be performed in 2007. The additional GW sampling efforts will be focused on providing additional characterization of the E&E plume underlying the southwestern portion of facility where NG has been detected in GW samples at the lower concentrations. The additional GW sampling activities will be discussed with the NJDEP through the continued use of the Triad approach and documented in the future actions portion within Volume A of the RIR.

Please call either myself (610) 594-4306, Jim Bevis (302) 995-3433, or Joe Keller (302) 995-3407 if you have any questions.

Sincerely,

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION



Edward D. Meeks
Project Manager
Energetic Materials Specialist

cc: J. Kealy; NJDEP
M. Romanell, NJDEP
J. Keller; Hercules
J. Bevis; Hercules
A. Mergenthaler, MWH