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FINAL

WORK PLAN

SITES 2, 8, 18 AND SITE SCREENING AREA (SSA) 14 ROUND TWO REMEDIAL INVESTIGATION

NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

CONTRACT TASK ORDER 0363

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Prepared by:

BAKER ENVIRONMENTAL, INC.
Coraopolis, Pennsylvania

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LIST OF ACRONYMS AND ABBREVIATIONS

AET	apparent effects threshold
ASTM	American Society for Testing and Materials
Baker	Baker Environmental, Inc.
bgs	Below Ground Surface
BNA	base/neutral and acid extractable organic compounds
CEC	Cation Exchange Capacity
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP	Contract Laboratory Program
COPC	Chemical of Potential Concern
CTO	Contract Task Order
DCA	Dichloroethane
DCE	1,2-dichloroethene
DDE	1,1-dichloro-2,2-bis(p-chlorophenol)ethylene
DO	Dissolved Oxygen
DoD	Department of Defense
DoN	Department of the Navy
DNT	Dinitrotoluene
Eh	Oxidation-Reduction Potential
EOD	Explosive Ordnance Disposal
ERA	Ecological Risk Assessment
ER-L	Effects Range-Low
ER-M	Effects Range - Median
eV	Electron Volt
FFA	Federal Facility Agreement
FSP	Field Sampling Plan
GW	groundwater
HASP	Health and Safety Plan
HEPA	High Efficiency Particulate Air
HMX	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
HRSD	Hampton Roads Sanitation District
IAS	Initial Assessment Study
IDW	Investigation Derived Waste
IRP	Installation Restoration Program
LANTDIV	Atlantic Division, Naval Facilities Engineering Command
µg/kg	Microgram per Kilogram
µg/L	Microgram per Liter

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued)

mg/kg	Milligram per Kilogram
msl	Mean Sea Level
NEDED	Naval Explosives Development Engineering Department
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NTR	Navy Technical Representative
NTU	Nephelometric Turbidity Units
NWI	National Wetland Inventory
OD	outer diameter
PAH	Polynuclear Aromatic Hydrocarbon
PID	Photoionization Detector
PCB	Polychlorinated Biphenyl
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
QAPP	Quality Assurance Project Plan
RA	Risk Assessment
RAB	Restoration Advisory Board
RBC	Risk-Based Concentration
RCRA	Resource Conservation and Recovery Act
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
RI/FS	Remedial Investigation/Feasibility Study
SD	sediment
SOP	Standard Operating Procedure
SPT	Standard Penetration Test
SSA	Site Screening Area
SVOC	Semivolatile Organic Compound
SW	surface water
TAL	Target Analyte List
TCA	Trichloroethane
TCE	Trichloroethene
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
TNT	Trinitrotoluene
TOC	Total Organic Carbon
TRC	Technical Review Committee

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued)

TSS	Total Suspended Solids
USEPA	United States Environmental Protection Agency
UXO	Unexploded Ordnance
VDEQ	Virginia Department of Environmental Quality
VOC	Volatile Organic Compound
WPNSTA Yorktown	Naval Weapons Station Yorktown, Yorktown, Virginia

EXECUTIVE SUMMARY

INTRODUCTION

This Work Plan presents the scope of activities to be accomplished during the Round Two Remedial Investigation (RI) for Sites 2, 8, 18, and Site Screening Area (SSA) 14 at the Naval Weapons Station Yorktown, Yorktown, Virginia (WPNSTA Yorktown).

During previous investigations under the Department of Defense's (DoD's) Installation Restoration Program (IRP), Sites 2, 8, and SSA 14 had been identified as potentially affecting the environment and, therefore, requiring further evaluation and possible remediation. Based on the results of the Final Round One RI Report, no further action was recommended at Site 18 although additional data will be collected to support this recommendation. The study and evaluation of these sites are being performed under a Federal Facilities Agreement (FFA) with the DoN, the United States Environmental Protection Agency (USEPA) Region III, and the Virginia Department of Environmental Quality (VDEQ).

This site-specific Work Plan is intended for use in conjunction with the Master Project Plans for WPNSTA Yorktown, submitted under a separate cover (Baker, 1994). The Master Project Plans include a Work Plan, Field Sampling Plan (FSP), Quality Assurance Project Plan (QAPP), and Health and Safety Plan (HASP). These plans address the full range of potentially applicable activities that could be required throughout the Remedial Investigation/Feasibility Study (RI/FS) process: field investigative activities; sampling and analytical methodologies; health and safety considerations; data evaluation/methodology interpretation; and other overall project activities. As such, methodology information contained in the Master Project Plans is incorporated by reference in this site-specific Work Plan, as applicable.

This site-specific Work Plan, which includes a HASP Addendum, provides a detailed description of site conditions and the findings of previous investigative work at the sites. This plan also contains the number and types of samples to be collected, the analytical methods, specific sample locations, and the rationale for selecting these environmental media, analyses, and locations. The plan will also establish the schedule for completion of field activities and project management and staffing.

The Round One RI was implemented at WPNSTA Yorktown to determine the extent of contamination at various sites and to address data needs for additional investigations. The sampling and analysis program presented in this Round Two RI/FS Work Plan for Sites 2, 8, 18, and SSA 14 is designed to fill those data gaps identified during the Round One RI conducted in 1992 and 1993 (Baker/WESTON, 1993), or in the case of SSA 14, to provide information on a site screening area (SSA 14 was not investigated under the Round One RI). This site-specific Work Plan is also designed to provide analytical data for use in human health and ecological risk assessments.

Setting

WPNSTA Yorktown is a 10,624 acre installation located on the York-James Peninsula in York and James City Counties and the City of Newport News. The installation is bounded on the northwest by the Naval Supply Center Cheatham Annex, the Virginia Emergency Fuel Farm, and the future community development of Whittaker's Mill; on the northeast by the York River and the Colonial National Historic Parkway; on the southwest by Route 143 and Interstate 64; and on the southeast by Route 238 and the community of Lackey.

Site 2 is a 5-acre landfill located east of Turkey Road in a wetland area adjacent to the southern branch of Felgates Creek (Figure 2-2). Operations at the landfill reportedly began in the 1940s and ceased in 1981. Wastes disposed in this landfill reportedly included mercury and carbon-zinc batteries, tree stumps and limbs, construction rubble, missile hardware (e.g., wings, fins and power packs), electrical devices, and unidentified drums and/or tanks. Waste quantities have been estimated at 240 tons during the period of use. Hard waste material (mine casings) is primarily located along the tributaries to the southern branch of Felgates Creek. A removal of hard waste material was conducted during the summer of 1994 at Site 2.

Site 8 is a 300-foot drainage way located along the eastern branch of Felgates Creek, approximately 1.5 miles from the confluence of the creek and the York River. This area received wastewater from the Naval Explosives Development Engineering Department (NEDED) complex (Building 456) from 1940 to 1975. The wastewater reportedly contained unspecified solvents, spent/neutralized acids, and nitramine compounds. In 1975, a carbon adsorption tower was installed to treat the contaminated wastewater prior to discharge into the drainage area. A National Pollutant Discharge Elimination System (NPDES) permit was granted by USEPA Region III to allow this discharge. In

1986, the effluent from the tower was diverted to the sanitary sewer and ultimately to Hampton Roads Sanitation District (HRSD). Currently, the site has reverted to a natural drainage area.

Site 18 is a one-quarter mile long, drainage ditch located north of Building 476 in the southeastern area of the installation along a small tributary leading to Lee Pond. This area was in use for approximately 20 years from the 1940s to the 1960s. The discharge into the area reportedly contained battery acid waste, consisting of hydrochloric acid or calcium hydroxide and dissolved metals such as lead, cadmium, nickel, and antimony. An estimated 100 to 200 pounds of metals may have been discharged. Battery acid waste no longer discharges from Building 476 into this drainage way.

SSA 14 occupies an area of approximately 0.4 acres, and is located outside of Building 537 upstream of Site 8 (NEDED Explosives-Contaminated Wastewater Discharge Area) in the north central portion of the facility. This SSA consists of a pipe leading from the building, through which nitramine-contaminated wastewater was reportedly discharged to Felgates Creek.

Results of Previous Investigations

Previous investigation reports completed through the IRP for Sites 2, 8, and 18, and SSA 14 include the following:

- Initial Assessment Study (IAS) (C. C. Johnson & Associates, Inc. and CH2M Hill, 1984)
- Confirmation Study Rounds One and Two Reports (Dames & Moore, 1986 and Dames & Moore, 1988)
- RI Interim Report (Versar, 1991)
- Focused Biological Sampling and Preliminary Risk Evaluation Report (Baker/Weston, 1993b)
- Round One RI Report (Baker/Weston, 1993a)

- Habitat Evaluation Report (Baker, 1995b)

- Final Closeout Report, Sites 2, 9, and SSA 4 - Mine Casing and Debris Removal Action (IT, 1995)

- Relative Risk Ranking System Data Collection Investigation - SSAs 9, 10, and 14 (Baker, 1995c)

These reports have been generated in conjunction with the continuing development of the DoD IRP. Summaries of previous investigations are provided in the following subsections.

TECHNICAL APPROACH

Site 2 - Turkey Road Landfill

Ten soil borings will be advanced at the site and numbered 2SB05 through 2SB14. The boring locations have been selected to determine the vertical extent of contaminants (SVOCs, Aroclor-1254) detected in the confirmation samples collected during the removal action. Three of the soil borings (2SB05, 2SB06, and 2SB07) will be converted to monitoring wells to replace 2GW02, 2GW03 and 2GW04 (which are currently under water and will be abandoned).

Two subsurface soil samples will be collected from each of the ten borings; one subsurface soil sample will be collected from just above the water table and a second subsurface soil sample will be collected from within the zone of apparent contamination (typically from the area with the highest PID reading, odor, or visible evidence of contamination), for a total of 20 environmental subsurface soil samples. In addition, one sample will be collected within the aquifer material at one location. This sample (along with one collected above the water table) will be analyzed for grain size (sieve hydrometer), bulk density, and cation exchange capacity to obtain information on the migration potential of contaminants at the site.

Subsurface soil samples collected at Site 2 that are submitted to the laboratory will be analyzed for Target Compound List (TCL) VOCs, SVOCs, nitramine compounds, pesticides/PCBs, and Target Analyte List (TAL) inorganics, total organic carbon (TOC), and nitrate/nitrite. A summary of the

number of samples to be collected (including QA/QC samples) and the analytical parameters is presented, by media, in Tables ES-1 and ES-2.

One round of groundwater samples will be collected from the newly installed and currently existing wells at Site 2 for a total of four environmental samples. Prior to groundwater sampling, three to five well volumes will be purged from each well. Purging will be accomplished in the shallow wells using low flow pumps. The main purpose of the low-flow purging technique is to reduce turbidity (i.e., suspended sediment/soil particles) in the groundwater samples. Turbidity in groundwater samples may result in higher inorganic concentrations.

Groundwater samples will be analyzed for TCL organics, TAL inorganics (unfiltered and filtered), TOC, nitrate/nitrite, total dissolved solids (TDS), total suspended solids (TSS), bromide, chloride, orthophosphorous, sulfate, and dissolved methane. These parameters have been selected based on the results of the Round One RI and removal action data. Tables ES-1 and ES-2 summarize the environmental samples (and QA/QC samples) to be collected and the analytical parameters for these samples.

Surface water and sediment investigations will be conducted along the unnamed drainage ways that border Site 2. Data from these studies will be used to assess potential impacts to the environment from Site 2 and will be used in conjunction with the biota data in the ERA.

Nine surface water/sediment sampling stations have been identified to characterize the drainage ways that border Site 2. Sample locations 2SW/SD01, 2SW/SD02, and 2SW/SD03 will address conditions in the drainage area downstream of the site. Sample locations 2SW/SD04, 2SW/SD05, 2SW/SD06, and 2SW/SD07 will address conditions in the drainage ways adjacent to the site. Sample locations 2SW/SD08 and 2SW/SD09 will address conditions in the drainage ways upstream of, and presumably unaffected by Site 2. The results from the Round Two RI will be compared to ecologically similar background areas (Baker, 1994)

In addition, three sediment samples will be collected in the wetland to evaluate potential impacts to this area. These three samples will be designated 2SD10, 2SD11, and 2SD12.

At each of the nine surface water locations mentioned above, a surface (0- to 4-inches) and a subsurface (4- to 8-inches) sediment sample will be collected, for a total of eighteen samples. The methods of collection are described in Section 3.7.2 of the Master FSP (Baker, 1994).

All surface water and sediment samples will be analyzed for TCL organics, nitramine compounds, TAL inorganics, TOC, nitrate/nitrite, grain size (sediment only), and pH (sediment pH shall be measured in the laboratory with surface water pH measured in the field). These analyses were selected to meet the needs of the ERA. In addition, analyses for temperature, dissolved oxygen, salinity, and specific conductivity will be performed on surface water samples in the field. The procedures for performing these measurements can be found in the "On-site Water Quality Testing" SOP in Appendix A, Section F201 of the Master Project Plans (Baker, 1994). Tables ES-1 and ES-2 summarize the environmental samples (and QA/QC samples) to be collected and the analytical parameters for these samples.

An aquatic ecological investigation will be conducted at each of the nine surface water/sediment locations. These studies will be used to assess potential ecological impacts to benthic macroinvertebrate and fish populations, if present in Felgates Creek. Site-specific considerations were incorporated into the overall sample station selection process.

Benthic macroinvertebrate samples will be collected from midstream sampling points of the water body at each station. Three replicate samples will be collected with a standard Ponar grab sampler. These samples will be archived for future taxonomic analysis; if required, results will be used to calculate species density and diversity. For surveying the fish populations, the upstream portion of the drainage way will be sampled with gill nets, trot lines, hoop nets, or haul seines depending on site-specific conditions.

Representative fish samples will be collected and frozen (and stored) from each of the surface water/sediment locations. If contaminants are detected within the surface water/sediment samples the fish sample associated with the surface water/sediment location will be analyzed for the specific contaminants (i.e., TCL organics, or TAL inorganics) detected at the location. Further details of the sample collection techniques are found in Section 3.18 of the Master FSP.

East Branch of Felgates Creek (Site 8 and SSA 14)

Site 8 and SSA 14 are both located along the East Branch of Felgates Creek. SSA 14 is located approximately 800 feet upstream of Site 8. Due to their proximity, the surface water/sediment and aquatic ecological investigations for these sites will be combined. For example, one sampling station located between the two sites could serve as both an upstream sampling station for Site 8 and as a downstream sampling station for SSA 14.

Six surface water/sediment sampling stations have been identified to characterize the East Branch of Felgates Creek in this area. Sample locations will address the following conditions:

A14SW/SD01	-	upstream of SSA 14
A14SW/SD02	-	adjacent to SSA 14
A14SW/SD03/ 8SW/SD01	-	downstream of SSA 14 and upstream of Site 8
8SW/SD02	-	adjacent to Site 8
8SW/SD03	-	downstream of Site 8

The results from the Round Two RI will be compared to ecologically similar background study areas (Baker, 1994).

At each of the six surface water locations mentioned above, a surface (0- to 4- inches) and a subsurface (4- to 8- inches) sediment sample will be collected, for a total of fourteen samples. The methods of collected are described in Section 3.7.2 of the Master FSP (Baker, 1994).

All surface water and sediment samples will be analyzed for TCL organics, nitramine compounds, TAL inorganics, TOC, nitrate/nitrite, grain size (sediment only), and pH (sediment pH will be measured in the laboratory with surface water pH measured in the field). These analyses were selected to meet the needs of the ERA. In addition, analyses for temperature, dissolved oxygen, salinity, and specific conductivity will be performed on surface water samples in the field. The procedures for performing these measurements can be found in the "On-site Water Quality Testing" SOP in Appendix A, Section F201 of the Master Project Plans (Baker, 1994). Tables ES-3 and ES-4

summarize the environmental samples to be collected and the analytical parameters for these samples.

Aquatic Ecological Investigation

An aquatic ecological investigation will be conducted at each of the six surface water/sediment locations. These studies will be used to assess potential ecological impacts to benthic macroinvertebrate and fish populations, if present in the East Branch of Felgates Creek. Site-specific considerations were incorporated into the overall sample station selection process.

Benthic macroinvertebrate samples will be collected from midstream sampling points of the water body at each station. Three replicate samples will be collected with a standard Ponar grab sampler. These samples will be archived for future taxonomic analysis; if required, results will be used to calculate species density and diversity. For surveying the fish populations, the upstream portion of the drainage way will be sampled with gill nets, trot lines, hoop nets, or haul seines depending on site-specific conditions.

Representative fish samples will be collected and frozen (and stored) from each of the surface water/sediment locations. If contaminants are detected within the surface water/sediment samples the fish sample associated with the surface water/sediment location may be analyzed for the specific contaminants (i.e., TCL organics or TAL inorganics) detected at the location. Further details of the sample collection techniques are found in Section 3.18 of the Master FSP.

Site 8 - NEDED Explosives - Contaminated Wastewater Discharge Area

The soil investigation for Site 8 will include the collection of 9 surface and 18 subsurface soil samples. Surface soil samples will be collected at the soil boring locations in accordance with the methods presented in Section 3.8 of the Master FSP (Baker, 1994). Subsurface soil samples will be collected during soil boring and monitoring well installations.

Ten soil borings will be advanced at the site and numbered 8SB01 through 8SB09 for the shallow soil borings and 8SB01A for the deep boring. Three of the soil borings, 8SB01, 8SB02, and 8SB03,

will be converted to shallow monitoring wells. One boring, 8SB01A, will be converted into a deep monitoring well and the remaining six will be grouted to surface grade upon completion.

The soil borings and monitoring wells will be installed at Site 8 to address the following:

8SB04 through 8SB09 (soil borings)	- Delineate horizontal and vertical extent of soil contamination within the drainage area.
8GW01, 8GW02, and 8GW03 (shallow wells)	- Delineate the horizontal extent of groundwater contaminants detected in Round One RI HydroPunch™ sample. It is anticipated that these wells will be installed in the Cornwallis Cave aquifer.
8GW01D (deep well)	- Delineate the vertical extent of groundwater contaminants detected in Round One RI HydroPunch™ sample. It is anticipated that this well will be installed in the Yorktown/Eastover aquifer.

Two subsurface soil samples will be collected from each of the 10 borings; one subsurface soil sample will be collected from just above the water table and one subsurface soil sample will be collected from within the zone of apparent contamination (typically from the area with the highest PID reading, odor, or visible evidence of contamination), for a total of 18 environmental subsurface soil samples (subsurface soil samples will not be collected from the deep monitoring well boring). In addition, one sample will be collected within the aquifer material at one location. This sample (along with one collected above the water table) will be analyzed for grain size (sieve hydrometer), bulk density, and cation exchange capacity to obtain information on the migration potential of contaminants at the site.

Based on the results of the Round One RI, the soil samples will be analyzed for TCL VOCs (excluding surface soil), TCL SVOCs, TCL pesticides/PCBs, nitramine compounds, TAL inorganics, TOC, and nitrate/nitrite. A summary of the number of samples to be collected (including QA/QC samples) and the analytical parameters is presented, by media, in Tables ES-5 and ES-6.

Three shallow monitoring wells (8GW01, 8GW02, and 8GW03) will be installed at the site to aid in defining the horizontal extent of groundwater contamination and to obtain data pertinent to the site hydrogeology (i.e., groundwater flow direction). One deep monitoring well (8GW01A) will also be installed at Site 8 to evaluate the vertical extent of contamination.

One round of groundwater samples will be collected from the newly installed monitoring wells at Site 8, for a total of four environmental samples. Prior to groundwater sampling, three to five well volumes will be purged from each well. Purging will be accomplished in the shallow wells using low flow pumps; for the deep well, a Wattera Pump will be used. The main purpose of the low-flow purging technique is to reduce turbidity (i.e., suspended sediment/soil particles) in the groundwater samples. Turbidity in groundwater samples may result in higher inorganic concentrations.

Groundwater samples will be analyzed for TCL organics, TAL inorganics (total and dissolved), TOC, nitrate/nitrite, TDS, TSS, bromide, chloride, orthophosphorous, sulfate, and dissolved methane. These parameters have been selected based on the results of the Round One RI. Tables ES-5 and ES-6 summarize the environmental samples (and QA/QC samples) to be collected and the analytical parameters for these samples.

Site 18 - Building 476 Discharge Area

Based on the results and recommendations of the Final Round One RI Report, a No Further Remedial Action Plan (NFRAP) and No-Action Record of Decision (ROD) will be prepared to document that no further or remedial actions are required at this site. Additional data will be collected to support this action.

The soil investigation for Site 18 will include the collection of both surface and subsurface soil samples. Surface soil samples will be collected in accordance with methods presented in Section 3.8 of the Master FSP (Baker, 1994). Subsurface soil samples will be collected during soil boring installations.

Three surface soil samples will be collected at soil boring locations and three surface soil samples will be collected in the swale area. The six surface soil samples will be labeled 18SS11 through

18SS16. The numbering scheme was developed to follow the Round One RI samples which ended with the designation 18SS10.

The Round Two RI surface soil samples will be collected for two primary reasons: to obtain surface soil information to be used in the baseline RA and ERA and to support the recommendation of the Round One RI that no further remedial action be conducted at the site. A summary of the number of samples to be collected (including QA/QC samples) and the analytical parameters is presented, by medium, in Tables ES-7 and ES-8.

Three soil borings will be advanced at the site and numbered 18SB01 through 18SB03. The soil boring locations have been selected to determine the horizontal and vertical extent of the soil contamination within the drainage area. The soil borings (18SB01, 18SB02, 18SB03) will be converted to shallow monitoring wells (18GW01, 18GW02, 18GW03).

Two subsurface soil samples will be collected from each of the three soil borings; one subsurface soil sample will be collected from just above the water table and a second subsurface soil sample will be collected from within the area of apparent contamination (typically from the area with the highest PID reading, odor, or visible evidence of contamination), for a total of six environmental subsurface soil samples. If no contamination is apparent, the second sample will be collected from a mid-point in the soil boring. In addition, one sample will be collected within the aquifer material at one location. This sample (along with one collected above the water table) will be analyzed for grain size (sieve/hydrometer), bulk density, and CEC to obtain information on the migration potential of contaminants at the site.

Subsurface soil samples collected at Site 18 that are submitted to the laboratory will be analyzed for TCL inorganics, nitramine compounds, TAL inorganics, TOC, and nitrate/nitrite. A summary of the number of samples to be collected (including QA/QC samples) and the analytical parameters is presented, by medium, in Table ES-7 and ES-8.

Three shallow monitoring wells (18GW01, 18GW02, 18GW03) will be installed at the site to evaluate whether groundwater quality has been impacted by former site operations and to obtain data pertinent to the site hydrogeology (i.e., groundwater flow direction). It is anticipated that these monitoring wells will be installed in the Cornwallis Cave aquifer.

One round of groundwater samples will be collected from the newly installed monitoring wells at Site 18 for a total of three environmental samples. Prior to groundwater sampling, three to five well volumes will be purged from the well. Purging will be accomplished using low flow pumps. The main purpose of the low-flow purging technique is to reduce turbidity (i.e., suspended sediment/soil particles) in the groundwater samples. Turbidity in groundwater samples may result in higher inorganic concentrations.

Groundwater samples will be analyzed for TCL organics and TAL inorganics (total and dissolved), TOC, nitrate/nitrite, TDS, TSS, bromide, chloride, orthophosphorous, sulfate, and dissolved methane. These parameters have been selected based on the results of the Round One RI. Tables ES-7 and ES-8 summarize the environmental samples (and QA/QC samples) to be collected and the analytical parameters for these samples.

Surface water and sediment investigations will be conducted at Site 18 Data from these studies will be used to assess potential impacts to the environment from Site 18 and will be used in the ERA.

Four surface water/sediment sampling stations have been identified to characterize the downstream of Site 18. At each of the four surface water locations mentioned above, a surface (0- to 4-inch) and a subsurface (4- to 8-inch) sediment sample will be collected for a total of eight samples. All surface water and sediment samples will be analyzed for TCL organics, nitramine compounds, TAL inorganics, TOC, nitrate/nitrite, grain size (sediment only), and pH (sediment pH shall be measured in the laboratory).

SSA 14 - Building 537 Discharge to Felgates Creek

The soil investigation for SSA 14 will include the collection of both surface and subsurface soil samples. Surface soil samples will be collected in accordance with methods presented in Section 3.8 of the Master FSP (Baker, 1994). Subsurface soil samples will be collected from soil borings.

Four surface soil samples will be collected at the soil boring locations from the 0- to 6- inch bgs interval and analyzed for TCL SVOCs, TCL pesticides/PCBs, nitramine compounds, TAL inorganics, TOC, pH, and nitrate/nitrite.

Four subsurface soil borings will be advanced at SSA 14 for the collection of subsurface soil samples. One monitoring well will be installed at SSA 14; however, subsurface soil samples will not be collected during installation. The soil borings are located at the end of the discharge pipe, on the stream bank of Felgates Creek. It is unlikely that a drilling rig will gain access to this area. The soil borings will therefore be advanced using hand augering techniques, as described in Section 3.9 of the Master FSP.

Two subsurface soil samples will be collected from each of these four borings; one subsurface soil sample will be collected from just above the water table and a second subsurface soil sample will be collected from within the area of apparent contamination (typically from the area with the highest PID reading, odor, or visible evidence of contamination), for a total of eight environmental subsurface soil samples.

Based on the results of the Relative Risk Ranking Data Collection Investigation soil samples will be analyzed for TCL VOCs (excluding surface soil), TCL SVOCs, TCL pesticides/PCBs, nitramine compounds, TAL inorganics, TOC, and nitrate/nitrite. A summary of the number of samples to be collected (including QA/QC samples) and the analytical parameters is presented, by medium, in Tables ES-9 and ES-10.

One shallow monitoring well (A14GW01) will be installed in the middle of the site to evaluate whether groundwater quality has been impacted by former site operations. It is anticipated that this well will be installed in the Cornwallis Cave aquifer. The data from the proposed monitoring well will be used in conjunction with the monitoring wells at Site 8 to form a groundwater monitoring well network for evaluating the nature and extent of groundwater contamination in this vicinity.

One round of groundwater samples will be collected from the newly installed monitoring well at SSA 14. Prior to groundwater sampling, three to five well volumes will be purged from the well. Purging will be accomplished using low flow pumps. The main purpose of the low-flow purging

technique is to reduce turbidity (i.e., suspended sediment/soil particles) in the groundwater samples. Turbidity in groundwater samples may result in higher inorganic concentrations.

Groundwater samples will be analyzed for TCL organics, TAL inorganics (total and dissolved), TOC, nitrate/nitrite, TDS, TSS, bromide, chloride, orthophosphorous, sulfate, and dissolved methane. These parameters have been selected based on the results of the Relative Risk Ranking Data Collection Investigation. Tables ES-9 and ES-10 summarize the environmental samples (and QA/QC samples) to be collected and the analytical parameters for these samples.

SUMMARY OF ANALYSES
SITE 2
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Medium	Sample ID	TCL Organics				TAL Inorganics		TOC	Nitrate/ Nitrite	Other	QA/QC Samples	
		TCL VOCs	TCL SVOCs	TCL Pesticides/ PCBs	Nitramines/ Nitroaromatics	Total[1]	Dissolved				Duplicate	MS/MSD
Subsurface Soil	2SB01-XX	X	X	X	X	X		X	X	pH		
	2SB01-YY	X	X	X	X	X		X	X	pH		
	2SB02-XX	X	X	X	X	X		X	X	pH		
	2SB02-YY	X	X	X	X	X		X	X	pH		
	2SB03-XX	X	X	X	X	X		X	X	pH		
	2SB03-YY	X	X	X	X	X		X	X	pH		
	2SB04-XX	X	X	X	X	X		X	X	pH		
	2SB04-YY	X	X	X	X	X		X	X	pH		
	2SB05-XX	X	X	X	X	X		X	X	pH	X	X
	2SB05-YY	X	X	X	X	X		X	X	pH		
	2SB06-XX	X	X	X	X	X		X	X	pH		
	2SB06-YY	X	X	X	X	X		X	X	pH		
	2SB07-XX	X	X	X	X	X		X	X	pH		
	2SB07-YY	X	X	X	X	X		X	X	pH		
	2SB08-XX	X	X	X	X	X		X	X	pH		
	2SB08-YY	X	X	X	X	X		X	X	pH		
	2SB09-XX	X	X	X	X	X		X	X	pH		
	2SB09-YY	X	X	X	X	X		X	X	pH[2], GS, BD, CEC		

ES-1 (Continued)

SUMMARY OF ANALYSES
SITE 2
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Medium	Sample ID	TCL Organics				TAL Inorganics		TOC	Nitrate/ Nitrite	Other	QA/QC Samples	
		TCL VOCs	TCL SVOCs	TCL Pesticides/ PCBs	Nitramines/ Nitroaromatics	Total[1]	Dissolved				Duplicate	MS/MSD
Subsurface Soil (continued)	2SB09-ZZ							X	X	GS, BD, CEC, pH		
	2SB10-XX	X	X	X	X	X		X	X	pH		
	2SB10-YY	X	X	X	X	X		X	X	pH, CEC, BD, GS	X	
	2SB10-ZZ							X	X	GS, BD, CEC, pH		
Groundwater	2GW01-001	X	X	X	X	X	X	X	X	TDS, TSS, BCPSM		
	2GW05-001	X	X	X	X	X	X	X	X	TDS, TSS, BCPSM		
	2GW06-001	X	X	X	X	X	X	X	X	TDS, TSS, BCPSM	X	X
	2GW07-001	X	X	X	X	X	X	X	X	TDS, TSS, BCPSM		
Surface Water	2SW01-01	X	X	X	X	X	X	X	X			
	2SW02-01	X	X	X	X	X	X	X	X			
	2SW03-01	X	X	X	X	X	X	X	X			
	2SW04-01	X	X	X	X	X	X	X	X		X	X
	2SW05-01	X	X	X	X	X	X	X	X			
	2SW06-01	X	X	X	X	X	X	X	X			
	2SW07-01	X	X	X	X	X	X	X	X			
	2SW08-01	X	X	X	X	X	X	X	X			
	2SW09-01	X	X	X	X	X	X	X	X			

ES-1 (Continued)

SUMMARY OF ANALYSES
SITE 2
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Medium	Sample ID	TCL Organics				TAL Inorganics		TOC	Nitrate/ Nitrite	Other	QA/QC Samples	
		TCL VOCs	TCL SVOCs	TCL Pesticides/ PCBs	Nitramines/ Nitroaromatics	Total[1]	Dissolved				Duplicate	MS/MSD
Sediment	2SD01-01	X	X	X	X	X		X	X	GS, pH		
	2SD01-02	X	X	X	X	X		X	X	GS, pH		
	2SD02-01	X	X	X	X	X		X	X	GS, pH		
	2SD02-02	X	X	X	X	X		X	X	GS, pH		
	2SD03-01	X	X	X	X	X		X	X	GS, pH		
	2SD03-02	X	X	X	X	X		X	X	GS, pH		
	2SD04-01	X	X	X	X	X		X	X	GS, pH		
	2SD04-02	X	X	X	X	X		X	X	GS, pH		
	2SD05-01	X	X	X	X	X		X	X	GS, pH	X	X
	2SD05-02	X	X	X	X	X		X	X	GS, pH		
	2SD06-01	X	X	X	X	X		X	X	GS, pH		
	2SD06-02	X	X	X	X	X		X	X	GS, pH		
	2SD07-01	X	X	X	X	X		X	X	GS, pH		
	2SD07-02	X	X	X	X	X		X	X	GS, pH		
	2SD08-01	X	X	X	X	X		X	X	GS, pH		
	2SD08-02	X	X	X	X	X		X	X	GS, pH		
	2SD09-01	X	X	X	X	X		X	X	GS, pH		
	2SD09-02	X	X	X	X	X		X	X	GS, pH	X	
	2SD10-10	X	X	X	X	X		X	X	GS, pH		

ES-1 (Continued)

SUMMARY OF ANALYSES
SITE 2
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Medium	Sample ID	TCL Organics				TAL Inorganics		TOC	Nitrate/ Nitrite	Other	QA/QC Samples	
		TCL VOCs	TCL SVOCs	TCL Pesticides/ PCBs	Nitramines/ Nitroaromatics	Total[1]	Dissolved				Duplicate	MS/MSD
Sediment (continued)	2SD10-02	X	X	X	X	X		X	X	GS, pH	X	X
	2SD11-01	X	X	X	X	X		X	X	GS, pH		
	2SD11-02	X	X	X	X	X		X	X	GS, pH		
	2SD12-01	X	X	X	X	X		X	X	GS, pH		
	2SD12-02	X	X	X	X	X		X	X	GS, pH		

Notes:

(1) Total TAL inorganics includes cyanide
(2) CEC, TOC, Nitrate/Nitrite, Grain Size, and Bulk Density should be analyzed in subsurface soil just above the water table and in each aquifer encountered.

CEC = Cation Exchange Capacity
BD = Bulk Density
GS = Grain Size
BCPSM = Bromide, Chloride, Orthophosphorous, Sulfate, Dissolved Methane
TDS = Total Dissolved Solids
TSS = Total Suspended Solids

SUMMARY OF ENVIRONMENTAL AND QUALITY CONTROL SAMPLES AND ANALYTICAL PARAMETERS
SITE 2
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Sample Type	Number of Environmental Samples	Analytical Parameters	Number of Duplicates	Number of MS/MSDs	Number of Trip Blanks	Number of Rinsate Blanks
Subsurface Soil (soil borings)	20	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics, Cyanide, TOC, Nitrate/Nitrite, CEC(1), BD(1), GS(1), pH	2	1	5	5
Monitoring Wells - Groundwater(2)(3)	4	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics (total and dissolved), Cyanide, TOC, Nitrate/Nitrite, TDS/TSS, BCPSM	1	1	1	1
Surface Water(4)(5)	9	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics (total and dissolved), Cyanide, TOC, Nitrate/Nitrite	1	1	1	1
Sediment (18 associated with surface water)	24(6)	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics, Cyanide, TOC, Grain Size, Nitrate/Nitrite, pH	3	2	1	1

Notes:

(1) Analyzed in two soil boring locations: just above the water table and in each aquifer.
(2) Field parameters including pH, specific conductivity, temperature, Eh, D.O., and turbidity will be measured in the field, as appropriate.
(3) Assumes one round of sampling of new and existing monitoring wells.
(4) Seven benthic macroinvertebrate samples collected in association with surface water and sediment sampling.
(5) Field parameters including pH, specific conductivity, temperature, D.O., salinity, and turbidity will be measured in the field, as appropriate.
(6) Nine locations with two sediment samples per location.

SUMMARY OF ANALYSES
EAST BRANCH FELGATES CREEK
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

		TCL Organics				TAL Inorganics					QA/QC Samples	
Medium	Sample ID	TCL VOCs	TCL SVOCs	TCL Pesticides/ PCBs	Nitramines/ Nitroaromatics	Total[1]	Dissolved	TOC	Nitrate/ Nitrite	Other	Duplicate	MS/MSD
Surface Water	8SW01-01	X	X	X	X	X		X	X			
	8SW02-01	X	X	X	X	X		X	X			
	8SW03-01	X	X	X	X	X		X	X		X	X
	A14SW01-01	X	X	X	X	X		X	X			
	A14SW02-01	X	X	X	X	X		X	X			
	A14SW03-01	X	X	X	X	X		X	X			
Sediment	8SD01-01	X	X	X	X	X		X	X	Grain Size, pH	X	X
	8SD01-02	X	X	X	X	X		X	X	Grain Size, pH		
	8SD02-01	X	X	X	X	X		X	X	Grain Size, pH		
	8SD02-02	X	X	X	X	X		X	X	Grain Size, pH		
	8SD03-01	X	X	X	X	X		X	X	Grain Size, pH		
	8SD03-02	X	X	X	X	X		X	X	Grain Size, pH		
	A14SD01-01	X	X	X	X	X		X	X	Grain Size, pH		
	A14SD01-02	X	X	X	X	X		X	X	Grain Size, pH	X	
	A14SD02-01	X	X	X	X	X		X	X	Grain Size, pH		
	A14SD02-02	X	X	X	X	X		X	X	Grain Size, pH		
	A14SD03-01	X	X	X	X	X		X	X	Grain Size, pH		
	A14SD03-02	X	X	X	X	X		X	X	Grain Size, pH		

Notes:

[1] Total TAL inorganics includes cyanide

SUMMARY OF ENVIRONMENTAL AND QUALITY CONTROL SAMPLES AND ANALYTICAL PARAMETERS
EAST BRANCH FELGATES CREEK
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Sample Type	Number of Environmental Samples	Analytical Parameters	Number of Duplicates	Number of MS/MSDs	Number of Trip Blanks	Number of Rinsate Blanks
Surface Water[1][2]	6	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics (total and dissolved), Cyanide, TOC, Nitrate/Nitrite	1	1	1	1
Sediment (associated with surface water)	12[3]	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics, Cyanide, TOC, Grain Size, Nitrate/Nitrite, pH	2	1	1	1

Notes:

(1) Seven benthic macroinvertebrate samples collected in association with surface water and sediment sampling.
(2) Field parameters including pH, specific conductivity, temperature, D.O., salinity, and turbidity will be measured in the field, as appropriate.
(3) Six locations with two sediment samples per location.

SUMMARY OF ANALYSES
SITE 8
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Medium	Sample ID	TCL Organics				TAL Inorganics		TOC	Nitrate/ Nitrite	Other	QA/QC Samples	
		TCL VOCs	TCL SVOCs	TCL Pesticides/PCBs	Nitramines/ Nitroaromatics	Total[1]	Dissolved				Duplicate	MS/MSD
Surface Soil	8SS01		X	X	X	X		X	X	pH, CEC		
	8SS02		X	X	X	X		X	X	pH, CEC		
	8SS03		X	X	X	X		X	X	pH		
	8SS04		X	X	X	X		X	X	pH	X	X
	8SS05		X	X	X	X		X	X	pH		
	8SS06		X	X	X	X		X	X	pH		
	8SS07		X	X	X	X		X	X	pH		
	8SS08		X	X	X	X		X	X	pH		
	8SS09		X	X	X	X		X	X	pH, CEC		
Subsurface Soil	8SB01-XX	X	X	X	X	X		X	X	pH, CEC		
	8SB01-YY	X	X	X	X	X		X	X	pH, CEC		
	8SB02-XX	X	X	X	X	X		X	X	pH, CEC		
	8SB02-YY	X	X	X	X	X		X	X	pH, CEC		
	8SB03-XX	X	X	X	X	X		X	X	pH		
	8SB03-YY	X	X	X	X	X		X	X	pH		
	8SB04-XX	X	X	X	X	X		X	X	pH		
	8SB04-YY	X	X	X	X	X		X	X	pH		
	8SB05-XX	X	X	X	X	X		X	X	pH	X	X
	8SB05-YY	X	X	X	X	X		X	X	pH		

ES-5 (Continued)

SUMMARY OF ANALYSES
SITE 8
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Medium	Sample ID	TCL Organics				TAL Inorganics		TOC	Nitrate/ Nitrite	Other	QA/QC Samples	
		TCL VOCs	TCL SVOCs	TCL Pesticides/PCBs	Nitramines/ Nitroaromatics	Total[1]	Dissolved				Duplicate	MS/MSD
	8SB06-XX	X	X	X	X	X		X	X	pH		
	8SB06-YY	X	X	X	X	X		X	X	pH		
	8SB07-XX	X	X	X	X	X		X	X	pH		
	8SB07-YY	X	X	X	X	X		X	X	pH		
	8SB08-XX	X	X	X	X	X		X	X	pH		
	8SB08-YY	X	X	X	X	X		X	X	pH		
	8SB09-XX	X	X	X	X	X		X	X	pH		
	8SB09-YY	X	X	X	X	X		X	X	GS, BD, CEC, pH[2]	X	
	8SB09-ZZ							X	X	GS, BD, CEC, pH[2]		
Groundwater	8GW01-001	X	X	X	X	X	X	X	X	TDS, TSS, BCPSM		
	8GW01A-001	X	X	X	X	X	X	X	X	TDS, TSS, BCPSM		
	8GW02-001	X	X	X	X	X	X	X	X	TDS, TSS, BCPSM		
	8GW03-001	X	X	X	X	X	X	X	X	TDS, TSS, BCPSM	X	X

Notes:

(1) = Total TAL inorganics includes cyanide
(2) = CEC, TOC, Nitrate/Nitrite, GS, and BD should be analyzed in subsurface soil just above the water table and in each aquifer encountered.

TDS = Total Dissolved Solids
TSS = Total Suspended Solids
BCPSM = Bromide, Chloride, Sulfate, Orthophosphorous, Dissolved Methane

SUMMARY OF ENVIRONMENTAL AND QUALITY CONTROL SAMPLES AND ANALYTICAL PARAMETERS
SITE 8
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Sample Type	Number of Environmental Samples	Analytical Parameters	Number of Duplicates	Number of MS/MSDs	Number of Trip Blanks	Number of Rinsate Blanks
Surface Soil	9	TCL SVOCs, TCL Pest/PCBs, Nitramines/nitroaromatics, TAL Inorganics,Cyanide, TOC, Nitrate/Nitrite, pH	1	1	0	1
Subsurface Soil (soil borings)	18	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, Nitramines/nitroaromatics, TAL Inorganics, Cyanide, Nitrate/Nitrite, TOC, CEC (1), BD (1), GS (1), pH	2	1	1	1
Monitoring Wells - Groundwater(2)(3)	4	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, Nitramines/nitroaromatics, TAL Inorganics (total and dissolved), Cyanide, Nitrate/Nitrite, TOC, TDS, TSS, BCPSM	1	1	1	1

Notes:

(1) Analyzed in one soil boring location: just above the water table and in each aquifer encountered.

(2) Field parameters including pH, specific conductivity, temperature, Eh, and turbidity will be measured in the field, as appropriate.

(3) Assumes one round of sampling of new monitoring wells.

SUMMARY OF ANALYSES
SITE 18
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Medium	Sample ID	TCL Organics				TAL Inorganics		TOC	Nitrate/ Nitrite	Other	QA/QC Samples	
		TCL VOCs	TCL SVOCs	TCL Pesticides/ PCBs	Nitramines/ Nitroaromatics	Total[1]	Dissolved				Duplicate	MS/MSD
Surface Soil	18SS11	X	X	X	X	X		X	X	pH, CEC	X	X
	18SS12	X	X	X	X	X		X	X	pH, CEC		
	18SS13	X	X	X	X	X		X	X	pH		
	18SB01-00	X	X	X	X	X		X	X	pH		
	18SB02-00	X	X	X	X	X		X	X	pH		
	18SB03-00	X	X	X	X	X		X	X	pH		
Subsurface Soil	18SB01-XX	X	X	X	X	X		X	X	pH		
	18SB01-YY	X	X	X	X	X		X	X	pH		
	18SB02-XX	X	X	X	X	X		X	X	pH	X	X
	18SB02-YY	X	X	X	X	X		X	X	GS, BD, pH, CEC[2]		
	18SB02-ZZ							X	X	GS, BD, pH, CEC		
	18SB03-XX	X	X	X	X	X		X	X	pH		
	18SB03-YY	X	X	X	X	X		X	X	GS, BD, pH, CEC		
	18SB03-ZZ							X	X	GS, BD, pH, CEC		
Groundwater	18GW01-001	X	X	X	X	X	X	X	X	TDS, TSS, BCSPM	X	X
	18GW02-001	X	X	X	X	X	X	X	X	TDS, TSS, BCSPM		
	18GW03-001	X	X	X	X	X	X	X	X	TDS, TSS, BCSPM		

ES-7 (Continued)

SUMMARY OF ANALYSES
SITE 18
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Medium	Sample ID	TCL Organics				TAL Inorganics		TOC	Nitrate/ Nitrite	Other	QA/QC Samples	
		TCL VOCs	TCL SVOCs	TCL Pesticides/ PCBs	Nitramines/ Nitroaromatics	Total[1]	Dissolved				Duplicate	MS/MSD
Surface Water	18SW07	X	X	X	X	X		X	X		X	X
	18SW08	X	X	X	X	X		X	X			
	18SW09	X	X	X	X	X		X	X			
	18SW10	X	X	X	X	X		X	X			
Sediment	18SD07-01	X	X	X	X	X		X	X	pH, GS		
	18SD07-02	X	X	X	X	X		X	X	pH, GS		
	18SD08-01	X	X	X	X	X		X	X	pH, GS		
	18SD08-02	X	X	X	X	X		X	X	pH, GS	X	X
	18SD09-01	X	X	X	X	X		X	X	pH, GS		
	18SD09-02	X	X	X	X	X		X	X	pH, GS		
	18SD10-01	X	X	X	X	X		X	X	pH, GS		
	18SD10-02	X	X	X	X	X		X	X	pH, GS		

Notes:

(1) Total TAL inorganics includes cyanide
(2) CEC, TOC, Nitrate/Nitrite, Grain Size, and Bulk Density should be analyzed in subsurface soil just above the water table and in each aquifer encountered

CEC = Cation Exchange Capacity
GS = Grain Size
BD = Bulk Density
TDS = Total Dissolved Solids
TSS = Total Suspended Solids
BCSPM = Bromide, Chloride, Sulfate, Orthophosphorous, Dissolved Methane

SUMMARY OF ENVIRONMENTAL AND QUALITY CONTROL SAMPLES AND ANALYTICAL PARAMETERS
SITE 18
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Sample Type	Number of Environmental Samples	Analytical Parameters	Number of Duplicates	Number of MS/MSDs	Number of Trip Blanks	Number of Rinsate Blanks
Surface Soil	6	TCL VOCs, SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics, Cyanide, TOC, Nitrate/Nitrite, pH	1	1	1	1
Subsurface Soil (soil borings)	6	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics, Cyanide, TOC, Nitrate/Nitrite, CEC(1), BD(1), GS(1), pH	1	1	1	1
Monitoring Wells - Groundwater(2)(3)	3	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics (total and dissolved), Cyanide, TOC, Nitrate/Nitrite, TDS, TSS, BCSPM	1	1	1	1
Surface Water(2)	4	TCL VOCs, SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics, Cyanide, TOC, Nitrate/Nitrite	1	1	1	1
Sediment	8	TCL VOCs, SVOCs, TCL Pest/PCBs, Nitramines, TAL Inorganics, Cyanide, TOC, Nitrate/Nitrite, pH, Grain Size	1	1	1	1

Notes:

(1) Analyzed in two soil boring locations: just above the water table and in each aquifer
(2) Field parameters including pH, specific conductivity, temperature, Eh, D.O. and turbidity will be measured in the field, as appropriate.
(3) Assumes one round of sampling of new monitoring wells.

SUMMARY OF ANALYSES
SITE SCREENING AREA 14
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Medium	Sample ID	TCL Organics				TAL Inorganics		TOC	Nitrate/ Nitrite	Other	QA/QC Samples	
		TCL VOCs	TCL SVOCs	TCL Pesticides/ PCBs	Nitramines/ Nitroaromatics	Total[1]	Dissolved				Duplicate	MS/MSD
Surface Soil	A14SS01		X	X	X	X		X	X	pH, CEC	X	X
	A14SS02		X	X	X	X		X	X	pH, CEC		
	A14SS03		X	X	X	X				pH		
Subsurface Soil	A14SB01-XX	X	X	X	X	X		X	X	pH		
	A14SB01-YY	X	X	X	X	X		X	X	pH		
	A14SB02-XX	X	X	X	X	X		X	X	pH	X	X
	A14SB02-YY	X	X	X	X	X		X	X	pH		
	A14SB03-XX	X	X	X	X	X		X	X	pH		
	A14SB03-YY	X	X	X	X	X		X	X	GS, BD, CEC, pH[2]		
	A14SB03-ZZ							X	X	GS, BD, CEC, pH[2]		
Groundwater	A14GW01-001	X	X	X	X	X	X	X	X	TDS, TSS, BCSPM	X	X

Notes:

[1] Total TAL inorganics includes cyanide.
[2] CEC, TOC, Nitrate/Nitrite, GS, and BD should be analyzed in subsurface soil just above the water table and in each aquifer encountered.

CEC = Cation Exchange Capacity
BCPSM = Bromide, Chloride, Sulfates, Orthophosphorous, Dissolved Methane
TDS = Total Dissolved Solids
TSS = Total Suspended Solids
GS = Grain Size
BD = Bulk Density

SUMMARY OF ENVIRONMENTAL AND QUALITY CONTROL SAMPLES AND ANALYTICAL PARAMETERS
SITE SCREENING AREA 14
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Sample Type	Number of Environmental Samples	Analytical Parameters	Number of Duplicates	Number of MS/MSDs	Number of Trip Blanks	Number of Rinsate Blanks
Surface Soil	3	TCL SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics, Cyanide, TOC, Nitrate/Nitrite, pH, CEC	1	1	0	1
Subsurface Soil (soil borings)	6	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics, TOC,Cyanide, Nitrate/Nitrite, pH, CEC(1), BD(1), GS(1)	1	1	2	2
Monitoring Wells - Groundwater(2)(3)	1	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics (total and dissolved), Cyanide, TOC, Nitrate/Nitrite, TDS, TSS, BCSPM	1	1	1	1

Notes:

(1) Analyzed in one soil boring location: just above the water table and in each aquifer encountered.

(2) Field parameters including pH, specific conductivity, temperature, Eh, D.O., and turbidity will be measured in the field, as appropriate.

(3) Assumes one round of sampling of new monitoring well.

CEC = Cation Exchange Capacity
BD = Bulk Density
GS = Grain Size
BCPSM = Bromide, Chloride, Sulfates, Orthophosphorous, Dissolved Methane
TDS = Total Dissolved Solids
TSS = Total Suspended Solids

1.0 INTRODUCTION

This Work Plan presents the scope of activities to be accomplished during the Round Two Remedial Investigation (RI) for Sites 2, 8, 18, and Site Screening Area (SSA) 14 at the Naval Weapons Station Yorktown, Yorktown, Virginia (WPNSTA Yorktown). This document has been prepared by Baker Environmental, Inc. (Baker) under Contract Task Order (CTO) 0363 of the United States Department of the Navy (DoN) Comprehensive Long-Term Environmental Action Navy (CLEAN) Program for the Atlantic Division, Naval Facilities Engineering Command (LANTDIV).

During previous investigations under the Department of Defense's (DoD's) Installation Restoration Program (IRP), Sites 2, 8, and SSA 14 had been identified as potentially affecting the environment and, therefore, required further evaluation and possible remediation. Based on the results of the Final Round One RI Report, no further action was recommended at Site 18; however additional data will be collected to support this recommendation. The study and evaluation of these sites are being performed under a Federal Facility Agreement (FFA) with the DoN, the United States Environmental Protection Agency (USEPA) Region III, and the Virginia Department of Environmental Quality (VDEQ).

This site-specific Work Plan is intended for use in conjunction with the Master Project Plans for WPNSTA Yorktown, submitted under a separate cover (Baker, 1994). The Master Project Plans include a Work Plan, Field Sampling Plan (FSP), Quality Assurance Project Plan (QAPP), and Health and Safety Plan (HASP). These plans address the full range of potentially applicable activities that could be required throughout the Remedial Investigation/Feasibility Study (RI/FS) process: field investigative activities; sampling and analytical methodologies; health and safety considerations; data evaluation/ methodology interpretation; and other overall project activities. As such, methodology information contained in the Master Project Plans is incorporated by reference in this site-specific Work Plan, as applicable.

This site-specific Work Plan, which includes a HASP Addendum, provides a detailed description of site conditions and the findings of previous investigative work at the sites. This plan also contains the number and types of samples to be collected, the analytical methods, specific sample locations, and the rationale for selecting these environmental media, analyses, and locations. The plan also will establish the schedule for completion of field activities and project management and staffing.

1.1 Purpose

The Round One RI was implemented at WPNSTA Yorktown to determine the extent of contamination at various sites and to address data needs for additional investigations. The sampling and analysis program presented in this Round Two RI/FS Work Plan for Sites 2, 8, 18, and SSA 14 is designed to fill those data gaps identified during the Round One RI conducted in 1992 and 1993 (Baker/Weston, 1993), or in the case of SSA 14, to provide information about a site screening area (SSA 14 was not investigated under the Round One RI). This site-specific Work Plan also is designed to provide analytical data for use in baseline human health and ecological risk assessments.

1.2 Document Organization and Purpose

This document is organized into five additional sections. Section 2.0 summarizes background information and the previous site investigation results for Sites 2, 8, 18, and SSA 14. Section 3.0 presents the preliminary conceptual site models that identify the potential exposure pathways under consideration. Section 4.0 presents the technical approach for the investigation, evaluation, and assimilation of data, including the Risk Assessment (RA). Section 4.0 also presents the types and numbers of environmental and associated quality control (QC) samples to be collected; the locations of these samples; and the analytical parameters for which the samples will be tested. Section 5.0 contains project management and staffing information. Section 6.0 includes the project schedule. References for this Work Plan are presented at the conclusion of each section.

1.3 References

Baker Environmental, Inc. 1994. Final Master Project Plans, Naval Weapons Station Yorktown, Yorktown, Virginia. June 1994.

Baker Environmental, Inc. and Roy F. Weston, Inc. 1993. Final Round One Remedial Investigation Report for Sites 1-9, 11, 12, 16-19, and 21, Naval Weapons Station, Yorktown, Virginia. July 1993.

2.0 SITE HISTORY AND RESULTS OF PREVIOUS INVESTIGATIONS

The information in this section has been drawn from the Site Management Plan (Baker, 1996), the Round One RI Report (Baker/Weston, 1993a), the Summary of Background Constituent Concentrations and Characterization of the Biotic Community from the York River Drainage Basin (Baker, 1995a), the Final Master Project Plans (Baker, 1994), and other documents referenced throughout this section. The existing Round One RI data may be used in conjunction with data collected during the Round Two RI to evaluate the nature and extent of contamination present at each site and to calculate potential human health and environmental risks.

2.1 Site History and Background Information

The following subsections provide pertinent Station- and site-specific background information, including site histories, for Sites 2, 8, 18, and SSA 14.

2.1.1 Facility Description

WPNSTA Yorktown is a 10,624 acre installation located on the York-James Peninsula in York and James City Counties and the City of Newport News (Figure 2-1). The installation is bounded on the northwest by the Naval Supply Center Cheatham Annex, the Virginia Emergency Fuel Farm, and the future community development of Whittaker's Mill; on the northeast by the York River and the Colonial National Historic Parkway; on the southwest by Route 143 and Interstate 64; and on the southeast by Route 238 and the community of Lackey.

WPNSTA Yorktown, originally named the U.S. Mine Depot, was established in 1918 to support the laying of mines in the North Sea during World War I. The establishment of the depot was the culmination of a search process, begun in 1917 at the request of Congress, to locate an Atlantic coast site for a weapons handling and storage facility. For 20 years after World War I, the depot received, reclaimed, stored, and issued mines, depth charges, and related materials. During World War II, the facility was expanded to include three additional trinitrotoluene (TNT) loading plants and new torpedo overhaul facilities. A research and development laboratory for experimentation with high explosives was established in 1944. In 1947, a quality evaluation laboratory was developed to monitor special tasks assigned to the facility, which included the design and development of depth

charges and advanced underwater weapons. On August 7, 1959, the U.S. Mine Depot was redesignated the U.S. Naval Weapons Station. The primary mission of WPNSTA Yorktown is to provide ordnance, technical support, and related services to sustain the war-fighting capability of the armed forces in support of national military strategy. The long-term plans for the facility are the same as the present plans, with land use generally the same as at present (DoN, 1991)).

2.1.2 Site 2 - Turkey Road Landfill

Site 2 is a 5-acre landfill located east of Turkey Road in a wetland area adjacent to the southern branch of Felgates Creek (Figure 2-2). Operations at the landfill reportedly began in the 1940s and ceased in 1981. Wastes disposed in this landfill reportedly included mercury and carbon-zinc batteries, tree stumps and limbs, construction rubble, missile hardware (e.g., wings, fins and power packs), electrical devices, and unidentified drums and/or tanks. Waste quantities have been estimated at 240 tons during the period of use. Hard waste material (mine casings) was primarily located along the tributaries to the southern branch of Felgates Creek. A removal of hard waste material was conducted during the summer of 1994 at Site 2.

2.1.3 Site 8 - NEDED Explosives-Contaminated Wastewater Discharge Area

Site 8 is a 300-foot drainage way located along the eastern branch of Felgates Creek, approximately 1.5 miles from the confluence of the creek and the York River (Figure 2-3). This area received wastewater from the Naval Explosives Development Engineering Department (NEDED) complex (Building 456) from 1940 to 1975. The wastewater reportedly contained unspecified solvents, spent/neutralized acids, and nitramine compounds. In 1974, a carbon adsorption tower was installed to treat the contaminated wastewater prior to discharge into the drainage area. A National Pollutant Discharge Elimination System (NPDES) permit was granted by USEPA Region III to allow this discharge. In 1986, the effluent from the tower was diverted to the sanitary sewer and ultimately to Hampton Roads Sanitation District (HRSD). Currently, the site has reverted to a natural drainage area.

2.1.4 Site 18 - Building 476 Discharge Area

Site 18 is a one-quarter mile long, drainage ditch located north of Building 476 in the southeastern area of the installation along a small tributary leading to Lee Pond (Figure 2-4). This area was in use for approximately 20 years from the 1940s to the 1960s. The discharge into the area reportedly contained battery acid waste, consisting of hydrochloric acid or calcium hydroxide and dissolved metals such as lead, cadmium, nickel, and antimony. An estimated 100 to 200 pounds of metals may have been discharged. Battery acid waste no longer discharges from Building 476 into this drainage way.

2.1.5 Site Screening Area 14 - Building 537 Discharge to Felgates Creek

SSA 14 occupies an area of approximately 0.4 acres, and is located outside of Building 537 upstream of Site 8 (NEDED Explosives-Contaminated Wastewater Discharge Area) in the north central portion of the facility (Figure 2-3). This SSA consists of a pipe leading from the building, through which nitramine-contaminated wastewater was reportedly discharged to Felgates Creek.

2.2 Results of Previous Investigations

Previous investigation reports completed through the IRP for Sites 2, 8, and 18, and SSA 14 include the following:

- Initial Assessment Study (IAS) (C. C. Johnson & Associates, Inc. and CH2M Hill, 1984)
- Confirmation Study Rounds One and Two Reports (Dames & Moore, 1986 and Dames & Moore, 1988)
- RI Interim Report (Versar, 1991)
- Focused Biological Sampling and Preliminary Risk Evaluation Report (Baker/Weston, 1993b)

- Round One RI Report (Baker/Weston, 1993a)
- Habitat Evaluation Report (Baker, 1995b)
- Final Closeout Report, Sites 2, 9, and SSA 4 - Mine Casing and Debris Removal Action (IT, 1995)
- Relative Risk Ranking System Data Collection Investigation - SSAs 9, 10, and 14 (Baker, 1995c)

These reports have been generated in conjunction with the continuing development of the DoD IRP. Summaries of previous investigations are provided in the following subsections.

2.2.1 Initial Assessment Study

The purpose of the IAS (C. C. Johnson & Associates, Inc. and CH2M Hill, 1984) was to identify and assess sites posing a potential threat to human health and/or the environment due to contamination from past operations. A total of 19 potentially contaminated sites were identified based on information from historical records, aerial photographs, field inspections, and personnel interviews. Each site was evaluated for the type of contamination, migration pathways, and pollutant receptors. The IAS concluded that 15 of the 19 sites, including Sites 2, 8, and 18, were of sufficient potential threat to human health or the environment to warrant Confirmation Studies.

At Site 2 well installation and collection of groundwater, surface water, and sediment was recommended. Four wells were to be installed and four groundwater samples were to be collected at each quarter for four quarters. Samples were to be analyzed for mercury, zinc, and pH. In addition, four surface water samples were to be collected quarterly and analyzed for mercury, zinc, and pH. Three sediment samples were recommended and were to be sampled for the same parameters as the surface water.

At Site 8 soil, surface water, and sediment samples were recommended. Two soil borings would be installed; the samples collected from these borings were to be analyzed for pH, TNT, RDX, HMX, volatiles, and the base neutral fraction of the semivolatiles. Two surface water samples were

to be collected quarterly for a year and two sediment samples were to be collected as well. The parameters recommended for soil analysis also were recommended for surface water and sediment.

At Site 18 three soil borings were recommended. Soil samples from these borings were to be analyzed for pH, mercury, cadmium, nickel, lead, and zinc.

2.2.2 Confirmation Study and RI Interim Report

Two rounds of data were obtained during the Confirmation Study effort. The first round of sampling and analysis was documented in the "Confirmation Study Step IA (Verification), Round One" (Dames & Moore, 1986). The results of the second round of sampling and comparisons with appropriate regulatory standards were presented in the "Confirmation Study Step IA (Verification), Round Two" Dames & Moore, 1988). The results of these field efforts were combined and summarized in the Draft RI Interim Report (Dames & Moore, 1989). This report was subsequently revised by Versar, Inc. (Versar) in 1991 to incorporate comments from the former Technical Review Committee (TRC); now called a Restoration Advisory Board (RAB). The revised report is referred to as the RI Interim Report (Versar, 1991). The RI Interim Report recommended that further RI activities be completed at 14 of the 15 sites, including Sites 2, 8, and 18.

During the Confirmation Study four wells were installed and three surface water and sediment samples were collected during the Round One activities. Metals were detected in groundwater, surface water, and sediment. Volatile organics were detected in the surface water, although at levels below criteria, and in the sediment. During Round Two activities four groundwater samples and three surface water and sediment samples were collected. Results were consistent with the results of the Round One analyses.

At Site 8 two soil samples and two surface water and sediment samples were collected during both the Round One and Round Two portions of the Confirmation Study. Metals and low levels of organics were detected in all media; many of the organics were laboratory contaminants and common pesticides.

At Site 18 two surface water and two sediment samples were collected during the Round One Confirmation Study and three surface water and four sediment and soil samples were collected

during the Round Two. Organics, all of which were laboratory contaminants, were detected in surface water, soil, and sediment. Metals were also detected in all media; silver was the only metal detected above criteria in surface water.

Monitoring wells installed at Site 2 during the Confirmation Study are still in existence. Well 2GW01 will be incorporated into the groundwater monitoring network for the Round Two RI at this site. Wells include 2GW01, 2GW02, 2GW03, and 2GW04 will be abandoned because they have been flooded.

2.2.3 Focused Biological Sampling and Preliminary Risk Evaluation Report

The Focused Biological Sampling and Preliminary Risk Evaluation Report (Baker/Weston, 1993b) summarized the results of a limited biological tissue, surface water, and sediment sampling effort conducted in October 1992. The primary objective of the sampling program was to evaluate the potential human health risk associated with consumption of fish and shellfish taken from select waters within WPNSTA Yorktown, including Lee Pond, Roosevelt Pond, Felgates Creek, and Indian Field Creek.

2.2.4 Round One Remedial Investigation

The results of the Round One RI (Baker/Weston, 1993a) indicated that further investigation was needed at all sites that were studied to better define the nature and extent of contamination associated with each site. Data indicate that surface soil, subsurface soil, groundwater, surface water, and sediment have been potentially impacted by past site activities. In this report, references are made to "control samples," which are background samples collected during the Round One RI. These should not be confused with the background samples collected as part of the comprehensive Station-wide background investigation conducted in 1994 (Baker, 1995a). The results of the Round One RI for Sites 2, 8, and 18 are presented below.

2.2.4.1 Site 2 Round One RI

The Round One RI at Site 2 consisted of groundwater, surface water, and sediment investigations. Figure 2-5 identifies the sampling locations. The following subsections present the analytical results for each medium and the conclusions made for Site 2.

Groundwater Sampling Results

Four groundwater samples were collected from monitoring wells 2GW01, 2GW02, 2GW03, and 2GW04 at Site 2. Only base/neutral and acid extractable organic (BNA) compounds, at very low concentrations, were detected in the groundwater samples. Nitrate concentrations ranged from nondetect to 470 micrograms per liter (µg/L). No volatile organic compounds (VOCs), explosives, pesticides, or polychlorinated biphenyls (PCBs) were detected. Figure 2-6 presents select analytical results for organic compounds in groundwater at Site 2.

The inorganic analyses performed on the groundwater samples provided the following results, as shown in Table 2-1:

- Unfiltered metals analysis of sample 2GW02-001 contained chromium (55 µg/L) and zinc (93.8 µg/L) above the state standard. The lead concentration (15.5 µg/L) also exceeded the federal action level. None of these compounds, however, were above the standards in the filtered metals sample.

- Zinc exceeded the state standard in the unfiltered metals sample from monitoring well 2GW03, at a concentration of 67.1 µg/L; zinc was below standards in the filtered metals sample.

- The unfiltered metals sample 2GW04-001 contained concentrations of arsenic, chromium, and zinc above the state standard. Arsenic also was above the federal standard, at a concentration of 110J µg/L. The "J " qualifier indicates that the reported sample concentration value has been estimated. Lead concentrations also exceeded the federal action level. Arsenic was the only inorganic detected above

standards in the filtered metals sample, at 74.8 µg/L; this concentration exceeded both the federal standard (50 µg/L) and the state standard (50 µg/L).

- The unfiltered and filtered metals samples collected from monitoring wells 2GW02, 2GW03, and 2GW04 contained concentrations of several metals above Round One background levels.

The groundwater analytical results obtained during the Round One RI activities were consistent with those obtained during previous investigations.

Surface Water Sampling Results

Seven surface water stations were sampled during the Round One RI sampling activities. Figure 2-7 presents select analytical results for organic compounds detected in surface water at Site 2. The organic analyses indicated the following:

- Di-n-butylphthalate (a common laboratory contaminant) was detected at low concentrations (10J µg/L or less) in surface water samples 2SW01-001, 2SW02-001, 2W04-001, and 2SW05-001.

- Bis(2-ethylhexyl)phthalate (a common laboratory contaminant) was detected, also in low concentrations (7J µg/L or less), in surface water samples 2SW04-001, SW05-001, and 2SW06-001.

- Acetone (a common laboratory contaminant), the only VOC detected in any of the surface water samples, was present in sample 2SW04-001.

- Surface water samples 2SW07-001 and 2SW03-001, and duplicate sample 2SW03-101, located farthest from the landfill, contained no detectable concentrations of VOCs or BNAs.

- No explosives, pesticides, or PCBs were detected in any of the surface water samples.

The inorganics analyses, summarized in Table 2-2, indicated the following:

- The unfiltered copper concentrations in samples 2SW01-001 and 2SW04-001 were above the state and federal criteria. The filtered metals concentration of copper in sample 2SW04-001 also was above these levels.

- The unfiltered nickel concentration in sample 2SW02-001 was above the state and federal criteria. The filtered metals concentrations in samples 2SW03-001, 2SW06-001, and 2SW07-001 were above the state and federal salt water chronic levels. Previous studies had shown the presence of low concentrations of VOCs and pesticides, which were not confirmed in these analyses.

Sediment Sampling Results

A total of nine sediment stations were sampled at Site 2. Figure 2-8 presents select analytical results for organic compounds in sediment at Site 2. Toluene, 2-butanone, acetone, (a common laboratory contaminant), and carbon disulfide were the only VOCs detected in any of the sediment samples. Two BNA compounds, bis(2-ethylhexyl)phthalate (a common laboratory contaminant) and pentachloropenol, were detected in a few of the sediment samples at less than 1,000 micrograms per kilogram (µg/kg). Aroclor-1248 was detected in the sample collected from the 6- to 12-inch interval of sediment sampling station 2SD06, but not in the 0- to 6-inch interval. The pesticide 4,4'-DDE was detected in the sample collected from the 0- to 6-inch interval of sediment station 2SD08. The concentrations of Aroclor-1248 and 4,4'-DDE exceeded the National Oceanic and Atmospheric Administration (NOAA) effects range-low (ER-L) criteria.

A few of the inorganic concentrations exceeded the levels found in the Round One background sediment samples, especially in the 6- to 12-inch interval. Silver concentrations exceeded the NOAA effects range-median (ER-M) and apparent effects threshold (AET) criteria in five sediment samples collected from Site 2. Higher levels of inorganics were detected in the sediment samples analyzed during previous investigations.

Summary of the Round One RI at Site 2

Groundwater does not appear to be impacted by organics. Only two constituents were detected, and both are present in the upgradient well. Inorganic concentrations were elevated above background levels.

In surface water, no site-related organic contaminants were detected. Inorganics detected were typical of background concentrations.

In sediment, bis(2-ethylhexyl)phthalate (a common laboratory contaminant) was detected in four samples (all detected concentrations were below 1 milligram per kilogram [mg/kg]). However, this contaminant does not appear to be site-related because the highest concentrations were found upstream of the site. There also was a single pesticide detection at a very low estimated value (2.9 µg/kg). Toluene also was found in one downstream sample at a concentration of 1.2 mg/kg. Toluene also was detected at much lower levels at two upstream locations.

Based on the results of the Round One RI, a removal action to excavate and dispose of surficial waste and debris was recommended, followed by a risk evaluation.

2.2.4.2 Site 8 Round One RI

The Round One RI at Site 8 consisted of surface soil, groundwater, surface water, and sediment investigations. Figure 2-9 identifies the sampling locations. The following subsections present the analytical results for each medium sampled and the conclusions made for Site 8.

Surface Soil Sampling Results

Figure 2-10 provides select analytical results for surface soil samples collected at Site 8. These results identified the presence of explosives in samples 8S03-001 and 8S04-101. No explosives were detected in sample 8S05-001, the sample located furthest from the potential source area. Several BNA compounds were identified in all of the surface soil samples. VOCs, including vinyl chloride, 1,2-dichloroethane (DCA), 1,2-dichloroethene (1,2-DCE), 1,2-trichloroethene (TCE), toluene, and 2-butanone were detected in samples 8S04-101 and 8S05-001 at concentrations less

than 100 µg/kg. Pesticides were detected in sample 8S04-101. No PCBs were detected in any of the surface soil samples. The concentrations of inorganics were comparable to those found in Round One background surface soil samples.

Groundwater Sampling Results

One groundwater sample was obtained at Site 8 using a Hydropunch™ sampler. Analysis of this sample provided the following results:

- VOCs, including acetone (5J µg/L), 1,1-DCE (2J µg/L), chloroform (3J µg/L), 1,1,1-trichloroethane (1,1,1-TCA; 45 µg/L), and TCE (15 µg/L) were present in groundwater. The concentration of TCE exceeded the federal standard of 5 µg/L.

- Explosives (13 µg/L HMX and 64 µg/L RDX) also were detected in the groundwater.

- Nitrate was detected in the groundwater at a concentration of 1,000 µg/L.

- No BNAs, pesticides, or PCBs were detected.

Table 2-3 presents the inorganic concentrations detected in groundwater. In the unfiltered metals sample, the concentrations of chromium (163 µg/L) and zinc (216 µg/L) exceeded the state standard. Chromium levels also were above the federal standard and the lead action level was exceeded. The beryllium concentration (4.5J µg/L) was above the federal standard of 4 µg/L. Several unfiltered metals concentrations were above Round One background levels. All of the concentrations in the filtered metals sample were below the standards and background levels.

Surface Water Sampling Results

Three surface water samples were collected from Site 8. No VOCs, BNAs, pesticides, PCBs, or explosives were detected in any of the surface water samples. Table 2-4 presents the inorganic concentrations detected in surface water. Copper concentrations in the unfiltered metals sample from 8SW01 were above state and federal criteria. The filtered metals concentrations were below

these criteria. Lead and nickel exceeded the federal salt water chronic level concentrations in the unfiltered metals sample 8SW03; nickel also was above the state standard. The filtered metals lead concentration, however, was below this standard. Copper and nickel concentrations in the unfiltered metals sample collected from 8SW04 were above the state and federal salt water chronic levels. The filtered metals concentrations were below these standards. Low concentrations of some VOCs and BNAs had been previously detected in the surface water collected at Site 8; these results were not duplicated during the Round One sampling activities. The surface water metals concentrations were consistent with those found in Round One background samples.

Sediment Sampling Results

Figure 2-11 presents select analytical results for organic compounds detected in sediment at Site 8. The sediment samples did not contain explosives, pesticides, or PCBs. The only VOCs detected were acetone, methylene chloride, and carbon disulfide (common laboratory contaminants). 4-Methyl phenol was the only BNA compound detected in any of the sediment samples. Inorganic concentrations were similar to those found in the Round One background sediments. Lead and zinc were detected at concentrations slightly above the NOAA low effects range criteria in sample 8SD03-001; lead was also slightly above NOAA standards in sample 8SD04-002. Mercury exceeded the NOAA ER-M and AET criteria in sample 8SD01-001. Previous investigations indicated the presence of other VOCs and BNAs at low concentrations that were not detected in the Round One analyses.

Conclusions for Site 8

Site 8 is a drainage ditch that received wastewater from the operation of Building 456 from 1940 to 1986. There is no longer any discharge to the ditch, which is inundated at high tide. The highest contaminant detections were the explosives HMX and RDX. These constituents were detected in two of three soil samples near the ditch at concentrations in the approximate range of 1,000 to 3,000 µg/kg. Explosives were not detected in sediment or surface water samples. The surface soil also contained numerous BNAs and some VOCs, most of which were reported as estimated values, less than 200 µg/kg. The highest VOCs were DCE and TCE, collected at a soil sample location midway between Building 456 and Felgates Creek. Two soil samples were collected at that location (8S04), and the higher contaminant levels (32 µg/L TCE) were found in the deeper soil sample.

VOCs and explosives were detected in the Hydropunch™ groundwater sample. Detected VOCs included TCA (45 µg/L) and TCE (15 µg/L), and explosives HMX (13 µg/L) and RDX (64 µg/L). No VOC contaminants were detected in surface water samples. Volatile contaminants (mainly acetone - a common laboratory contaminant) were found in sediments but acetone also was present in upgradient samples.

Based on the Round One RI results, it was recommended that further soil sampling for explosives and VOCs be conducted to delineate the extent of contamination around 8S03 and 8S04 and that monitoring wells be installed and sampled for VOCs, explosives, and inorganics to confirm the Hydropunch™ results and delineate the extent of contamination.

2.2.4.3 Site 18 Round One RI

The Round One RI at Site 18 consisted of surface soil, groundwater, surface water, and sediment investigations. Figure 2-12 identifies the sampling locations. The following subsections present the analytical results for each medium sampled and the conclusions made for Site 18.

Soil Sampling Summary

Six soil samples were collected at Site 18. Analysis of these samples indicated that copper, zinc, and arsenic concentrations exceeded Round One background levels in several samples. These results confirm those obtained from previous investigations. Soil sample results for inorganic analyses are presented in Table 2-5.

Groundwater Sampling Results

One groundwater sample was collected from Site 18 and was analyzed for unfiltered and filtered metals and hardness. Table 2-6 presents the inorganics results. Cadmium, chromium, lead, mercury, and zinc were present in the unfiltered metals sample at concentrations exceeding the state standard. The levels of unfiltered cadmium (12.6 µg/L) also exceeded federal standards. The concentration of unfiltered lead exceeded the federal action level, and unfiltered beryllium (7.5J µg/L) exceeded the federal standard. The filtered metals analysis showed concentrations of these inorganics below the above-referenced standards.

Surface Water Sampling Results

Five surface water samples were collected at Site 18; the inorganic results are presented in Table 2-7. The results show that there are no inorganic concentrations above the state and federal criteria in the samples collected at downgradient station 18SW02 and upgradient station 18SW06. Copper and zinc concentrations were above the federal salt water chronic levels in both the unfiltered and filtered metals samples collected from stations 18SW01, 18SW04, and 18SW05.

Sediment Sampling Results

Ten sediment samples were collected at Site 18. Beryllium was the only inorganic that was detected above background levels. The antimony concentrations in samples 18DS01-002 and 18SD06-002 exceeded the NOAA ER-L range criteria. The inorganic concentrations in sediment were similar to those found in previous investigations.

Conclusions for Site 18

Site 18 is a ditch north of Building 476 that drains to a tributary of Lee Pond. The ditch reportedly received battery acid discharges. Several pounds of metals are estimated to have been discharged between 1940 and 1960. Soil contains arsenic and zinc at concentrations above Round One background levels at four sample locations, lead at two locations, and copper at three locations. Sediment samples in the ditch also exceeded background inorganic concentrations for beryllium at only one location. Copper and zinc in surface water exceeded the state and federal criteria, but not at the farthest downstream sampling point or in the branch northeast of Building 476. Groundwater samples showed that no filtered samples contained inorganic concentrations that exceeded state or federal criteria.

Based on the Round One RI results, it was recommended that a risk screening, followed by a no further remedial plan, be implemented at Site 18.

2.2.5 Habitat Evaluation Results

This section summarizes the results of the Habitat Evaluation (Baker, 1995b) that was conducted for the aquatic and terrestrial habitats at Sites 2, 8, and 18. Sites 2 and 8 are located in the Felgates Creek Watershed and Site 18 is located in the Lee Pond Watershed. Although SSA 14 was not included in the Habitat Evaluation, it is located immediately upstream of Site 8 (Figure 2-3).

2.2.5.1 Site 2 Habitat Evaluation Results

Four different habitats are present in the vicinity of Site 2. These include deciduous upland forest, an ecotone or transition zone along the edge of the disposal area, an open area on top of the disposal area, and wetlands along the tributaries to Felgates Creek.

Upland forest is present along Turkey Road and on the higher ground to the east and west of the site. Beech is dominant in some portions of the upland forest. In other areas, beech is mixed with tulip poplar, white oak, and loblolly pine. The understory in this forest consists of pawpaw, dogwood, persimmon, holly, and sourwood. There are no vines growing in the upland forest. Vegetation on the forest floor is sparse and species that are present are typical of acidic soil. These species include beech drops, cranefly orchid, partridgeberry, Christmas fern, and ebony spleenwort.

Between the open area at Site 2 and the wetland, an ecotone or transition zone is present. This ecotone area includes a variety of trees, shrubs, woody vines, and herbaceous plants, none of which is dominant. The following trees are identified in the ecotone area: post oak, southern red oak, sourgum, persimmon, ironwood, sycamore, sweetgum, loblolly pine, black walnut, and black locust.

Young trees and saplings in the ecotone are mixed with shrubs. The following shrubs were noted at Site 2 during the habitat evaluation: pawpaw, wax myrtle, coastal plain willow, groundsel-tree, slippery elm, juniper, privit, and princess-tree.

Three species of woody vines are also present in the ecotone. These include greenbriar, Japanese honeysuckle, and sand grape.

Herbaceous annuals and perennials are also common in the ecotone, particularly along the edges of the open area. The following species were identified during the habitat evaluation: thimbleweed, peppermint, aster, tall goldenrod, curly dock, dog fennel, ladies thumb, blue mistflower, pokeweed, crownbeard, slender bush clover, and field thistle.

The middle of the Site 2 area is an open field, which is kept roughly mowed. There are no trees, shrubs, or vines growing in this open area, and grasses are clearly dominant. These grasses are mixed with few herbaceous annuals or perennials, probably because the area is regularly mowed. Slender bush clover, field thistle, and blue mistflower were identified in the grassy, open area.

The wetland regime at Site 2 is somewhat complex. Wetlands are present along both tributaries to Felgates Creek that flank the disposal area and along Felgates Creek itself. These wetlands represent three different sub-habitats.

The wetland to the south of the disposal area between Turkey Road and the rail line was formed when beavers dammed the eastern tributary of Felgates Creek. This wetland is classified as a palustrine, scrub shrub wetland. Stressed and dead trees still stand in this wetland area. Seaside alder and groundsel-tree are growing among the dead trees. In one portion of this wetland, cattail is the dominant forb, while lizards tail is dominant in other areas. Various rushes and sedges are also present. Additional wetland vegetation, including the following, was found in the palustrine scrub shrub wetland: jewelweed, clearweed, hop sedge, arrowhead, and black rush.

The wetland downstream of the palustrine scrub shrub wetland and the wetland to the west of the disposal area are both classified as palustrine forested wetlands. In these areas upland forest is present to the edges of the lower wetland areas, which can be delineated by topography and wetland vegetation. Wetland trees in these areas include red maple and sycamore. Shrubs are not present. Wetland vegetation identified during the habitat evaluation included the following: jewelweed, clearweed, arrowhead, and lizards tail.

Trumpet creeper and dodder, a parasitic plant, are also growing in this wetland. As the tributary flows from the wooded area into Felgates Creek, sedges, rushes, and cattails appear. These palustrine forested wetlands grade into estuarine wetlands where the tributaries meet Felgates Creek.

The wetlands along Felgates Creek are estuarine and consist primarily of tidal saltmarsh. Spartina is clearly dominant in these wetlands and is mixed with groundsel-tree and other salt marsh shrubs in the intertidal scrub shrub wetland.

Because of the varied habitats present at Site 2, avifauna observed at the site was abundant and diverse. Sixteen different species of birds were identified during the habitat evaluation, even though field work was conducted in the afternoon. Birds noted at Site 2 included the following: common crow, robin, blue jay, carolina wren, carolina chickadee, red-bellied woodpecker, catbird, cardinal, common grackle, alder flycatcher, bay-breasted warbler, white-breasted nuthatch, yellow-bellied sapsucker, turkey vulture, wild turkey, and phoebe.

Evidence of four mammal species was also observed during the habitat evaluation. Whitetail deer, beaver, raccoon, and groundhog were all feeding and/or living at Site 2. One reptile, the box turtle, and one amphibian, the green frog, were also found at Site 2.

2.2.5.2 Site 8 Habitat Evaluation Results

Two habitat types are present at Site 8, deciduous upland forest on the higher ground and mixed forest in the vicinity of the drainageway. Salt marsh, dominated by spartina, is also present beyond the drainageway in Felgates Creek.

Trees are dominant in the upland forest, although no species is clearly dominant. Beech, white oak, tulip poplar, southern red oak, and southern sugar maple were all identified in the upland forest at Site 8. The understory of this forest is made up of holly and mountain laurel. Only two forbs, partridgeberry and Christmas fern are present on the forest floor.

A mixed forest is present along the drainageway. The following trees, none of which were dominant, were identified in this mixed forest: beech, loblolly pine, sweetgum, silktree, sourwood, red maple, Virginia pine, and sycamore.

The mixed forest also has a variety of species in the understory. These species include the following: juniper, holly, redbud, pawpaw, wax myrtle, groundsel-tree, blueberry, and swamp rose mallow.

In addition, six different woody vines are present in the understory at Site 8: poison ivy, Virginia creeper, bullbriar, trumpet creeper, sand grape, and wild grape.

Although the drainageway is not officially classified as a wetland on the National Wetland Inventory (NWI) maps, wetland vegetation is present. Three wetland forbs were identified: sensitive fern, water pennywort, and clearweed. These wetland forbs constituted the primary forbs in the area. The drainageway leads to an estuarine, intertidal, emergent wetland along Felgates Creek.

Only four birds were observed at Site 8, perhaps because the habitat evaluation was conducted in the late afternoon or because most migrants had already passed through the area when the habitat evaluation was conducted. A great blue heron was feeding on Felgates Creek, and a robin, blue jay, and a Carolina chickadee were present in the mixed forest. Signs of two mammals, whitetail deer and squirrel, were also observed. No reptiles or amphibians were noted at Site 8 during the habitat evaluation.

2.2.5.3 Site 18 Habitat Evaluation Results

Currently, Site 18 is a drainageway that appears to be a natural stream in some areas and an excavated trench in others. From the amount of erosion present in portions of the drainageway, a good deal of water appears to flow through the area during storms. During September, when the habitat evaluation was conducted, water was present in the drainageway.

Site 18 is surrounded by deciduous forest. The dominant species and makeup of the forest are dependent upon the topography. Upland species are present on the slopes and lowland species are present along the drainage ditch.

In the upland forest, beech, tulip poplar, and white oak are dominant. Dogwood and holly are present in the understory. Christmas fern is the dominant forb in the upland forest, and partridgeberry, violet, grape fern, New York fern, broad beech fern, and ebony spleenwort are also present.

Beech and tulip poplar are also growing in the lowland areas adjacent to the drainage ditch, but they are not dominant. Instead, they are mixed with the following species: sweetgum, loblolly pine, ironwood, sycamore, swamp chestnut oak, red maple, and bitternut hickory.

The understory in the lowland forest is dominated in some areas by pawpaw. Wax myrtle and beautyberry are also present. Vines occurring in the area along the drainage ditch include Virginia creeper, sand grape, and muscadine grape.

Forbs found in the upland forest also occur in the lowland areas. In addition, wetland vegetation is present along the drainageway. Two species in particular, golden ragwort and clearweed, were identified.

Avifauna were not abundant at Site 18, perhaps because the habitat was evaluated in late afternoon when birds are not as active as they are in the morning and in the evening. Five species were identified at the site: Carolina chickadee, blue jay, common crow, robin, and red-bellied woodpecker.

No mammals were observed at the site, nor was any mammal sign noted. However, based upon the habitat present, whitetail deer, raccoons, opossums, and squirrels would be expected in the vicinity of Site 18.

One reptile, an adult male box turtle was found at the site. Adult green frogs were also observed living in the drainage ditch.

2.2.6 Removal Action and Confirmation Sampling at Site 2

A removal action was conducted at Site 2 from September through December 1994 (IT, 1995). The main objectives of the removal action were to removal all surface and near surface wastes from the designated areas at Site 2 and to restore the site to pre-removal action conditions. Based on historical photographs, waste disposal appears to have been limited to the perimeter of the site.

Wastes removed from Site 2 included large concrete masses, asphalt, high efficiency particulate air (HEPA) filter drums, scrap metal, empty drums, miscellaneous construction/demolition debris,

batteries, and unexploded ordnance (UXO). All ordnance items were certified inert either by the UXO superintendent, were transferred to the NEDED laboratory on site and verified as inert, or were transferred off site by the Station explosive ordnance demolition (EOD) staff for final disposition.

Upon completion of the removal action, confirmatory soil sampling was completed at designated locations at Site 2. Forty samples were collected and the locations were field located through surveying. The confirmatory sampling was conducted to develop a database from which a determination as to further RI/FS and remediation activities would be made. Confirmatory sampling locations are presented on Figure 2-13. Each sample was analyzed for the following parameters:

- Target Compound List (TCL) volatile organics
- TCL semivolatile organics
- TCL pesticides/PCBs
- Nitramine compounds

The samples were collected after all excavation activities were completed and prior to any backfilling. Each sample that was taken from within a waste removal area was obtained from the base of the excavated area, at a depth of 0- to 6-inches. In addition, a number of designated samples were located outside the designated limits of excavation. In these cases, the samples were taken from a 0- to 6-inch depth. If any backfill was required in these sample locations, the samples were taken prior to placement of any backfill materials. Each sample was collected using stainless steel hand tools that were decontaminated between each sampling event.

Confirmatory sample results were received in Contract Laboratory Program (CLP) data packages. Data validation activities were then completed for each sample. Validated analytical results are presented on Table 2-8.

VOCs were not detected in the confirmatory samples. SVOCs, predominantly polynuclear aromatic hydrocarbons (PAHs), were detected in the majority of these samples. Three of the confirmation samples (2-SS1, 2-SS2, 2-SS7) exhibited total SVOC concentrations exceeding 100 mg/kg.

Low levels of nitramine compounds (less than 3 µg/kg) were detected in two samples (2-SS114 and 2-SS17). Pesticides were detected in several samples at low concentrations consistent with Round One background concentrations. Aroclor-1254 was detected in nine of the confirmation samples. At two of these locations, concentrations of Aroclor-1254 exceeded 1 mg/kg (2-SS17 at 6.2 mg/kg and 2-SS11 at 1.9 mg/kg).

Inorganics were detected in all confirmatory surface soil samples. Analytical results indicated that there is no contaminant source or discernible pattern of inorganic contamination. The majority of inorganic analytical results fell within Station background levels.

2.2.7 Relative Risk Ranking for SSA 14

A Relative Risk Ranking Data Collection Investigation was conducted at SSA 14 during late October 1995 (Baker, 1995c). The objective of this effort was to gather contaminant, pathway, and receptor information to be used in the Navy's Relative Risk Ranking System. Prior to this investigation, no samples had been collected at SSA 14.

Surface soil, surface water, and sediment samples were collected at SSA 14. All samples were analyzed for nitramine compounds. Sample locations are presented on Figure 2-14. Analytical results are presented on Table 2-9.

Explosives were detected in one surface soil (HMX and RDX), one surface water sample (HMX, RDX, and amino-dinitrotoluene (amino-DNTs), and in one sediment sample (HMX).

2.3 References

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SECTION 2.0 TABLES

TABLE 2-1

ROUND ONE RI
SITE 2
INORGANIC CONCENTRATIONS (µg/L) IN GROUNDWATER
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

SITE ID	Federal	Federal	VGS	2GW01-001	2GW02-001	2GW03-001	2GW04-001
ANALYTE	MCL	SMCL					
Aluminum		200		6,810 (c)	19,900 (c)	157.00 (c)	5,800 (c)
Aluminum (dissolved)				35.00 U	37.70 U	78.80 U	78.80 U
Antimony	6			44.00 UJ	44.00 UJ	44.00 UJ	44.00 UJ
Antimony (dissolved)				44.00 U	44.00 U	44.00 U	44.00 U
Arsenic	50		50	5.90 J	39.60 J	11.40 J	10.00 J (d)
Arsenic (dissolved)				2.00 UJ	19.70	2.00 U	7.60 (d)
Barium	2,000		1,000	31.10 J	108	161 *	197 *
Barium (dissolved)				15.00	40.70	68.00	58.00
Beryllium	4			1.00 U	1.50	1.10	3.50 *
Beryllium (dissolved)				1.00 U	1.00 U	1.00 U	1.00 U
Cadmium	5		0.04	4.00 U	4.00 U	4.00 U	4.00 U
Cadmium (dissolved)				4.00 U	4.50 (a)	4.00 U	4.00 U
Calcium				258,000 *	109,000	132,000	71,600
Calcium (dissolved)				278,000 *	110,000	132,000	66,700
Chromium	100		50	33.20	55.90 (a)	38.60	39.40 (a)
Chromium (dissolved)				8.00 U	8.00 U	8.00 U	8.00 U
Cobalt				12.40 J	10.00 J	6.00 UJ	24.60 J *
Cobalt (dissolved)				6.00 U	6.00 U	6.00 U	9.80
Copper	1,300**	1,000	1000	8.40	16.90	6.60	15.90
Copper (dissolved)				5.00 U	5.00 U	5.00 U	5.00 U
Iron		300	300	21,300 (e)	47,900 (e)	36,200 (e)	23,900 (e)
Iron (dissolved)				19.00 U	124	3,280 (e)	19.00 U
Lead	15**		50	3.60 J	5.50 (b)	20.00 UJ	20.30 (b)
Lead (dissolved)				2.00 UJ	2.00 UJ	2.00 UJ	2.00 U
Magnesium				20,500 *	12,400 *	30,000 *	29,500 *
Magnesium (dissolved)				19,800 *	10,000 *	24,800 *	21,600 *
Manganese		50	50	1,360 (e)	2,230 (e)	348 J (e)	584 (e)
Manganese (dissolved)				2.00 U	38.80	109 (e)	1.60 (e)
Mercury	2		0.05	0.10 U	0.10 U	0.10 UJ	0.10 U
Mercury (dissolved)				0.10 U	0.10 U	0.10 U	0.10 U
Nickel	100			34.80	18.00 U	18.00 U	29.80
Nickel (dissolved)				18.00 U	18.00 U	18.00 U	18.00 U
Potassium				5,300 J *	8,400 J *	20,700 *	21,200 *
Potassium (dissolved)				4,830 *	7,840 *	20,100 *	19,100 *
Selenium	50		10	2.00 UJ	2.00 UJ	2.00 UJ	2.00 UJ
Selenium (dissolved)				20.00 UJ	2.00 U	2.00 UJ	2.00 U
Silver		100		6.00 U	6.00 U	6.00 U	6.00 U
Silver (dissolved)				6.00 U	6.00 U	7.00 U	9.60 U
Sodium			100,000	10,600	108,000 (a)	367,000 (a)	244,000 (a)
Sodium (dissolved)				11,300 *	427,000 (a)	383,000 (a)	274,000 (a)
Thallium	2			2.00 UJ	2.00 UJ	2.00 UJ	2.00 UJ
Thallium (dissolved)				2.00 U	2.00 U	2.00 UJ	2.00 U
Vanadium				6.00 UJ	38.50 J *	14.90 J	64.20 J *
Vanadium (dissolved)				6.00 U	7.80	6.00 U	7.80
Zinc		5,000	50	58.10 U	93.80 (a)	67.10 (a)	136 (a)
Zinc (dissolved)				14.00 UJ	11.10 UJ	13.50 UJ	6.10 UJ
Nitrates	10,000		5,000	470	270	170	100 U

Shaded cells indicate concentration exceeds one or more ARARs.
(a) Exceeds VGS.
(b) Exceeds federal action level.
(c) Exceeds federal SMCL.
(d) Exceeds federal MCL and VGS.
(e) Exceeds federal SMCL and VGS.

TABLE 2-2

ROUND ONE RI
SITE 2
INORGANIC CONCENTRATIONS (µg/L) IN SURFACE WATER
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

SITE ID	VWQS	CWA	2SW01-001	2SW02-001	2SW03-001	2SW03-101	2SW04-001	2SW05-001	2SW06-001	2SW07-001
ANALYTE	Criteria	Criteria								
Aluminum			64.50	4,990	394 J	376 J	364	510 J	2,000	241 J
Aluminum (dissolved)			35.00 U	35.00 U	125 U	35.00 U	50.20	35.00 U	48.60 U	50.50 U
Antimony			44.00 UJ	44.00 U	44.00 U	44.00 U	44.00 UJ	44.00 U	44.00 U	44.00 U
Antimony (dissolved)			44.00 UJ	44.00 U	44.00 U	44.00 U	44.00 UJ	44.00 U	44.00 U	44.00 U
Arsenic		190/36	2.10 J	3.70	4.30 J	5.20 J	2.10 J	2.00 U	2.00 U	3.30 J
Arsenic (dissolved)			2.00 J	2.00 UJ	2.40 J	20.00 UJ	2.70 J	2.00 U	2.00 U	4.20 J
Barium			41.40	57.20	31.90	31.30	51.20	40.40	41.40	30.00
Barium (dissolved)			38.90	51.50 J	36.10 J	29.10 J	44.60	31.10 J	53.50 J	30.40 J
Beryllium			1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Beryllium (dissolved)			1.20	1.00 U	1.10	1.00 U	1.30	1.00 U	1.00 U	1.00 U
Cadmium	–/9.3	1.1/–	4.00 U	4.00 U	4.00 U	4.00 U	4.00 U	4.00 U	4.00 U	4.00 U
Cadmium (dissolved)			4.00 U	4.00 U	4.00 U	4.00 U	4.00 U	4.00 U	4.00 U	4.10
Calcium			92,300	92,200 J	108,000 J	110,000 J	110,000	91,200 J	90,200 J	10,300 J
Calcium (dissolved)			90,900	92,600	110,000	115,000	105,000	93,400	92,800	107,000
Chromium	11/50		8.00 U	8.00 U	8.00 U	8.00 U	8.00 U	8.00 U	8.00 U	8.00 U
Chromium (dissolved)			8.00 U	8.00 U	8.00 U	8.00 U	8.00 U	8.00 U	8.00 U	8.00 U
Cobalt			6.00 U	6.00 U	6.00 U	6.00 U	6.00 U	6.00 U	6.00 U	6.00 U
Cobalt (dissolved)			6.00 U	6.00 U	7.50 U	6.00 U	6.00 U	6.00 U	6.00 U	6.00 U
Copper	–/2.9	12/2.9	7.70 J (c)	5.00 UJ	5.00 UJ	5.00 UJ	5.80 J (c)	5.00 UJ	5.00 UJ	5.00 UJ
Copper (dissolved)			5.00 U	5.00 U	5.00 U	5.00 U	5.90 J (c)	5.00 U	5.00 U	5.00 U
Iron			812	14,600	1,110	1,210	2,360	3,820	7,390	1,090
Iron (dissolved)			112	19.00 U	80.90	89.90	119	19.00 U	20.60	37.90
Lead		3.2/8.5	2.00 U	7.90 J	2.10 J	2.70 J	2.00 U	2.40 J	3.90 J	2.20 J
Lead (dissolved)			2.00 U	2.00 UJ	2.50 J	20.00 UJ	2.00 U	2.00 UJ	2.00 UJ	2.00 UJ
Magnesium			2,660	20,200 J	186,000 J	187,000 J	3,030	2,090 J	2,070 J	143,000 J
Magnesium (dissolved)			2,640	32,800	185,000	196,000	2,850	2,180	2,030	136,000
Manganese			299	330 J	293 J	312 J	1,320	87.90 J	95.30 J	341 J
Manganese (dissolved)			210	243	271	278	1,180 *	41.30	30.60	308
Mercury	.012/.025	.012/.025	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Mercury (dissolved)			0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Nickel	–/8.3	160/8.3	18.00 U	59.90 J (c)	18.00 U	18.00 U	18.00 U	18.00 U	18.00 U	18.00 U
Nickel (dissolved)			18.00 U	18.00 U	24.60 J (c)	18.00 U	18.00 U	18.00 U	18.80 J (c)	52.70 J (c)
Potassium			1,520	8,520 J	62,900 J	62,600 J	2,360	1,840 J	2,180 J	48,300 J
Potassium (dissolved)			2,520	10,900 J	62,800 J	64,400 J	1,800	970 J	1,340 J	45,300 J
Selenium	5/71	5/71	2.00 UJ	2.00 UJ	2.00 UJ	5.80	2.00 UJ	2.00 UJ	2.00 UJ	2.00 UJ
Selenium (dissolved)			2.00 UJ	2.00 UJ	2.00 UJ	20.00 UJ	2.00 UJ	2.00 UJ	2.00 UJ	20.00 U
Silver			6.00 U	6.00 U	6.00 U	6.00 U	6.00 U	6.00 U	6.00 U	6.00 U
Silver (dissolved)			6.00 U	6.00 UJ	6.00 UJ	6.00 UJ	6.00 U	6.00 UJ	6.00 UJ	6.00 UJ
Sodium			5,470 J	153,000 J	284,000 J	273,000 J	5,660 J	7,500 J	5,880 J	189,000 J
Sodium (dissolved)			5,280 J	254,000 J	1,510,000 J	1,640,000 J	5,370 J	7,200 J	5,680 J	1,130,000 J
Thallium			2.00 UJ	2.00 UJ	20.00 UJ	20.00 UJ	2.00 UJ	2.00 UJ	2.00 UJ	20.00 UJ
Thallium (dissolved)			2.00 UJ	2.00 UJ	2.00 UJ	20.00 UJ	2.00 UJ	2.00 UJ	2.00 UJ	20.00 UJ
Vanadium			6.00 U	16.50 J	6.00 UJ	6.00 UJ	6.00 UJ	6.00 UJ	6.00 UJ	6.00 UJ
Vanadium (dissolved)			6.00 U	6.00 U	17.40 *	6.00 U	6.00 U	6.00 U	6.00 U	7.90
Zinc	–/86	110/86	23.70 J	49.30 U	40.70 U	17.40 U	12.70 J	20.70 U	22.50 U	14.50 U
Zinc (dissolved)			18.50 J	15.20	12.50	9.30	21.10 J	9.60	14.20	10.20

Shaded cell indicates concentration exceeds one or more ARARs.
(c) Exceeds both VWQS and CWA criteria.

TABLE 2-3

ROUND ONE RI
SITE 8
INORGANIC CONCENTRATIONS (µg/L) IN GROUNDWATER
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

SITE ID	Federal	Federal	VQS	4GW01-001	4GW02-001	4GW03-001	4GW04-001	4GW05-001	8HP01-001	21GW01-001	21GW02-001	21GW02-101	21GW03-001	21GW04-001
ANALYTE	MCL	SMCL												
Aluminum		200		53,700 J (d)	84,300 J (d)	70,800 J (d)	26,000 J (d)	154,000 J (d)	27,700 J (d)	53,700 J (d)	10,300 U (d)	41,800 J (d)	180,300 J (d)	28,900 J (d)
Aluminum (dissolved)				150 J	35.00 UJ	58.00 UJ	35.00 UJ	88.00 UJ	35.00 UJ	35.00 UJ	35.00 UJ	35.00 UJ	35.00 UJ	35.00 UJ
Antimony	6			44.00 U	44.00 U	44.00 U	44.00 U	44.00 U	44.00 R	44.00 U	44.00 U	44.00 U	44.00 U	44.00 U
Antimony (dissolved)				44.00 U	44.00 U	44.00 U	44.00 U	45.70 (b)	44.00 R	44.00 U	44.00 U	44.00 U	44.00 U	44.00 U
Arsenic	50		50	20.60	5.00	2.00 U	13.30	4.70	5.40 J	2.70	5.80	3.30	5.40	2.00 U
Arsenic (dissolved)				2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U
Barium	2,000		1,000	250 *	174 *	253 *	102	287 *	194 J *	193 *	225 *	222 *	412 *	110
Barium (dissolved)				6.60 U	26.60 U	24.80 U	22.00 U	77.10 *	61.00	3.00 U	147 *	159 *	112 *	17.30 U
Beryllium	4			2.20 (b)	1.60 (b)	1.30 (b)	3.30 *	4.20 (b)	1.50 (b)	1.40 (b)	2.10 *	2.90 *	6.30 (b)	2.30
Beryllium (dissolved)				1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Cadmium	5		0.04	6.20 U (d)	4.00 UJ	6.20 U (d)	4.00 UJ	4.80 U (d)	4.00 U	5.60 U (d)	53.20 (d)	62.10 (d)	141.15 (d)	4.00 UJ
Cadmium (dissolved)				4.00 UJ	4.00 UJ	4.00 UJ	4.00 UJ	4.00 UJ	4.00 U	4.00 UJ	25.40 U (d)	68.40 U (d)	199.80 (d)	4.00 UJ
Calcium				52,900	231,000 *	839,000 *	465,000 *	127,000,000 *	894,000 J *	45,200	99,700	92,700	59,200	151,000
Calcium (dissolved)				41,300	133,000	152,000	140,000	322,000 *	110,000	19,800	111,000	115,000	45,100	125,000
Chromium	100		50	17.4 (d)	7.50 (d)	28.6 (d)	14.54 (d)	20.3 (d)	6.53 (d)	2.24 (d)	35.70	36.40	68.7 (d)	24.40 (d)
Chromium (dissolved)				8.00 U	8.00 U	8.00 U	8.00 U	8.00 U	8.00 U	8.00 U	8.00 U	8.00 U	8.00 U	8.00 U
Cobalt				80.40 *	42.00 U	59.10 *	29.10 U	82.10 *	29.30 J *	146 *	202 *	202 *	93.50 *	25.30 U
Cobalt (dissolved)				6.00 U	6.00 U	6.00 U	6.00 U	6.00 U	6.00 U	6.00 U	6.00 U	9.90 U	29.70 U	6.00 U
Copper	1,300**	1,000	1000	31.70 U	28.70 U	25.60 U	16.60 U	17.70 U	24.80 J *	27.70 U	52.40 U	47.50 U	45.50 U	16.80 U
Copper (dissolved)				5.00 UJ	5.00 UJ	5.00 UJ	5.00 UJ	5.00 UJ	5.00 U	5.00 UJ	5.00 UJ	5.00 UJ	5.00 UJ	5.00 UJ
Iron		300	300	168,000 J (d)	21,000 J (d)	226,000 J (d)	99,600 J (d)	62,000 J (d)	12,000 J (d)	898,000 J (d)	21,600 J (d)	23,000 J (d)	180,000 J (d)	72,200 J (d)
Iron (dissolved)				219 J (d)	19.00 U	19.00 U	19.00 U	19.00 U	29.10 U	127 U	19.00 U	21,960 J (d)	19.00 U	19.00 U
Lead	15**		50	54.80 (d)	83.80 (d)	65.50 (d)	29.20 (d)	54.10 (d)	20.20 (d)	83.00 (d)	40.40 (d)	46.80 (d)	68.30 (d)	19.80 (d)
Lead (dissolved)				2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 UJ
Magnesium				10,700 J *	13,700 *	25,900 J *	13,300 J *	31,900 J *	18,500 J *	9,640 J *	10,500 J *	10,300 J *	13,700 J *	8,210 J *
Magnesium (dissolved)				2,150 J	2,360 J	3,410 J	2,820 J	11,900 J *	2,200	2,820 J	8,880 J *	9,180 J *	4,230 J *	4,670 J *
Manganese		50	50	1,200 (d)	1,070 (d)	2,200 (d)	1,040 (d)	3,110 (d)	1,640 (d)	3,090 (d)	2,650 (d)	2,870 (d)	1,740 (d)	1,288 (d)
Manganese (dissolved)				11.50	26.90	2.00 U	3.90	1,230 (d)	7.50	5.40	798 (d)	898 (d)	9,630 (d)	71.40 *
Mercury	2		0.05	0.218 (b)	0.10 U	0.10 U	0.10 U	0.10 U	0.10 UJ	0.25 (b)	0.10 U	0.10 U	0.25 (b)	0.10 U
Mercury (dissolved)				0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 UJ	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Nickel	100			94.70	118 (b)	208 (b)	63.60	209 (b)	89.30 J	93.30	58.30	59.20	137 (b)	27.30
Nickel (dissolved)				18.00 U	18.00 U	18.00 U	18.00 U	18.00 U	18.00 U	18.00 U	18.00 U	33.40	33.00	18.00 U
Potassium				5,220 U	8,900 *	18,300 *	10,200 *	18,800 *	21,400 *	3,920 U	6,750 *	5,770 U	11,200 *	3,530 U
Potassium (dissolved)				970 U	2,350 U	970 U	970 U	3,220 U	1,660	1,460 U	3,360 U	4,350 U	6,030 U	970 U
Selenium	50		10	2.00 UJ	2.00 UJ	20.00 UJ	2.00 UJ	20.00 UJ	20.00 R	2.00 UJ	2.00 UJ	2.00 UJ	2.00 UJ	2.00 UJ
Selenium (dissolved)				2.00 UJ	2.00 UJ	2.00 UJ	2.00 UJ	2.00 UJ	2.00 UJ	2.00 UJ	2.00 UJ	2.00 UJ	2.00 UJ	2.00 UJ
Silver		100		6.00 UJ	6.00 UJ	6.00 UJ	6.00 UJ	6.00 UJ	6.00U	6.00 UJ	6.00 UJ	6.00 UJ	6.00 UJ	6.00 UJ
Silver (dissolved)				6.00 UJ	6.00 UJ	6.00 UJ	6.00 UJ	7.50 J	6.00 R	6.00 UJ	6.00 UJ	6.00 UJ	6.00 UJ	6.00 UJ
Sodium			100,000	4,790	6,140	11,700 *	7,110	9,140	13,100 J *	3,480	4,240	4,260	6,130	5,490
Sodium (dissolved)				4,870	5,990	7,620	5,080	5,620	7,950	5,580	4,410	4,480	5,620	4,950
Thallium	2			2.00 UJ	2.00 U	2.00 U	2.00 U	2.00 U	2.00 UJ	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U
Thallium (dissolved)				2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 UJ	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U
Vanadium				136 *	97.80 *	201 *	132 *	132 *	120 J *	394 *	39.10 *	43.50 *	172 *	98.60 *
Vanadium (dissolved)				6.00 U	6.00 U	6.00 U	6.00 U	6.00 U	17.90 U	6.00 U	6.00 U	7.90	6.60	6.00 U
Zinc		5,000	50	97.5 (d)	26 (d)	73 (d)	26 (d)	54 (d)	218 (d)	482 (d)	10,100 (d)	10,200 (d)	30,600 (d)	263 (d)
Zinc (dissolved)				10.30	12.60	13.30	17.70	22.60	9.70 J	8.00	8,070 (d)	9,800 (d)	2,490,000 (d)	24.50
Nitrates	10,000		5,000	250	100 U	220	110	620	1000	690	25,100 (d)	24,900 (d)	11,100 (d)	5,500 (d)

Shaded cell indicates concentration exceeds one or more ARARs.
(a) Exceeds VQS.
(b) Exceeds federal MCL.
(c) Exceeds federal SMCL.
(d) Exceeds federal MCL and VQS.
(e) Exceeds SMCL and VQS.

TABLE 2-4

ROUND ONE RI
SITE 8
INORGANIC CONCENTRATIONS (µg/L) IN SURFACE WATER
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

SITE ID	VWQS	CWA	4SW02-001	4SW03-001	4SW04-001	4SW05-001	4SW06-001	8SW01-001	8SW03-001	8SW04-001
ANALYTE	Criteria	Criteria								
Aluminum			670 J	40,500	255 J	5,630	642 J	545 J	803 J	1,490 J
Aluminum (dissolved)			62.20 U	58.00 U	114 U	69.20 U	35.00 U	91.40 U	35.00 U	38.90 U
Antimony			44.00 U	44.00 U	44.00 U	44.00 U	44.00 U	44.00 U	44.00 U	44.00 U
Antimony (dissolved)			44.00 U	44.10	44.00 U	44.00 U	44.00 U	44.00 U	66.10	44.00 U
Arsenic		190/36	2.60 J	24.30 (a)	2.00 U	3.30 J	20.00 UJ	2.50 J	3.10 J	3.20 J
Arsenic (dissolved)			2.10 J	3.10	2.00 UJ	2.00 UJ	20.00 UJ	2.40 J	2.00 J	2.50 J
Barium			20.00	243	31.60	61.60	29.70	18.00	19.00	22.00
Barium (dissolved)			22.00	81.20 J	30.70 J	26.70 J	28.40 J	17.20	18.70	42.80
Beryllium			1.00 U	2.20 *	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Beryllium (dissolved)			1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Cadmium	–/9.3	1.1/–	4.00 U	11.60 (b)	4.00 U	4.00 U	4.00 U	4.00 U	4.00 U	4.00 U
Cadmium (dissolved)			7.30	4.00 U	4.00 U	4.00 U	4.00 U	4.00 U	4.00 U	4.00 U
Calcium			70,300 J	86,200 J	65,900 J	67,900 J	116,000 J	53,600 J	63,100 J	58,800 J
Calcium (dissolved)			76,800	71,100	66,800	63,900	131,000	56,500	65,800	61,800
Chromium	11/50		8.00 U	46.00	8.00 U	8.00 U	8.00 U	8.00 U	8.00 U	8.00 U
Chromium (dissolved)			8.00 U	8.00 U	8.00 U	8.00 U	8.00 U	8.00 U	8.00 U	8.00 U
Cobalt			6.00 U	25.20	6.00 U	6.00 U	6.00 U	6.00 U	6.00 U	6.00
Cobalt (dissolved)			6.00 U	8.10 U	6.00 U	10.10 U	6.00 U	6.00 U	6.00 U	6.00 U
Copper	–/2.9	12/2.9	5.00 U	200 (c)	5.00 UJ	7.70 J (c)	5.00 UJ	5.10 (c)	5.00 U	6.10 (c)
Copper (dissolved)			5.00 U	5.10 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
Iron			2,320 J	143,000	1,050	16,100	1,580	2,280 J	2,740 J	4,450 J
Iron (dissolved)			31.60	528	107	50.00	63.10	87.70	39.00	50.10
Lead		3.2/8.5	2.00 U	215 J (a)	6.50 J	25.30 (a)	2.80 J	2.80	2.50 (a)	2.40 J
Lead (dissolved)			20.00 R	2.00 UJ	2.00 UJ	2.20 UJ	20.00 UJ	20.00 R	20.00 R	20.00 R
Magnesium			107,000 J	4,010 J	3,610 J	5,700 J	272,000 J	33,800 J	66,400 J	54,100 J
Magnesium (dissolved)			117,000 J	2,690	3,720	5,140	311,000 *	36,800 J	69,600 J	56,400 J
Manganese			208 J	1,020 J	63.50 J	977 J	503 J	186 J	214 J	210 J
Manganese (dissolved)			195 J	446	54.30	147	567	173 J	200 J	169 J
Mercury	.012/.025	.012/.025	0.10 U	2.56 (c)	0.10 U	0.13 (c)	0.10 U	0.10 U	0.10 U	0.10 U
Mercury (dissolved)			0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	18.00 U
Nickel	–/8.3	160/8.3	18.00 U	20.10 (c)	18.00 U	29.00 (c)	18.00 U	18.00 U	21.20 (c)	18.00 U
Nickel (dissolved)			18.00 U	18.10 (c)	18.00 U	18.00 U	22.20 (c)	18.00 U	18.00 U	21.30 (c)
Potassium			37,300 J	2,930 J	1,790 J	2,420 J	89,900 J	13,900 J	25,200 J	21,100 J
Potassium (dissolved)			42,500	970 U	970 U	1,440 J	105,000 J *	14,600	26,200	20.00 R
Selenium	5/71	5/71	2.00 R	2.00 UJ	2.00 UJ	2.00 UJ	20.00 UJ	2.00 R	2.00 R	2.00 R
Selenium (dissolved)			20.00 R	2.00 UJ	2.00 U	2.00 U	20.00 UJ	20.00 R	20.00 R	6.00 U
Silver			6.00 U	6.00 U	6.00 U	6.00 U	6.00 U	6.00 U	6.00 U	6.00 U
Silver (dissolved)			6.00 U	6.00 UJ	6.00 UJ	6.00 UJ	6.00 UJ	6.00 U	6.00 U	460,000 *
Sodium			997,000	4,690 J	4,650 J	12,600 J	331,000 J	277,000	531,000	442,000
Sodium (dissolved)			1,010,000	4,570 J	4,760 J	11,600 J	2,560,000 J *	297,000	559,000	2.00 R
Thallium			2.00 UJ	2.00 UJ	2.00 UJ	2.00 UJ	2.00 UJ	2.00 UJ	2.00 UJ	2.00 UJ
Thallium (dissolved)			20.00 R	2.00 UJ	2.00 UJ	2.00 UJ	20.00 UJ	20.00 R	20.00 R	6.00 U
Vanadium			6.00 U	37.80 J	6.00 UJ	6.00 UJ	6.40 J	6.00 U	6.40	8.80
Vanadium (dissolved)			6.00 U	6.00 U	6.00 U	6.00 U	10.40	6.00 U	7.10	8.20
Zinc	–/86	110/86	61.10	3,680 * (b)	57.10 U	786 (b)	36.90 U	27.50 U	50.70	30.00 U
Zinc (dissolved)			6.00 U	30.40	19.10	13.80	9.80	6.10	6.00 U	8.20

Shaded cell indicates concentration exceeds one or more ARARs.
(a) Exceeds CWA salt water chronic criteria.
(b) Exceeds VWQS salt water chronic criteria.
(c) Exceeds both CWA and VWQS salt water chronic criteria.

TABLE 2-5

METALS CONCENTRATIONS FOR SOILS COLLECTED DURING THE ROUND ONE RI ACTIVITIES
SITE 18
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

SITE ID	18S05-001	18S06-001	18S07-001	18S08-001	18S09-001	18S10-001
ANALYTE						
Aluminum	6900	5910	6140	5560	4430	6850
Antimony	9.890 UJ	11.000 UJ	10.200 UJ	10.400 UJ	10.300 UJ	10.600 UJ
Arsenic	0.710 J	180.000 J *	0.470 UJ	5.800 J *	4.400 J *	3.700 J *
Barium	32.8	18.2	8.9	22.1	16.2	32.4
Beryllium	0.290 J	0.250 UJ	0.230 UJ	0.240 UJ	0.230 UJ	0.240 UJ
Cadmium	0.9U	1U	0.92U	0.95U	0.93U	0.97U
Calcium	873 *	1200 *	1120 *	2330 *	1080 *	1260 *
Chromium	8.3	11.2	10.5	10.9	5.9	8.5
Cobalt	2.2	2.1	1.7	1.8	1.4U	1.9
Copper	3.2	9.5 *	1.9	12.6 *	3.5	6.9 *
Iron	8990	11500	14600 *	8920	5690	9170
Lead	8.500 J	12.9J	6.300 J	27.100 J *	11.200 J	27.500 J *
Magnesium	264	215	116	240	148	232
Manganese	27.900 J	27.200 J	15.800 J	24.800 J	19.300 J	22.900 J
Mercury	0.06U	0.07	0.06U	0.06U	0.06U	0.06
Nickel	4.2	4.48U	4.15U	4.27U	4.2U	4.35U
Potassium	322	289	224U	246	226U	234U
Selenium	0.470 R	0.500 R	0.470 R	0.490 R	0.470 R	0.500 R
Silver	1.350 R	1.490 R	1.380 R	1.420 R	1.400 R	1.450 R
Sodium	24.1	28.6	25	31.1	23.4	40.6
Thallium	0.47U	0.5U	0.47U	0.49U	0.47U	0.5U
Vanadium	13.1	19	14.3	19.4	10.5	13.3
Zinc	26.4 *	29.6 *	8.9	110 *	17.7	34.8 *

TABLE 2-6

ROUND ONE RI
SITE 18
INORGANIC CONCENTRATIONS (µg/L) IN GROUNDWATER
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

SITE ID	Federal	Federal	VGS	18HP01-001
ANALYTE	MCL	SMCL		
Aluminum		200		44,000(c) *
Aluminum (dissolved)				35.00 U
Antimony	6			44.00 R
Antimony (dissolved)				44.00 R
Arsenic	50		50	2.00 R
Arsenic (dissolved)				2.00 R
Barium	2,000		1,000	505 *
Barium (dissolved)				3.00 U
Beryllium	4			7.50 J *
Beryllium (dissolved)				1.00 UJ
Cadmium	5		0.04	12.60 J(d) *
Cadmium (dissolved)				4.00 UJ
Calcium				19,600
Calcium (dissolved)				14.00 U
Chromium	100		50	294 J(d) *
Chromium (dissolved)				8.00 U
Cobalt				34.40 *
Cobalt (dissolved)				6.00 U
Copper	1,300**	1,000	1000	144 J *
Copper (dissolved)				5.00 U
Iron		300	300	83,000 J(e) *
Iron (dissolved)				73.40 J
Lead	15**		50	260 J(d) *
Lead (dissolved)				9.20 J
Magnesium				6,780 *
Magnesium (dissolved)				36.00 U
Manganese		50	50	849 J(e) *
Manganese (dissolved)				2.00 U
Mercury	2		0.05	0.73 J(a) *
Mercury (dissolved)				0.10 UJ
Nickel	100			23.20
Nickel (dissolved)				18.00 U
Potassium				6,510 *
Potassium (dissolved)				970 U
Selenium	50		10	2.00 R
Selenium (dissolved)				2.00 R
Silver		100		27.00
Silver (dissolved)				6.00 U
Sodium			100,000	3,460
Sodium (dissolved)				51.00 U
Thallium	2			2.00 UJ
Thallium (dissolved)				2.00 UJ
Vanadium				508 *
Vanadium (dissolved)				6.00 U
Zinc		5,000	50	357 J(a) *
Zinc (dissolved)				6.60 J
Nitrates	10,000		5,000	NA

Shaded cell indicates concentration exceeds one or more ARARs.
(a) Exceeds VGS.
(c) Exceeds federal SMCL.
(d) Exceeds federal MCL and VGS.
(e) Exceeds SMCL and VGS.

TABLE 2-7

ROUND ONE RI
SITE 18
INORGANIC CONCENTRATIONS (µg/L) IN SURFACE WATER
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

SITE ID	VWQS	CWA	18SW01-001	18SW02-001	18SW04-001	18SW05-001	18SW06-001
ANALYTE	Criteria	Criteria					
Aluminum			215	89.40	192	288	152
Aluminum (dissolved)			35.00 U	35.00 U	35.00 U	60.60	35.00 U
Antimony			44.00 U	44.00 U	44.00 U	44.00 U	44.00 U
Antimony (dissolved)			44.00 U	44.00 U	44.00 U	44.00 U	44.00 U
Arsenic		190/36	4.00	2.00 U	4.10	3.20	2.20
Arsenic (dissolved)			4.10	2.00 U	3.50	3.20	2.00 U
Barium			13.30	55.50	15.60	15.10	29.80
Barium (dissolved)			9.50	33.60	11.30	14.30	25.00
Beryllium			1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Beryllium (dissolved)			1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Cadmium	--/9.3	1.1/--	4.00 U	4.00 U	4.00 U	4.00 U	4.00 U
Cadmium (dissolved)			4.00 U	4.00 U	4.00 U	4.00 U	4.00 U
Calcium			19,900 J	87,600 J	11,600 J	10,600 J	90,400 J
Calcium (dissolved)			20,100 J	88,000 J	11,600 J	10,500 J	97,500 J
Chromium	11/50		8.00 U	8.00 U	8.00 U	8.00 U	8.00 U
Chromium (dissolved)			8.00 U	8.00 U	8.00 U	8.00 U	8.00 U
Cobalt			6.00 U	6.70	6.00 U	6.00 U	6.00 U
Cobalt (dissolved)			6.00 U	6.00 U	6.00 U	6.00 U	6.00 U
Copper	--/2.9	12/2.9	7.40 (c)	5.00 U	4.99 (c)	6.90 (c)	5.00 U
Copper (dissolved)			3.20 (c)	5.00 U	3.92 (c)	4.90 (c)	5.00 U
Iron			420 J	291 J	217 J	379 J	1,680 J
Iron (dissolved)			69.40 UJ	19.00 UJ	96.10 UJ	129 UJ	19.00 UJ
Lead		3.2/8.5	2.00 UJ	2.00 UJ	2.00 UJ	2.00 UJ	2.00 UJ
Lead (dissolved)			2.00 UJ	2.00 U	2.00 UJ	2.00 UJ	2.00 U
Magnesium			894	2,380	860	760	1,970
Magnesium (dissolved)			798	2,240	772	738	2,130
Manganese			43.90	29.40	26.50	32.90	267
Manganese (dissolved)			46.90	21.70	24.50	33.60	275
Mercury	.012/.025	.012/.025	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Mercury (dissolved)			0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Nickel	--/8.3	160/8.3	18.00 U	18.00 U	18.00 U	18.00 U	18.00 U
Nickel (dissolved)			18.00 U	18.00 U	18.00 U	18.00 U	18.00 U
Potassium			1,480	970 U	1,210	1,810	1,590
Potassium (dissolved)			970 UJ	970 UJ	970 UJ	970 UJ	1,120 J
Selenium	5/71	5/71	2.00 R	2.00 R	2.00 R	2.00 R	2.00 R
Selenium (dissolved)			2.00 R	2.00 R	2.00 R	2.00 R	2.00 R
Silver			6.00 U	6.00 U	6.00 U	6.00 U	6.00 U
Silver (dissolved)			6.00 U	6.00 U	6.00 U	6.00 U	6.00 U
Sodium			2,870 J	9,040 J	3,750 J	2,630 J	8,230 J
Sodium (dissolved)			2,930 J	9,390 J	3,400 J	2,790 J	9,140 J
Thallium			2.00 U	2.00 U	2.00 U	2.00 U	2.00 U
Thallium (dissolved)			2.00 UJ	2.00 U	2.00 UJ	2.00 UJ	2.00 UJ
Vanadium			6.00 U	6.10	8.80	8.80	6.00 U
Vanadium (dissolved)			6.00 U	6.00 U	6.00 U	8.30	6.00
Zinc	--/86	110/86	158 (c)	33.10 U	369 (c)	179 (c)	20.70 U
Zinc (dissolved)			144 (c)	13.50	360 (c)	178 (c)	10.70

Shaded cell indicates concentration exceeds one or more ARARs.
(c) Exceeds both VWQS and CWA criteria.

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Volatile Parameters	Sample Identification[a]							
	02-SS-29	02-SS-30	02-SS-30D	02-SS-31	02-SS-32	02-SS-33	02-SS-34	Trip Blank
Chloromethane	12U	12U	12U	11U	12U	21U	14U	10U
Bromomethane	12U	12U	12U	11U	12U	21U	14U	10U
Vinyl chloride	12U	12U	12U	11U	12U	21U	14U	10U
Chloroethane	12U	12U	12U	11U	12U	21U	14U	10U
Methylene chloride	7BJ	9BJ	4BJ	6BJ	7BJ	14BJ	10BJ	1BJ
Acetone	12U	11J	13	11U	12U	21U	14U	29
Carbon disulfide	12U	12U	12U	11U	12U	21U	14U	10U
1,1-Dichloroethene	12U	12U	12U	11U	12U	21U	14U	10U
1,1-Dichloroethane	12U	12U	12U	11U	12U	21U	14U	10U
1,2-Dichloroethene (total)	12U	12U	12U	11U	12U	21U	14U	10U
Chloroform	12U	12U	12U	11U	12U	21U	14U	10U
1,2-Dichloroethane	12U	12U	12U	11U	12U	21U	14U	10U
2-Butanone	10J	11J	11J	8J	9J	21U	14U	6BJ
1,1,1-Trichloroethane	12U	12U	12U	11U	12U	21U	14U	10U
Carbon tetrachloride	12U	12U	12U	11U	12U	21U	14U	10U
Vinyl acetate	12U	12U	12U	11U	12U	21U	14U	10U
Bromodichloromethane	12U	12U	12U	11U	12U	21U	14U	10U
1,2-Dichloropropane	12U	12U	12U	11U	12U	21U	14U	10U
cis-1,3-Dichloropropene	12U	12U	12U	11U	12U	21U	14U	10U
Trichloroethene	12U	12U	12U	11U	12U	21U	14U	10U
Dibromochloromethane	12U	12U	12U	11U	12U	21U	14U	10U
1,1,2-Trichloroethane	12U	12U	12U	11U	12U	21U	14U	10U
Benzene	12U	12U	12U	11U	12U	21U	14U	10U
trans-1,3-Dichloropropene	12U	12U	12U	11U	12U	21U	14U	10U
Bromoform	12U	12U	12U	11U	12U	21U	14U	10U
4-Methyl-2-pentanone	12U	12U	12U	11U	12U	21U	14U	10U
2-Hexanone	12U	12U	12U	11U	12U	21U	14U	10U
Tetrachloroethene	12U	12U	12U	11U	12U	21U	14U	10U
1,1,2,2-Tetrachloroethane	12U	12U	12U	11U	12U	21U	14U	10U
Toluene	12U	12U	12U	11U	1J	21U	14U	10U
Chlorobenzene	12U	12U	12U	11U	12U	21U	14U	10U
Ethylbenzene	12U	12U	12U	11U	12U	21U	14U	10U
Styrene	12U	12U	12U	11U	12U	21U	14U	10U
Xylenes (total)	12U	12U	12U	11U	12U	21U	14U	10U

[a] Sample Date: 11/16/94, Analysis Date: 11/22/94.
Concentration units: microgram(s) per kilogram (ug/kg), dry weight basis.

Notes: U - Compound was not detected, has been reported at the Contract Required Quantitation Limit (CRQL).
B-Compound detected in the associated method blank.
J - Compound detected below the CRQL and reported as estimated.

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Volatile Parameters	Sample Identification[a]								
	02-SS-21	02-SS-22	02-SS-23	02-SS-24	02-SS-25	02-SS-26	02-SS-27	02-SS-28	02-SS-28RE
Chloromethane	12U	12U	12U	12U	12U	11U	12U	16U	16U
Bromomethane.	12U	12U	12U	12U	12U	11U	12U	16U	16U
Vinyl chloride	12U	12U	12U	12U	12U	11U	12U	16U	16U
Chloroethane	12U	12U	12U	12U	12U	11U	12U	16U	16U
Methylene chloride	4BJ	4BJ	4BJ	4BJ	6BJ	4BJ	4BJ	25B	16B
Acetone	12U	5BJ	12U	5BJ	12U	7BJ	12U	16U	4BJ
Carbon disulfide	12U	12U	12U	12U	12U	11U	12U	6J	3J
1,1-Dichloroethene	12U	12U	12U	12U	12U	11U	12U	16U	16U
1,1-Dichloroethane	12U	12U	12U	12U	12U	11U	12U	16U	16U
1,2-Dichloroethene (total)	12U	12U	12U	12U	12U	11U	12U	16U	16U
Chloroform	12U	12U	12U	12U	12U	11U	12U	16U	16U
1,2-Dichloroethane	12U	12U	12U	12U	12U	11U	12U	16U	16U
2-Butanone	9BJ	9BJ	10BJ	7BJ	9BJ	8BJ	6BJ	16U	9BJ
1,1,1-Trichloroethane	12U	12U	12U	12U	12U	11U	12U	16U	16U
Carbon tetrachloride	12U	12U	12U	12U	12U	11U	12U	16U	16U
Vinyl acetate	12U	12U	12U	12U	12U	11U	12U	16U	16U
Bromodichloromethane	12U	12U	12U	12U	12U	11U	12U	16U	16U
1,2-Dichloropropane	12U	12U	12U	12U	12U	11U	12U	16U	16U
cis-1,3-Dichloropropene	12U	12U	12U	12U	12U	11U	12U	16U	16U
Trichloroethene	1J	12U	12U	12U	12U	11U	12U	16U	16U
Dibromochloromethane	12U	12U	12U	12U	12U	11U	12U	16U	16U
1,1,2-Trichloroethane	12U	12U	12U	12U	12U	11U	12U	16U	16U
Benzene	2J	12U	12U	12U	12U	11U	12U	16U	16U
trans-1,3-Dichloropropene	12U	12U	12U	12U	12U	11U	12U	16U	16U
Bromoform	12U	12U	12U	12U	12U	11U	12U	16U	16U
4-Methyl-2-pentanone	12U	12U	12U	12U	12U	11U	12U	16U	16U
2-Hexanone	12U	12U	12U	12U	12U	11U	12U	16U	16U
Tetrachloroethene	12U	12U	1J	12U	4J	11U	12U	16U	16U
1,1,2,2-Tetrachloroethane	12U	12U	12U	12U	12U	11U	12U	16U	16U
Toluene	2J	2J	12U	12U	12U	11U	12U	2J	16U
Chlorobenzene	12U	12U	12U	12U	12U	11U	12U	16U	16U
Ethylbenzene	12U	12U	12U	12U	12U	11U	12U	16U	16U
Styrene	12U	12U	12U	12U	12U	11U	12U	16U	16U
Xylenes (total)	12U	12U	12U	2J	12U	11U	12U	16U	16U

[a] Sample Date: 11/15/94, Analysis Date: 11/22,23/94.
Concentration units: microgram(s) per kilogram (ug/kg), dry weight basis.

Notes: U - Compound was not detected, has been reported at the Contract Required Quantitation Limit (CRQL).
B-Compound detected in the associated method blank.
J - Compound detected below the CRQL and reported as estimated.

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Volatile Parameters	Sample Identification[a]											
	02-SS-01	02-SS-02	02-SS-03	02-SS-04	02-SS-05	02-SS-06	02-SS-07	02-SS-08	02-SS-09	02-SS-10	02-SS-10D	Trip Blank
Chloromethane	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
Bromomethane	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
Vinyl chloride	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
Chloroethane	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
Methylene chloride	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
Acetone	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
Carbon disulfide	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
1,1-Dichloroethene	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
1,1-Dichloroethane	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
1,2-Dichloroethene (total)	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
Chloroform	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
1,2-Dichloroethane	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
2-Butanone	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
1,1,1-Trichloroethane	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
Carbon tetrachloride	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
Vinyl acetate	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
Bromodichloromethane	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
1,2-Dichloropropane	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
cis-1,3-Dichloropropene	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
Trichloroethene	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
Dibromochloromethane	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
1,1,2-Trichloroethane	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
Benzene	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
trans-1,3-Dichloropropene	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
Bromoform	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
4-Methyl-2-pentanone	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
2-Hexanone	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
Tetrachloroethene	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
1,1,2,2-Tetrachloroethane	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
Toluene	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
Chlorobenzene	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
Ethylbenzene	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
Styrene	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U
Xylenes (total)	14U	13U	12U	13U	12U	12U	12U	12U	12U	12U	13U	10U

[a] Sample Date: 11/4/94, Analysis Date: 11/10,11/94.
Concentration units: microgram(s) per kilogram (ug/kg), dry weight basis.

Notes: U - Compound was not detected, has been reported at the Contract Required Quantitation Limit (CRQL).
J - Compound detected below the CRQL and reported as estimated.

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Volatile Parameters	Sample Identification[a]										
	02-SS-11	02-SS-12	02-SS-13	02-SS-14	02-SS-15	02-SS-16	02-SS-17	02-SS-18	02-SS-19	02-SS-20	02-SS-20D
Chloromethane	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
Bromomethane	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
Vinyl chloride	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
Chloroethane	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
Methylene chloride	12U	10U	12U	15U	12U	11U	12U	12U	3J	12U	12U
Acetone	12U	10U	12U	15U	12U	11U	12U	12U	51	12U	6J
Carbon disulfide	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
1,1-Dichloroethene	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
1,1-Dichloroethane	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
1,2-Dichloroethene (total)	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
Chloroform	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
1,2-Dichloroethane	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
2-Butanone	12U	10U	12U	15U	12U	11U	12U	12U	13U	9J	10J
1,1,1-Trichloroethane	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
Carbon tetrachloride	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
Vinyl acetate	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
Bromodichloromethane	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
1,2-Dichloropropane	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
cis-1,3-Dichloropropene	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
Trichloroethene	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
Dibromochloromethane	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
1,1,2-Trichloroethane	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
Benzene	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
trans-1,3-Dichloropropene	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
Bromoform	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
4-Methyl-2-pentanone	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
2-Hexanone	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
Tetrachloroethene	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
1,1,2,2-Tetrachloroethane	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
Toluene	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
Chlorobenzene	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
Ethylbenzene	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
Styrene	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U
Xylenes (total)	12U	10U	12U	15U	12U	11U	12U	12U	13U	12U	12U

[a] Sample Date: 11/14/94, Analysis Date: 11/16,17/94.
Concentration units: microgram(s) per kilogram (ug/kg), dry weight basis.

Notes: U - Compound was not detected, has been reported at the Contract Required Quantitation Limit (CRQL).
J - Compound detected below the CRQL and reported as estimated.

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Volatile Parameters	Sample Identification[a]						
	02-SS-43	02-SS-44	02-SS-45	02-SS-46	02-SS-47	02-SS-48	02-SS-48D
Chloromethane	12U	13U	12U	11U	11U	11U	11U
Bromomethane	12U	13U	12U	11U	11U	11U	11U
Vinyl chloride	12U	13U	12U	11U	11U	11U	11U
Chloroethane	12U	13U	12U	11U	11U	11U	11U
Methylene chloride	5BJ	3BJ	5BJ	4BJ	5BJ	5BJ	5BJ
Acetone	12U	13U	12U	11U	11U	11U	11U
Carbon disulfide	12U	13U	12U	11U	11U	11U	11U
1,1-Dichloroethene	12U	13U	12U	11U	11U	11U	11U
1,1-Dichloroethane	12U	13U	12U	11U	11U	11U	11U
1,2-Dichloroethene (total)	12U	13U	12U	11U	11U	11U	11U
Chloroform	12U	13U	12U	11U	11U	11U	11U
1,2-Dichloroethane	12U	13U	12U	11U	11U	11U	11U
2-Butanone	6BJ	7BJ	7BJ	7BJ	5BJ	6BJ	6BJ
1,1,1-Trichloroethane	12U	13U	12U	11U	11U	11U	11U
Carbon tetrachloride	12U	13U	12U	11U	11U	11U	11U
Vinyl acetate	12U	13U	12U	11U	11U	11U	11U
Bromodichloromethane	12U	13U	12U	11U	11U	11U	11U
1,2-Dichloropropane	12U	13U	12U	11U	11U	11U	11U
cis-1,3-Dichloropropene	12U	13U	12U	11U	11U	11U	11U
Trichloroethene	12U	13U	12U	11U	11U	11U	11U
Dibromochloromethane	12U	13U	12U	11U	11U	11U	11U
1,1,2-Trichloroethane	12U	13U	12U	11U	11U	11U	11U
Benzene	12U	13U	12U	11U	11U	11U	11U
trans-1,3-Dichloropropene	12U	13U	12U	11U	11U	11U	11U
Bromoform	12U	13U	12U	11U	11U	11U	11U
4-Methyl-2-pentanone	12U	13U	12U	11U	11U	11U	11U
2-Hexanone	12U	13U	12U	11U	11U	11U	11U
Tetrachloroethene	12U	13U	12U	11U	11U	11U	11U
1,1,2,2-Tetrachloroethane	12U	13U	12U	11U	11U	11U	11U
Toluene	12U	13U	12U	11U	11U	2J	1J
Chlorobenzene	12U	13U	12U	11U	11U	11U	11U
Ethylbenzene	12U	13U	12U	11U	11U	11U	11U
Styrene	12U	13U	12U	11U	11U	11U	11U
Xylenes (total)	12U	13U	12U	11U	11U	11U	11U

[a] Sample Date: 11/15/94, Analysis Date: 11/22,23/94.
Concentration units: microgram(s) per kilogram (ug/kg), dry weight basis.

Notes: U - Compound was not detected, has been reported at the Contract Required Quantitation Limit (CRQL).
B-Compound detected in associated method blank.
J - Compound detected below the CRQL and reported as estimated.

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Semivolatile Parameters	Sample Identification[a]									
	02-SS-01	02-SS-02	02-SS-03	02-SS-04	02-SS-05	02-SS-06	02-SS-07	02-SS-08	02-SS-09	02-SS-10
Phenol	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
2-Chloroethyl)Ether	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
2-Chlorophenol	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
1,3-Dichlorobenzene	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
1,4-Dichlorobenzene	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
1,2-Dichlorobenzene	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
2-Methylphenol	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
Bis(2-Chloroisopropyl)ether	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
4-Methylphenol	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
N-Nitroso-di-n-propylamine	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
Hexachloroethane	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
Nitrobenzene	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
Isophorone	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
2-Nitrophenol	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
2,4-Dimethylphenol	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
Bis(2-Chloroethoxy)methane	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
2,4-Dichlorophenol	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
1,2,4-Trichlorobenzene	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
Naphthalene	780J	650J	750U	410U	380U	390U	370U	5200J	380U	390U
4-Chloroaniline	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
Hexachlorobutadiene	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Semivolatile Parameters	Sample Identification[a]									
	02-SS-01	02-SS-02	02-SS-03	02-SS-04	02-SS-05	02-SS-06	02-SS-07	02-SS-08	02-SS-09	02-SS-10
4-Chloro-3-methylphenol	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
2-Methylnaphthalene	4300U	4000U	750U	410U	380U	390U	370U	2400J	380U	390U
Hexachlorocyclopentadiene	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
2,4,6-Trichlorophenol	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
2,4,5-Trichlorophenol	10000U	9800U	1800U	1000U	930U	940U	910U	38000U	920U	940U
2-Chloronaphthalene	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
2-Nitroaniline	10000U	9800U	1800U	1000U	930U	940U	910U	38000U	920U	940U
Dimethyl phthalate	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
Acenaphthylene	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
2,6-Dinitrotoluene	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
3-Nitroaniline	10000U	9800U	1800U	1000U	930U	940U	910U	38000U	920U	940U
Acenaphthene	1900J	1400J	750U	88J	380U	390U	370U	7000J	380U	390U
2,4-Dinitrophenol	10000U	9800U	1800U	1000U	930U	940U	910U	38000U	920U	940U
4-Nitrophenol	10000U	9800U	1800U	1000U	930U	940U	910U	38000U	920U	940U
Dibenzofuran	1200J	860J	750U	68J	380U	390U	370U	5400J	380U	390U
2,4-Dinitrotoluene	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
Diethylphthalate	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
4-Chlorophenyl-phenylether	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
Fluorene	2800J	2400J	750U	150J	380U	390U	370U	9900J	380U	390U
4-Nitroaniline	10000U	9800U	1800U	1000U	930U	940U	910U	38000U	920U	940U
4,6-Dinitro-2-methylphenol	10000U	9800U	1800U	1000U	930U	940U	910U	38000U	920U	940U
N-Nitrosodiphenylamine	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
4-Bromophenyl-phenylether	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
Hexachlorobenzene	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Semivolatile Parameters	Sample Identification[a]									
	02-SS-01	02-SS-02	02-SS-03	02-SS-04	02-SS-05	02-SS-06	02-SS-07	02-SS-08	02-SS-09	02-SS-10
Pentachlorophenol	10000U	9800U	1800U	1000U	930U	940U	910U	38000U	920U	940U
Phenanthrene	24000	18000	650J	1200	380U	64J	370U	79000	160J	170J
Anthracene	5200	4200	150J	240J	380U	390U	370U	17000	380U	39J
Carbazole	2000J	1000J	750U	140J	380U	390U	370U	6600J	380U	390U
Di-n-butylphthalate	4300U	660J	460J	330J	470	210J	350J	16000U	650	580
Fluoranthene	26000	21000	760	1500	140J	180J	370U	90000	230J	260J
Pyrene	23000	22000	790	1200	260J	210J	47J	84000	360J	230J
Butylbenzylphthalate	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
3,3'-Dichlorobenzidine	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
Benzo(a)anthracene	12000	12000	360J	730	140J	100J	370U	48000	110J	140J
Chrysene	13000	13000	440J	840	580	140J	370U	50000	140J	170J
Bis(2-Ethylhexyl)phthalate	4300U	4000U	750U	72J	96J	62J	370U	16000U	46J	60J
Di-n-octylphthalate	4300U	4000U	750U	410U	380U	390U	370U	16000U	380U	390U
Benzo(b)fluoranthene	9600	8500	390J	660	830	170J	65J	35000	110J	210J
Benzo(k)fluoranthene	7200	6900	240J	510	440	100J	44J	33000	97J	140J
Benzo(a)pyrene	9600	8600	380J	590	360J	110J	45J	40000	230J	150J
Indeno(1,2,3-cd)pyrene	6000	5600	270J	410J	570	99J	44J	28000	130J	110J
Dibenzo(a,h)anthracene	3400J	2300J	110J	230J	170J	390U	370U	11000J	380U	54J
Benzo(g,h,i)perylene	4100J	3700J	470J	280J	460	87J	370U	19000	870	87J

[a] Sample Date: 11/4/94, Analysis Date: 11/15,16/94.
Concentration Units: microgram(s) per kilogram (ug/kg), Dry weight basis.

Notes: U - Compound was not detected, has been reported at the Contract Required Quantiation Limit (CRQL).
B - Compound was detected in the associated blank.
J - Coumpound detected below the CRQL and reported as estimated.
E - Concentration was estimated, value exceeded the calibration range.
D - Result was obtained following a sample dilution.

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Semivolatile Parameters	Sample Identification[a]									
	02-SS-10D	02-SS-11	02-SS-12	02-SS-13	02-SS-14	02-SS-15	02-SS-16	02-SS-17	02-SS-18	02SS18DL
Phenol	380U	400U	660U	390U	2300U	390U	390U		390U	780U
2-Chloroethyl)Ether	380U	400U	660U	390U	2300U	390U	390U		390U	780U
2-Chlorophenol	380U	400U	660U	390U	2300U	390U	390U		390U	780U
1,3-Dichlorobenzene	380U	400U	660U	390U	2300U	390U	390U		390U	780U
1,4-Dichlorobenzene	380U	400U	660U	390BJ	2300U	390BJ	390BJ		390BJ	780U
1,2-Dichlorobenzene	380U	400U	660U	390U	2300U	390U	390U		390U	780U
2-Methylphenol	380U	400U	660U	390U	2300U	390U	390U		390U	780U
Bis(2-Chloroisopropyl)ether	380U	400U	660U	390U	2300U	390U	390U		390U	780U
4-Methylphenol	380U	400U	660U	390U	2300U	390U	390U		390U	780U
N-Nitroso-di-n-propylamine	380U	400U	660U	390U	2300U	390U	390U		390U	780U
Hexachloroethane	380U	400U	660U	390U	2300U	390U	390U		390U	780U
Nitrobenzene	380U	400U	660U	390U	2300U	390U	390U		390U	780U
Isophorone	380U	400U	660U	390U	2300U	390U	390U		390U	780U
2-Nitrophenol	380U	400U	660U	390U	2300U	390U	390U		390U	780U
2,4-Dimethylphenol	380U	400U	660U	390U	2300U	390U	390U		390U	780U
Bis(2-Chloroethoxy)methane	380U	400U	660U	390U	2300U	390U	390U		390U	780U
2,4-Dichlorophenol	380U	400U	660U	390U	2300U	390U	390U		390U	780U
1,2,4-Trichlorobenzene	380U	400U	660U	390U	2300U	390U	390U		390U	780U
Naphthalene	380U	400U	73J	390U	530J	390U	390U		120J	780U
4-Chloroaniline	380U	400U	660U	390U	2300U	390U	390U		390U	780U
Hexachlorobutadiene	380U	400U	660U	390U	2300U	390U	390U		390U	780U

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Semivolatile Parameters	Sample Identification[a]									
	02-SS-10D	02-SS-11	02-SS-12	02-SS-13	02-SS-14	02-SS-15	02-SS-16	02-SS-17	02-SS-18	02SS18DL
4-Chloro-3-methylphenol	380U	400U	660U	390U	2300U	390U	390U		390U	780U
2-Methylnaphthalene	380U	400U	660U	390U	290J	390U	390U		49J	780U
Hexachlorocyclopentadiene	380U	400U	660U	390U	2300U	390U	390U		390U	780U
2,4,6-Trichlorophenol	380U	400U	660U	390U	2300U	390U	390U		390U	780U
2,4,5-Trichlorophenol	930U	980U	1600U	950U	5500U	950U	950U		950U	1900U
2-Chloronaphthalene	380U	400U	660U	390U	2300U	390U	390U		390U	780U
2-Nitroaniline	930U	980U	1600U	950U	5500U	950U	950U		950U	1900U
Dimethyl phthalate	380U	400U	660U	390U	2300U	390U	390U		390U	780U
Acenaphthylene	380U	400U	82J	390U	2300U	390U	390U		390U	780U
2,6-Dinitrotoluene	380U	400U	660U	390U	2300U	390U	390U		390U	780U
3-Nitroaniline	930U	980U	1600U	950U	5500U	950U	950U		950U	1900U
Acenaphthene	380U	400U	260J	390U	1100J	47J	390U		440J	240DJ
2,4-Dinitrophenol	930U	980U	1600U	950U	5500U	950U	950U		950U	1900U
4-Nitrophenol	930U	980U	1600U	950U	5500U	950U	950U		950U	1900U
Dibenzofuran	380U	400U	170J	390U	790J	390U	390U		210J	110DJ
2,4-Dinitrotoluene	380U	400U	660U	390U	2300U	390U	390U		390U	780U
Diethylphthalate	380U	400U	660U	390U	2300U	390U	390U		390U	780U
4-Chlorophenyl-phenylether	380U	400U	660U	390U	2300U	390U	390U		390U	780U
Fluorene	380U	400U	390J	390U	1600J	66J	390U		400	220DJ
4-Nitroaniline	930U	980U	1600U	950U	5500U	950U	950U		950U	1900U
4,6-Dinitro-2-methylphenol	930U	980U	1600U	950U	5500U	950U	950U		950U	1900U
N-Nitrosodiphenylamine	380U	400U	660U	390U	2300U	390U	390U		390U	780U
4-Bromophenyl-phenylether	380U	400U	660U	390U	2300U	390U	390U		390U	780U
Hexachlorobenzene	380U	400U	660U	390U	2300U	390U	390U		390U	780U

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Semivolatile Parameters	Sample Identification[a]									
	02-SS-10D	02-SS-11	02-SS-12	02-SS-13	02-SS-14	02-SS-15	02-SS-16	02-SS-17	02-SS-18	02SS18DL
Pentachlorophenol	930U	980U	1600U	950U	5500U	950U	950U		950U	1900U
Phenanthrene	74J	86J	3500	110U	12000	640	390U		4600E	2700D
Anthracene	380U	400U	600J	390U	2600	110J	390U		980	650DJ
Carbazole	380U	400U	370J	390U	1500J	76J	390U		670	400DJ
Di-n-butylphthalate	330J	54J	180J	72J	2300U	160J	90J		150J	84DJ
Fluoranthene	130J	140J	4400	160J	15000	850	390U		7500E	5000D
Pyrene	160J	130J	3000	160J	8400	880	390U		5600E	2900D
Butylbenzylphthalate	380U	400U	660U	390U	2300U	390U	390U		390U	780U
3,3'-Dichlorobenzidine	380U	400U	660U	390U	2300U	390U	390U		390U	780U
Benzo(a)anthracene	83J	70J	2200	72J	6600	410	390U		4300E	2400D
Chrysene	100J	97J	2500	92J	6900	470	390U		4600E	2500D
Bis(2-Ethylhexyl)phthalate	62J	180J	110J	190J	2300U	110J	390U		75J	780U
Di-n-octylphthalate	380U	400U	660U	390U	2300U	390U	390U		42J	780U
Benzo(b)fluoranthene	130J	100J	2600	74J	8100	460	390U		7000E	3700D
Benzo(k)fluoranthene	83J	81J	1600	62J	3500	300J	390U		1900	1600D
Benzo(a)pyrene	88J	58J	1800	80J	5500	380J	390U		2700	2100D
Indeno(1,2,3-cd)pyrene	72J	62J	650J	59J	1600J	230J	390U		1300	650DJ
Dibenzo(a,h)anthracene	380U	400U	280J	390U	800J	95J	390U		570	310DJ
Benzo(g,h,i)perylene	47J	400U	240J	95J	660J	270J	390U		500	240DJ

[a] Sample Date: 11/4,14/94, Analysis Date: 11/15,16/94, 12/1,2,4/94.
Concentration Units: microgram(s) per kilogram (ug/kg), Dry weight basis.

Notes: U - Compound was not detected, has been reported at the Contract Required Quantiation Limit (CRQL).
B - Compound was detected in the associated blank.
J - Coumpound detected below the CRQL and reported as estimated.
E - Concentration was estimated, value exceeded the calibration range.
D - Result was obtained following a sample dilution.

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Semivolatile Parameters	Sample Identification[a]									
	02-SS-19	02SS19DL	02-SS-20	02-SS-20D	02-SS-21	02-SS-22	02-SS-23	02-SS-24	02-SS-25	02SS25DL
Phenol	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
2-Chloroethyl)Ether	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
2-Chlorophenol	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
1,3-Dichlorobenzene	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
1,4-Dichlorobenzene	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
1,2-Dichlorobenzene	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
2-Methylphenol	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
Bis(2-Chloroisopropyl)ether	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
4-Methylphenol	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
N-Nitroso-di-n-propylamine	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
Hexachloroethane	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
Nitrobenzene	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
Isophorone	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
2-Nitrophenol	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
2,4-Dimethylphenol	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
Bis(2-Chloroethoxy)methane	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
2,4-Dichlorophenol	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
1,2,4-Trichlorobenzene	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
Naphthalene	200J	1300U	160J	270J	2500U	410U	400U	1700U	390U	580U
4-Chloroaniline	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
Hexachlorobutadiene	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Semivolatile Parameters	Sample Identification[a]									
	02-SS-19	02SS19DL	02-SS-20	02-SS-20D	02-SS-21	02-SS-22	02-SS-23	02-SS-24	02-SS-25	02SS25DL
4-Chloro-3-methylphenol	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
2-Methylnaphthalene	80J	1300U	1200U	87J	2500U	410U	400U	1700U	390U	580U
Hexachlorocyclopentadiene	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
2,4,6-Trichlorophenol	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
2,4,5-Trichlorophenol	1100U	3200U	2900U	990U	6100U	990U	980U	4200U	940U	1400U
2-Chloronaphthalene	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
2-Nitroaniline	1100U	3200U	2900U	990U	6100U	990U	980U	4200U	940U	1400U
Dimethyl phthalate	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
Acenaphthylene	440U	1300U	1200U	410U	2500U	410U	400U	1700U	56J	580U
2,6-Dinitrotoluene	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
3-Nitroaniline	1100U	3200U	2900U	990U	6100U	990U	980U	4200U	940U	1400U
Acenaphthene	540	310DJ	390J	290J	710J	59J	400U	210J	53J	580U
2,4-Dinitrophenol	1100U	3200U	2900U	990U	6100U	990U	980U	4200U	940U	1400U
4-Nitrophenol	1100U	3200U	2900U	990U	6100U	990U	980U	4200U	940U	1400U
Dibenzofuran	310J	170DJ	210J	170J	390J	410U	400U	1700U	390U	580U
2,4-Dinitrotoluene	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
Diethylphthalate	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
4-Chlorophenyl-phenylether	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
Fluorene	520	310DJ	400J	280J	740J	60J	400U	220J	67J	66DJ
4-Nitroaniline	1100U	3200U	2900U	990U	6100U	990U	980U	4200U	940U	1400U
4,6-Dinitro-2-methylphenol	1100U	3200U	2900U	990U	6100U	990U	980U	4200U	940U	1400U
N-Nitrosodiphenylamine	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
4-Bromophenyl-phenylether	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
Hexachlorobenzene	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Semivolatile Parameters	Sample Identification[a]									
	02-SS-19	02SS19DL	02-SS-20	02-SS-20D	02-SS-21	02-SS-22	02-SS-23	02-SS-24	02-SS-25	02SS25DL
Pentachlorophenol	1100U	3200U	2900U	990U	6100U	990U	980U	4200U	940U	1400U
Phenanthrene	5400E	3500D	4600	2300	8400	610	400U	2700	970	960D
Anthracene	1100	760DJ	1100J	510	2300J	150J	400U	920J	240J	250DJ
Carbazole	840	540DJ	680J	320J	1300J	99J	400U	570J	180J	190DJ
Di-n-butylphthalate	94J	1300U	1200U	120J	2500U	100J	69J	1700U	72J	74DJ
Fluoranthene	7800E	5400D	7300	3100	14000	800	400U	7700	3600E	3800D
Pyrene	6400E	3600D	4500	2700	9000	690	400U	4700	2500	2400D
Butylbenzylphthalate	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
3,3'-Dichlorobenzidine	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
Benzo(a)anthracene	4400E	2500D	3400	1500	6800	350J	400U	3600	910	860D
Chrysene	4600E	2700D	3400	1600	6900	350J	400U	4900	1600	1600D
Bis(2-Ethylhexyl)phthalate	1100	540DJ	1200U	410U	2500U	190J	400U	1700U	820	850D
Di-n-octylphthalate	440U	1300U	1200U	410U	2500U	410U	400U	1700U	390U	580U
Benzo(b)fluoranthene	6400E	3400D	4100	1500	8800	320J	400U	4800	1700	1400D
Benzo(k)fluoranthene	2000	1700D	2400	1100	4000	240J	400U	2800	780	790D
Benzo(a)pyrene	2600	2300D	3000	1300	6500	330J	400U	2800	820	750D
Indeno(1,2,3-cd)pyrene	1700	990DJ	1100J	850	2500J	210J	400U	1100J	400	340DJ
Dibenzo(a,h)anthracene	700	370DJ	480J	350J	960J	71J	400U	370J	130J	130DJ
Benzo(g,h,i)perylene	820	400DJ	470J	540	1700J	200J	400U	640J	290J	300DJ

[a] Sample Date: 11/14,15/94, Analysis Date: 12/1,2,3,4,6/94.
Concentration Units: microgram(s) per kilogram (ug/kg), Dry weight basis.

Notes: U - Compound was not detected, has been reported at the Contract Required Quantiation Limit (CRQL).
B - Compound was detected in the associated blank.
J - Coumpound detected below the CRQL and reported as estimated.
E - Concentration was estimated, value exceeded the calibration range.
D - Result was obtained following a sample dilution.

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Semivolatile Parameters	Sample Identification[a]									
	02-SS-26	02-SS-27	02-SS-28	02-SS-43	02-SS-44	02-SS-45	02-SS-46	02-SS-47	02-SS-48	02-SS-48D
Phenol	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
2-Chloroethyl)Ether	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
2-Chlorophenol	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
1,3-Dichlorobenzene	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
1,4-Dichlorobenzene	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
1,2-Dichlorobenzene	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
2-Methylphenol	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
Bis(2-Chloroisopropyl)ether	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
4-Methylphenol	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
N-Nitroso-di-n-propylamine	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
Hexachloroethane	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
Nitrobenzene	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
Isophorone	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
2-Nitrophenol	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
2,4-Dimethylphenol	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
Bis(2-Chloroethoxy)methane	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
2,4-Dichlorophenol	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
1,2,4-Trichlorobenzene	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
Naphthalene	370U	470J	540U	1600J	440U	75J	380U	380U	61J	370U
4-Chloroaniline	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
Hexachlorobutadiene	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Semivolatile Parameters	Sample Identification[a]									
	02-SS-26	02-SS-27	02-SS-28	02-SS-43	02-SS-44	02-SS-45	02-SS-46	02-SS-47	02-SS-48	02-SS-48D
4-Chloro-3-methylphenol	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
2-Methylnaphthalene	370U	160J	540U	990J	440U	410U	380U	380U	370U	370U
Hexachlorocyclopentadiene	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
2,4,6-Trichlorophenol	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
2,4,5-Trichlorophenol	910U	3800U	1300U	5800U	1100U	1000U	930U	920U	900U	890U
2-Chloronaphthalene	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
2-Nitroaniline	910U	3800U	1300U	5800U	1100U	1000U	930U	920U	900U	890U
Dimethyl phthalate	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
Acenaphthylene	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
2,6-Dinitrotoluene	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
3-Nitroaniline	910U	3800U	1300U	5800U	1100U	1000U	930U	920U	900U	890U
Acenaphthene	370U	900J	540U	1500J	440U	130J	380U	380U	370U	370U
2,4-Dinitrophenol	910U	3800U	1300U	5800U	1100U	1000U	930U	920U	900U	890U
4-Nitrophenol	910U	3800U	1300U	5800U	1100U	1000U	930U	920U	900U	890U
Dibenzofuran	370U	600J	540U	1800J	440U	120J	380U	380U	370U	370U
2,4-Dinitrotoluene	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
Diethylphthalate	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
4-Chlorophenyl-phenylether	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
Fluorene	370U	1000J	540U	2600	440U	220J	380U	380U	370U	370U
4-Nitroaniline	910U	3800U	1300U	5800U	1100U	1000U	930U	920U	900U	890U
4,6-Dinitro-2-methylphenol	910U	3800U	1300U	5800U	1100U	1000U	930U	920U	900U	890U
N-Nitrosodiphenylamine	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
4-Bromophenyl-phenylether	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
Hexachlorobenzene	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Semivolatile Parameters	Sample Identification[a]									
	02-SS-26	02-SS-27	02-SS-28	02-SS-43	02-SS-44	02-SS-45	02-SS-46	02-SS-47	02-SS-48	02-SS-48D
Pentachlorophenol	910U	3800U	1300U	5800U	1100U	1000U	930U	920U	900U	890U
Phenanthrene	250J	8600	540U	14000	340J	1700	87J	380U	370U	140J
Anthracene	69J	2500	540U	2900	70J	360J	380U	380U	370U	370U
Carbazole	370U	1400J	540U	2000J	45J	210J	380U	380U	370U	370U
Di-n-butylphthalate	62J	1600U	110J	2400U	66J	410U	46J	52J	370U	370U
Fluoranthene	280J	11000	540U	11000	410J	1600	120J	110J	110J	160J
Pyrene	230J	5700	540U	6000	310J	1200	110J	98J	95J	140J
Butylbenzylphthalate	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
3,3'-Dichlorobenzidine	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
Benzo(a)anthracene	120J	4100	540U	4500	200J	850	54J	51J	54J	73J
Chrysene	110J	4000	540U	5000	230J	930	67J	63J	61J	94J
Bis(2-Ethylhexyl)phthalate	370U	1600U	540U	320J	440U	410U	48J	59J	370U	370U
Di-n-octylphthalate	370U	1600U	540U	2400U	440U	410U	380U	380U	370U	370U
Benzo(b)fluoranthene	84J	2500	540U	4200	200J	980	54J	54J	62J	90J
Benzo(k)fluoranthene	82J	670J	540U	2600	170J	490	50J	52J	45J	65J
Benzo(a)pyrene	98J	3500	540U	3400	150J	750	58J	52J	54J	80J
Indeno(1,2,3-cd)pyrene	59J	1200J	540U	1100J	87J	260J	380U	380U	370U	48J
Dibenzo(a,h)anthracene	370U	440J	540U	540J	440U	110J	380U	380U	370U	370U
Benzo(g,h,i)perylene	53J	800J	540U	740J	82J	190J	380U	380U	370U	370U

[a] Sample Date: 11//15/94, Analysis Date: 12/2,3,4,8/94.
Concentration Units: *microgram(s) per kilogram (ug/kg), Dry weight basis.*

Notes: U - Compound was not detected, has been reported at the Contract Required Quantiation Limit (CRQL).
B - Compound was detected in the associated blank.
J - Coumpound detected below the CRQL and reported as estimated.
E - Concentration was estimated, value exceeded the calibration range.
D - Result was obtained following a sample dilution.

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Semivolatile Parameters	Sample Identification[a]						
	02-SS-29	02-SS-30	02-SS-30D	02-SS-31	02-SS-32	02-SS-33	02-SS-34
Phenol	400U	400U	400U	380U	400U	730U	460U
2-Chloroethyl)Ether	400U	400U	400U	380U	400U	730U	460U
2-Chlorophenol	400U	400U	400U	380U	400U	730U	460U
1,3-Dichlorobenzene	400U	400U	400U	380U	400U	730U	460U
1,4-Dichlorobenzene	400U	400U	400U	380U	400U	730U	460U
1,2-Dichlorobenzene	400U	400U	400U	380U	400U	730U	460U
2-Methylphenol	400U	400U	400U	380U	400U	730U	460U
Bis(2-Chloroisopropyl)ether	400U	400U	400U	380U	400U	730U	460U
4-Methylphenol	400U	400U	400U	380U	400U	730U	460U
N-Nitroso-di-n-propylamine	400U	400U	400U	380U	400U	730U	460U
Hexachloroethane	400U	400U	400U	380U	400U	730U	460U
Nitrobenzene	400U	400U	400U	380U	400U	730U	460U
Isophorone	400U	400U	400U	380U	400U	730U	460U
2-Nitrophenol	400U	400U	400U	380U	400U	730U	460U
2,4-Dimethylphenol	400U	400U	400U	380U	400U	730U	460U
Bis(2-Chloroethoxy)methane	400U	400U	400U	380U	400U	730U	460U
2,4-Dichlorophenol	400U	400U	400U	380U	400U	730U	460U
1,2,4-Trichlorobenzene	400U	400U	400U	380U	400U	730U	460U
Naphthalene	400U	400U	43J	380U	400U	730U	460U
4-Chloroaniline	400U	400U	400U	380U	400U	730U	460U
Hexachlorobutadiene	400U	400U	400U	380U	400U	730U	460U

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Semivolatile Parameters	Sample Identification[a]						
	02-SS-29	02-SS-30	02-SS-30D	02-SS-31	02-SS-32	02-SS-33	02-SS-34
4-Chloro-3-methylphenol	400U	400U	400U	380U	400U	730U	460U
2-Methylnaphthalene	400U	400U	400U	380U	400U	730U	460U
Hexachlorocyclopentadiene	400U	400U	400U	380U	400U	730U	460U
2,4,6-Trichlorophenol	400U	400U	400U	380U	400U	730U	460U
2,4,5-Trichlorophenol	970U	980U	980U	920U	970U	1800U	1100U
2-Chloronaphthalene	400U	400U	400U	380U	400U	730U	460U
2-Nitroaniline	970U	980U	980U	920U	970U	1800U	1100U
Dimethyl phthalate	400U	400U	400U	380U	400U	730U	460U
Acenaphthylene	400U	400U	400U	380U	400U	730U	460U
2,6-Dinitrotoluene	400U	400U	400U	380U	400U	730U	460U
3-Nitroaniline	970U	980U	980U	920U	970U	1800U	1100U
Acenaphthene	400U	48J	97J	380U	400U	730U	460U
2,4-Dinitrophenol	970U	980U	980U	920U	970U	1800U	1100U
4-Nitrophenol	970U	980U	980U	920U	970U	1800U	1100U
Dibenzofuran	400U	43J	74J	380U	400U	730U	460U
2,4-Dinitrotoluene	400U	400U	400U	380U	400U	730U	460U
Diethylphthalate	400U	400U	400U	380U	400U	730U	460U
4-Chlorophenyl-phenylether	400U	400U	400U	380U	400U	730U	460U
Fluorene	400U	77J	150J	380U	400U	730U	460U
4-Nitroaniline	970U	980U	980U	920U	970U	1800U	1100U
4,6-Dinitro-2-methylphenol	970U	980U	980U	920U	970U	1800U	1100U
N-Nitrosodiphenylamine	400U	400U	400U	380U	400U	730U	460U
4-Bromophenyl-phenylether	400U	400U	400U	380U	400U	730U	460U
Hexachlorobenzene	400U	400U	400U	380U	400U	730U	460U

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Semivolatile Parameters	Sample Identification[a]						
	02-SS-29	02-SS-30	02-SS-30D	02-SS-31	02-SS-32	02-SS-33	02-SS-34
Pentachlorophenol	970U	980U	980U	920U	970U	1800U	1100U
Phenanthrene	400U	650	1100	380U	400U	730U	460U
Anthracene	400U	140J	230J	380U	400U	730U	460U
Carbazole	400U	89J	130J	380U	400U	730U	460U
Di-n-butylphthalate	91J	89J	80J	62J	110J	270J	180J
Fluoranthene	400U	730	1200	47J	57J	730U	50J
Pyrene	400U	380J	630	62J	400U	730U	460U
Butylbenzylphthalate	400U	400U	400U	380U	400U	730U	460U
3,3'-Dichlorobenzidine	400U	400U	400U	380U	400U	730U	460U
Benzo(a)anthracene	400U	280J	470	48J	400U	730U	460U
Chrysene	400U	310J	500	110U	400U	730U	460U
Bis(2-Ethylhexyl)phthalate	400U	66J	90J	380U	43J	730U	460U
Di-n-octylphthalate	400U	400U	400U	380U	400U	730U	460U
Benzo(b)fluoranthene	400U	300J	540	220J	400U	130J	53J
Benzo(k)fluoranthene	400U	310J	440	170J	400U	730U	460U
Benzo(a)pyrene	400U	250J	410	140J	400U	82J	460U
Indeno(1,2,3-cd)pyrene	400U	64J	91J	93J	400U	730U	460U
Dibenzo(a,h)anthracene	400U	400U	67J	380U	400U	730U	460U
Benzo(g,h,i)perylene	400U	400U	93J	91J	400U	730U	460U

[a] Sample Date: 11//16/94, Analysis Date: 12/7,8/94.
Concentration Units: microgram(s) per kilogram (ug/kg), Dry weight basis.

Notes: U - Compound was not detected, has been reported at the Contract Required Quantiation Limit (CRQL).
B - Compound was detected in the associated blank.
J - Coumpound detected below the CRQL and reported as estimated.
E - Concentration was estimated, value exceeded the calibration range.
D - Result was obtained following a sample dilution.

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Pesticides/PCBs	Sample Identification[a]										
Parameters	02-SS-01	02-SS-02	02-SS-03	02-SS-04	02-SS-05	02-SS-06	02-SS-07	02-SS-08	02-SS-09	02-SS-10	02-SS-10D
alpha-BHC	2.2U	2.1U	1.9U	2.1U	2.0U	2.0U	1.9U	2.0U	2.0U	2.0U	2.0U
beta-BHC	2.2U	2.1U	1.9U	2.1U	2.0U	2.0U	1.9U	2.0U	2.0U	2.0U	2.0U
delta-BHC	2.2U	2.1U	1.9U	2.1U	2.0U	2.0U	1.9U	2.0U	2.0U	2.0U	2.0U
gamma-BHC (Lindane)	2.2U	2.1U	1.9U	2.1U	2.0U	2.0U	1.9U	2.0U	2.0U	2.0U	2.0U
Heptachlor	2.2U	2.1U	1.9U	2.1U	2.0U	2.0U	1.9U	2.0U	2.0U	2.0U	2.0U
Aldrin	2.2U	2.1U	1.9U	2.1U	2.0U	2.0U	1.9U	2.0U	2.0U	2.0U	2.0U
Heptachlor Epoxide	2.2U	2.1U	1.9U	2.1U	2.0U	2.0U	1.9U	2.0U	2.0U	2.0U	2.0U
Endosulfan I	2.2U	2.1U	0.75JP	2.1U	2.0U	2.0U	1.9U	2.0U	2.0U	2.0U	2.0U
Dieldrin	4.3U	4.0U	3.7U	4.1U	0.65JP	0.54J	3.7U	3.9U	3.8U	3.9U	3.8U
4,4'-DDE	4.3U	0.88JP	3.7U	4.1U	1.4J	1.5J	5.6	3.9U	0.62JP	2.3J	1.8J
Endrin	4.3U	4.0U	3.2J	4.1U	3.8U	3.9U	3.7U	3.9U	3.8U	3.9U	3.8U
Endosulfan II	4.3U	4.0U	3.7U	4.1U	3.8U	3.9U	3.7U	3.9U	3.8U	3.9U	3.8U
4,4'-DDD	4.3U	4.0U	3.7U	4.1U	1.9JP	3.9U	3.7U	3.9U	3.8U	3.9U	3.8U
Endosulfan Sulfate	4.3U	4.0U	3.7U	4.1U	3.8U	1.8JP	3.7U	3.9U	3.2JP	2.5JP	1.7JP
4,4'-DDT	4.3U	4.0U	3.7U	4.1U	3.8U	3.9U	3.6J	3.9U	2.2J	3.9U	3.8U
Methoxychlor	22U	21U	19U	21U	20U	20U	19U	20U	20U	20U	20U
Endrin Ketone	6.8P	4.0U	3.7U	3.7JP	5.5P	3.9U	3.7U	3.9U	3.8U	3.9U	3.8U
Endrin Aldehyde	4.3U	4.0U	3.7U	4.1U	4.0	3.9U	3.7U	25	3.8U	3.9U	3.8U

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Pesticides/PCBs	Sample Identification[a]										
Parameters	02-SS-01	02-SS-02	02-SS-03	02-SS-04	02-SS-05	02-SS-06	02-SS-07	02-SS-08	02-SS-09	02-SS-10	02-SS-10D
alpha-Chlordane	2.2U	2.1U	1.9U	2.1U	2.0U	2.0U	1.9U	9.8P	2.0U	2.0U	2.0U
gamma-Chlordane	2.2U	2.1U	1.9U	2.1U	2.0U	2.0U	1.9U	9.6P	2.0U	2.0U	2.0U
Toxaphene	220U	210U	190U	210U	200U	200U	190U	200U	200U	200U	200U
Aroclor-1016	43U	40U	37U	41U	38U	39U	37U	39U	38U	39U	38U
Aroclor-1221	87U	82U	76U	84U	78U	79U	76U	80U	77U	79U	78U
Aroclor-1232	43U	40U	37U	41U	38U	39U	37U	39U	38U	39U	38U
Aroclor-1242	43U	40U	37U	41U	38U	39U	37U	39U	38U	39U	38U
Aroclor-1248	43U	40U	37U	41U	38U	39U	37U	39U	38U	39U	38U
Aroclor-1254	43U	40U	37U	41U	38U	39U	37U	39U	38U	39U	38U
Aroclor-1260	43U	40U	37U	41U	38U	39U	37U	39U	38U	39U	38U

[a] Sample Date: 11/4/94, Analysis Date: 11/24,28,29/94.
Concentration Units: microgram(s) per kilogram (ug/kg), dry weight basis.

Notes: U - Compound was not detected, has been reported at the Contract Required Quantiation Limit (CRQL).
B - Compound was detected in the associated blank.
J - Coumpound detected below the CRQL and reported as estimated.
P - Concentration reported is lowest amount, +/- 25 percent difference between analytical columns.

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Pesticides/PCBs	Sample Identification[a]										
Parameters	02-SS-11	02-SS-12	02-SS-13	02-SS-14	02-SS-15	02-SS-16	02-SS-17	02-SS-18	02-SS-19	02-SS-20	02-SS-20D
alpha-BHC	10U	1.7U	2.0U	2.3U	2.0U	2.0U	19U	2.0U	2.3U	2.1U	2.1U
beta-BHC	10U	1.7U	2.0U	2.3U	2.0U	2.0U	19U	2.0U	2.3U	2.1U	2.1U
delta-BHC	10U	1.7U	2.0U	2.6P	2.0U	2.0U	19U	2.0U	2.3U	0.98JP	2.1U
gamma-BHC (Lindane)	10U	1.7U	2.0U	2.3U	2.0U	2.0U	19U	2.0U	2.3U	2.1U	2.1U
Heptachlor	10U	1.7U	0.81J	1.8JP	0.80JP	2.0U	19U	2.0U	2.3U	2.1U	0.67JP
Aldrin	10U	1.7U	2.0U	2.3U	2.0U	2.0U	19U	2.0U	2.3U	2.1U	2.1U
Heptachlor Epoxide	10U	1.7U	0.73J	5.0P	2.0U	2.0U	19U	2.0U	2.3U	2.1U	0.85JP
Endosulfan I	10U	1.7U	2.0U	2.3U	2.0U	2.0U	19U	2.0U	2.3U	2.1U	2.1U
Dieldrin	13JP	3.2JP	0.61JP	4.5U	3.9U	3.9U	40P	2.9JP	4.4U	4.0U	4.1U
4,4'-DDE	20U	3.3U	6.6	29P	1.2JP	1.3JP	37U	4.7P	4.7P	4.4P	21P
Endrin	20U	3.3U	3.9U	4.5U	3.9U	3.9U	37U	3.9U	4.4U	4.0U	4.1U
Endosulfan II	20U	3.3U	3.9U	4.5U	3.9U	3.9U	37U	3.9U	4.4U	4.0U	4.1U
4,4'-DDD	20U	3.3U	0.86JP	4.5U	3.9U	3.9U	37U	2.1JP	4.4U	4.0U	4.1U
Endosulfan Sulfate	20U	3.3U	3.9U	4.5U	1.2JP	3.9U	37U	3.9U	4.4U	4.0U	4.1U
4,4'-DDT	20U	1.7JP	6.0P	15	3.9U	1.6JP	37U	2.6JP	3.1J	4.0U	5.4P
Methoxychlor	41BJP	21BP	6.0BJP	170BP	4.2BJP	20U	190U	45BP	140BP	100BP	190BP
Endrin Ketone	13JP	5.4P	3.9U	58P	3.9U	3.9U	37U	15	4.4U	4.0U	4.1U
Endrin Aldehyde	20U	3.3U	3.9U	4.5U	3.9U	3.9U	44P	3.9U	4.4U	4.0U	4.1U

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Pesticides/PCBs	Sample Identification[a]										
Parameters	02-SS-11	02-SS-12	02-SS-13	02-SS-14	02-SS-15	02-SS-16	02-SS-17	02-SS-18	02-SS-19	02-SS-20	02-SS-20D
alpha-Chlordane	10U	1.7U	3.1	2.3U	8.5	2.0U	19U	2.0U	2.3U	2.1U	2.1U
gamma-Chlordane	10U	2.4P	2.4	2.3U	7.8P	2.0U	20P	2.0U	2.3U	2.1U	2.1U
Toxaphene	1000U	170U	200U	230U	200U	200U	1900U	200U	230U	210U	210U
Aroclor-1016	200U	33U	39U	45U	39U	39U	370U	39U	44U	40U	41U
Aroclor-1221	410U	67U	80U	92U	80U	80U	740U	80U	90U	82U	83U
Aroclor-1232	200U	33U	39U	45U	39U	39U	370U	39U	44U	40U	41U
Aroclor-1242	200U	33U	39U	45U	39U	39U	370U	39U	44U	40U	41U
Aroclor-1248	200U	33U	39U	45U	39U	39U	370U	39U	44U	40U	41U
Aroclor-1254	1900	510	65	45U	50P	42	6200	140	44U	40U	41U
Aroclor-1260	200U	33U	39U	45U	39U	39U	370U	39U	44U	40U	41U

[a] Sample Date: 11/14/94, Analysis Date: 11/30/94,12/1/94.
Concentration Units: microgram(s) per kilogram (ug/kg), dry weight basis.

Notes: U - Compound was not detected, has been reported at the Contract Required Quantiation Limit (CRQL).
B - Compound was detected in the associated blank.
J - Coumpound detected below the CRQL and reported as estimated.
P - Concentration reported is lowest amount, less than or = to 25 percent difference between analytical columns.

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Pesticides/PCBs	Sample Identification[a]						
Parameters	02-SS-29	02-SS-30	02-SS-30D	02-SS-31	02-SS-32	02-SS-33	02-SS-34
alpha-BHC	2.1U	2.1U	2.1U	2.0U	2.1U	3.8U	2.4U
beta-BHC	2.1U	2.1U	2.1U	2.0U	2.1U	3.8U	0.73JP
delta-BHC	2.1U	2.1U	2.1U	2.0U	2.1U	3.8U	2.4U
gamma-BHC (Lindane)	2.1U	2.1U	2.1U	2.0U	2.1U	3.8U	2.4U
Heptachlor	2.1U	2.1U	2.1U	2.0U	2.1U	3.8U	2.4U
Aldrin	2.1U	2.1U	2.1U	2.0U	2.1U	3.8U	2.4U
Heptachlor Epoxide	2.1U	2.1U	2.1U	2.0U	2.1U	3.8U	2.4U
Endosulfan I	2.1U	2.1U	2.1U	2.0U	2.1U	3.8U	2.4U
Dieldrin	4.0U	4.0U	4.0U	3.8U	4.0U	7.3U	4.6U
4,4'-DDE	4.0U	0.68J	4.0U	3.8U	4.0U	7.3U	4.6U
Endrin	4.0U	4.0U	4.0U	3.8U	4.0U	7.3U	4.6U
Endosulfan II	4.0U	4.0U	4.0U	3.8U	4.0U	7.3U	4.6U
4,4'-DDD	4.0U	4.0U	4.0U	3.8U	4.0U	7.3U	4.6U
Endosulfan Sulfate	4.0U	4.0U	4.0U	3.8U	4.0U	7.3U	4.6U
4,4'-DDT	4.0U	4.0U	4.0U	3.8U	4.0U	7.3U	4.6U
Methoxychlor	21U	21U	21U	20U	21U	38U	24U
Endrin Ketone	4.0U	4.0U	4.0U	3.8U	4.0U	7.3U	4.6U
Endrin Aldehyde	4.0U	4.0U	4.0U	3.8U	4.0U	7.3U	4.6U

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Pesticides/PCBs Parameters	Sample Identification[a]						
	02-SS-29	02-SS-30	02-SS-30D	02-SS-31	02-SS-32	02-SS-33	02-SS-34
alpha-Chlordane	2.1U	2.1U	2.1U	2.0U	2.1U	3.8U	2.4U
gamma-Chlordane	2.1U	2.1U	2.1U	2.0U	2.1U	3.8U	2.4U
Toxaphene	210U	210U	210U	200U	210U	380U	240U
Aroclor-1016	40U	40U	40U	38U	40U	73U	46U
Aroclor-1221	82U	82U	82U	77U	82U	150U	94U
Aroclor-1232	40U	40U	40U	38U	40U	73U	46U
Aroclor-1242	40U	40U	40U	38U	40U	73U	46U
Aroclor-1248	40U	40U	40U	38U	40U	73U	46U
Aroclor-1254	40U	40U	40U	38U	40U	73U	46U
Aroclor-1260	40U	40U	40U	38U	40U	73U	46U

[a] Sample Date: 11/16/94, Analysis Date: 12/5/94.
Concentration Units: microgram(s) per kilogram (ug/kg), dry weight basis.

Notes: U - Compound was not detected, has been reported at the Contract Required Quantiation Limit (CRQL).
B - Compound was detected in the associated blank.
J - Coumpound detected below the CRQL and reported as estimated.
P - Concentration reported is lowest amount, less than or = to 25 percent difference between analytical columns.

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Pesticides/PCBs	Sample Identification[a]							
Parameters	02-SS-21	02-SS-22	02-SS-23	02-SS-24	02-SS-25	02-SS-26	02-SS-27	02-SS-28
alpha-BHC	2.8U	2.1U	2.1U	2.2U	2.0U	1.9U	2.0U	2.8U
beta-BHC	2.8U	2.1U	2.1U	2.2U	2.0U	1.9U	2.0U	2.8U
delta-BHC	2.8U	2.1U	2.1U	2.2U	2.0U	1.9U	2.0U	2.8U
gamma-BHC (Lindane)	2.8U	0.88J	2.1U	2.2U	2.0U	1.9U	2.0U	2.8U
Heptachlor	2.8U	0.80J	2.1U	2.2U	2.0U	1.9U	2.0U	2.8U
Aldrin	2.8U	2.1U	2.1U	2.2U	2.0U	1.9U	2.0U	2.8U
Heptachlor Epoxide	2.8U	2.1U	2.1U	2.2U	2.0U	1.9U	2.0U	2.8U
Endosulfan I	2.8U	2.1U	2.1U	2.2U	2.0U	1.9U	2.0U	2.8U
Dieldrin	0.64JP	2.0J	4.0U	4.3U	3.9U	3.7U	3.9U	5.4U
4,4'-DDE	4.2U	4.1U	4.0U	4.3U	3.9U	3.7U	3.9U	5.4U
Endrin	4.2U	1.8J	4.0U	4.3U	3.9U	3.7U	3.9U	5.4U
Endosulfan II	4.2U	4.1U	4.0U	4.3U	3.9U	3.7U	3.9U	5.4U
4,4'-DDD	4.2U	4.1U	4.0U	4.3U	3.9U	3.7U	3.9U	5.4U
Endosulfan Sulfate	4.2U	4.1U	4.0U	4.3U	3.9U	3.7U	3.9U	5.4U
4,4'-DDT	4.2U	1.8J	4.0U	4.3U	3.9U	3.7U	3.9U	5.4U
Methoxychlor	22U	21U	21U	22U	20U	19U	20U	28U
Endrin Ketone	4.2U	4.1U	4.0U	4.3U	3.9U	3.7U	3.9U	5.4U
Endrin Aldehyde	4.2U	4.1U	4.0U	4.3U	3.9U	3.7U	3.9U	5.4U

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Pesticides/PCBs	Sample Identification[a]							
Parameters	02-SS-21	02-SS-22	02-SS-23	02-SS-24	02-SS-25	02-SS-26	02-SS-27	02-SS-28
alpha-Chlordane	2.2U	2.1U	2.1U	2.2U	2.0U	1.9U	2.0U	2.8U
gamma-Chlordane	2.2U	2.1U	2.1U	2.2U	2.0U	1.9U	2.0U	2.8U
Toxaphene	220U	210U	210U	220U	200U	190U	200U	280U
Aroclor-1016	42U	41U	40U	43U	39U	37U	39U	54U
Aroclor-1221	86U	83U	82U	87U	79U	76U	80U	110U
Aroclor-1232	42U	41U	40U	43U	39U	37U	39U	54U
Aroclor-1242	42U	41U	40U	43U	39U	37U	39U	54U
Aroclor-1248	42U	41U	40U	43U	39U	37U	39U	54U
Aroclor-1254	42U	41U	40U	43U	39U	37U	39U	54U
Aroclor-1260	42U	41U	40U	43U	39U	37U	39U	54U

[a] Sample Date: 11/15/94, Analysis Date: 12/1/94.
Concentration Units: microgram(s) per kilogram (ug/kg), dry weight basis.

Notes: U - Compound was not detected, has been reported at the Contract Required Quantiation Limit (CRQL).
B - Compound was detected in the associated blank.
J - Coumpound detected below the CRQL and reported as estimated.
P - Concentration reported is lowest amount, less than or = to 25 percent difference between analytical columns.

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Pesticides/PCBs	Sample Identification[a]							
Parameters	02-SS-21RE	02-SS-22RE	02-SS-23RE	02-SS-24RE	02-SS-25RE	02-SS-26RE	02-SS-27RE	02-SS-28RE
alpha-BHC	2.2U	2.1U	2.1U	2.2U	2.0U	1.9U	2.0U	2.8U
beta-BHC	2.2U	2.1U	2.1U	2.2U	2.0U	1.9U	2.0U	2.8U
delta-BHC	2.2U	2.1U	2.1U	2.2U	2.0U	1.9U	2.0U	6.9P
gamma-BHC (Lindane)	2.2U	2.1U	2.1U	2.2U	2.0U	1.9U	2.0U	2.8U
Heptachlor	2.2U	2.1U	2.1U	2.2U	2.0U	1.9U	2.0U	2.8U
Aldrin	2.2U	2.1U	2.1U	2.2U	2.0U	1.9U	2.0U	2.8U
Heptachlor Epoxide	1.2JP	2.1U	2.1U	2.2U	2.0U	1.9U	2.0U	2.8U
Endosulfan I	2.2U	2.1U	2.1U	2.2U	2.0U	1.9U	2.0U	2.8U
Dieldrin	4.2U	4.1U	4.0U	1.4JP	3.9U	3.7U	3.9U	5.4U
4,4'-DDE	13P	0.84JP	4.0U	5.3P	3.9U	1.6JP	1.7JP	5.4U
Endrin	4.2U	4.1U	4.0U	4.3U	3.9U	3.7U	3.9U	5.4U
Endosulfan II	4.2U	4.1U	4.0U	4.3U	3.9U	3.7U	3.9U	5.4U
4,4'-DDD	4.2U	4.1U	4.0U	1.8JP	3.9U	3.7U	3.9U	5.4U
Endosulfan Sulfate	2.9JP	4.1U	4.0U	2.1JP	3.9U	3.7U	3.9U	5.4U
4,4'-DDT	5.5P	4.1U	4.0U	6.4P	3.9U	1.8JP	3.9U	5.4U
Methoxychlor	74BP	9.4BJP	21U	60BP	20U	19U	22BP	28U
Endrin Ketone	24P	4.1U	4.0U	18P	3.9U	3.7U	3.9U	5.4U
Endrin Aldehyde	4.2U	4.1U	4.0U	6.6P	3.9U	3.7U	3.9U	5.4U

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Pesticides/PCBs	Sample Identification[a]						
Parameters	02-SS-43	02-SS-44	02-SS-45	02-SS-46	02-SS-47	02-SS-48	02-SS-48D
alpha-BHC	2.1U	2.3U	2.1U	2.0U	2.0U	1.9U	1.9U
beta-BHC	2.1U	2.3U	2.1U	2.0U	2.0U	1.9U	1.9U
delta-BHC	2.1U	2.3U	2.1U	2.0U	2.0U	1.9U	1.9U
gamma-BHC (Lindane)	2.1U	2.3U	2.1U	2.0U	2.0U	1.9U	1.9U
Heptachlor	2.1U	2.3U	2.1U	2.0U	2.0U	1.9U	1.9U
Aldrin	2.1U	2.3U	2.1U	2.0U	2.0U	1.9U	1.9U
Heptachlor Epoxide	2.1U	2.3U	2.1U	2.0U	2.0U	1.9U	1.9U
Endosulfan I	2.1U	2.3U	2.1U	2.0U	2.0U	1.9U	1.9U
Dieldrin	4.0U	4.4U	4.1U	3.8U	3.8U	3.7U	3.7U
4,4'-DDE	4.0U	4.4U	4.1U	3.8U	3.8U	3.7U	3.7U
Endrin	0.96J	1.0J	4.1U	4.2	2.6J	3.7U	3.7U
Endosulfan II	4.0U	4.4U	4.1U	3.8U	3.8U	3.7U	3.7U
4,4'-DDD	4.0U	4.4U	4.1U	3.8U	3.8U	3.7U	3.7U
Endosulfan Sulfate	4.0U	4.4U	4.1U	3.8U	3.8U	3.7U	3.7U
4,4'-DDT	4.0U	4.4U	4.1U	3.8U	3.8U	3.7U	3.7U
Methoxychlor	21U	23U	21U	20U	20U	19U	19U
Endrin Ketone	4.0U	4.4U	4.1U	3.8U	3.8U	3.7U	3.7U
Endrin Aldehyde	4.0U	4.4U	4.1U	3.8U	3.8U	3.7U	3.7U

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Pesticides/PCBs Parameters	Sample Identification[a]							
	02-SS-21RE	02-SS-22RE	02-SS-23RE	02-SS-24RE	02-SS-25RE	02-SS-26RE	02-SS-27RE	02-SS-28RE
alpha-Chlordane	2.2U	2.1U	2.1U	2.2U	2.0U	1.9U	2.0U	2.8U
gamma-Chlordane	2.2U	2.1U	2.1U	2.2U	2.0U	1.9U	2.0U	2.8U
Toxaphene	220U	210U	210U	220U	200U	190U	200U	280U
Aroclor-1016	42U	41U	40U	43U	39U	37U	39U	54U
Aroclor-1221	86U	82U	82U	87U	79U	76U	80U	110U
Aroclor-1232	42U	41U	40U	43U	39U	37U	39U	54U
Aroclor-1242	42U	41U	40U	43U	39U	37U	39U	54U
Aroclor-1248	42U	41U	40U	43U	39U	37U	39U	54U
Aroclor-1254	42U	41U	40U	43U	39U	37U	39U	54U
Aroclor-1260	42U	41U	40U	43U	39U	37U	39U	54U

[a] Sample Date: 11/15/94, Analysis Date: 12/1/94.
Concentration Units: microgram(s) per kilogram (ug/kg), dry weight basis.

Notes: U - Compound was not detected, has been reported at the Contract Required Quantiation Limit (CRQL).
B - Compound was detected in the associated blank.
J - Coumpound detected below the CRQL and reported as estimated.
P - Concentration reported is lowest amount, less than or = to 25 percent difference between analytical columns.

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Pesticides/PCBs	Sample Identification[a]						
Parameters	02-SS-43	02-SS-44	02-SS-45	02-SS-46	02-SS-47	02-SS-48	02-SS-48D
alpha-Chlordane	2.1U	2.3U	2.1U	2.0U	2.0U	1.9U	1.9U
gamma-Chlordane	2.1U	2.3U	2.1U	2.0U	2.0U	1.9U	1.9U
Toxaphene	210U	230U	210U	200U	200U	190U	190U
Aroclor-1016	40U	44U	41U	38U	38U	37U	37U
Aroclor-1221	81U	89U	84U	78U	77U	75U	74U
Aroclor-1232	40U	44U	41U	38U	38U	37U	37U
Aroclor-1242	40U	44U	41U	38U	38U	37U	37U
Aroclor-1248	40U	44U	41U	38U	38U	37U	37U
Aroclor-1254	40U	44U	41U	78	52	37U	37U
Aroclor-1260	40U	44U	41U	38U	38U	37U	37U

[a] Sample Date: 11/15/94, Analysis Date: 12/1/94.
Concentration Units: microgram(s) per kilogram (ug/kg), dry weight basis.

Notes: U - Compound was not detected, has been reported at the Contract Required Quantiation Limit (CRQL).
B - Compound was detected in the associated blank.
J - Coumpound detected below the CRQL and reported as estimated.
P - Concentration reported is lowest amount, less than or = to 25 percent difference between analytical columns.

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Pesticides/PCBs	Sample Identification[a]						
Parameters	02-SS-43RE	02-SS-44RE	02-SS-45RE	02-SS-46RE	02-SS-47RE	02-SS-48RE	02-SS-48DRE
alpha-BHC	17U	2.3U	17U	16U	1.9U	1.9U	3.8U
beta-BHC	17U	2.3U	17U	16U	1.9U	1.9U	3.8U
delta-BHC	17U	2.3U	17U	16U	1.9U	1.9U	3.8U
gamma-BHC (Lindane)	17U	2.3U	17U	16U	1.9U	1.9U	3.8U
Heptachlor	17U	2.3U	17U	16U	1.9U	1.9U	3.8U
Aldrin	17U	2.3U	17U	16U	1.9U	1.9U	3.8U
Heptachlor Epoxide	17U	2.3U	17U	16U	1.9U	1.9U	3.8U
Endosulfan I	17U	2.3U	17U	16U	1.9U	1.9U	3.8U
Dieldrin	16JP	4.4U	13JP	25JP	1.3JP	3.7U	7.4P
4,4'-DDE	32U	1.7JP	7.6JP	31U	1.8JP	0.76JP	7.3U
Endrin	32U	3.5J	33U	31U	3.8U	3.7U	7.3U
Endosulfan II	32U	4.4U	33U	31U	3.8U	3.7U	7.3U
4,4'-DDD	32U	4.4U	33U	31U	1.3JP	3.7U	7.3U
Endosulfan Sulfate	32U	1.3JP	33U	9.6JP	3.8U	3.7U	7.3U
4,4'-DDT	32U	4.4U	33U	31U	2.4JP	1.8J	7.3U
Methoxychlor	170U	10BJP	66BJP	28BJ	19U	4.2BJP	12BJP
Endrin Ketone	32U	4.4U	27JP	31U	2.4JP	3.7U	7.3U
Endrin Aldehyde	32U	4.4U	33U	31U	3.8U	3.7U	34

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Pesticides/PCBs Parameters	Sample Identification[a]						
	02-SS-43RE	02-SS-44RE	02-SS-45RE	02-SS-46RE	02-SS-47RE	02-SS-48RE	02-SS-48DRE
alpha-Chlordane	17U	2.3U	17U	16U	1.9U	1.9U	3.8U
gamma-Chlordane	17U	2.3U	17U	16U	1.9U	1.9U	3.8U
Toxaphene	1700U	230U	1700U	1600U	190U	190U	380U
Aroclor-1016	320U	44U	330U	310U	38U	37U	73U
Aroclor-1221	650U	89U	670U	620U	77U	75U	150U
Aroclor-1232	320U	44U	330U	310U	38U	37U	73U
Aroclor-1242	320U	44U	330U	310U	38U	37U	73U
Aroclor-1248	320U	44U	330U	310U	38U	37U	73U
Aroclor-1254	1900	44U	1500	2800	120	37U	490
Aroclor-1260	320U	44U	330U	310U	38U	37U	920

[a] Sample Date: 11/15/94, Analysis Date: 12/1/94.
Concentration Units: microgram(s) per kilogram (ug/kg), dry weight basis.

Notes: U - Compound was not detected, has been reported at the Contract Required Quantiation Limit (CRQL).
B - Compound was detected in the associated blank.
J - Coumpound detected below the CRQL and reported as estimated.
P - Concentration reported is lowest amount, less than or = to 25 percent difference between analytical columns.

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Inorganic Parameter	Sample Identification[a]																					
	02-SS-01		02-SS-02		02-SS-03		02-SS-04		02-SS-05		02-SS-06		02-SS-07		02-SS-08		02-SS-09		02-SS-10		02-SS-10D	
	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]
Aluminum	7350	*	8340	*	4890	*	6720	*	6880	*	9280	*	10600	*	11400	*	8950	*	7310	*	8240	*
Antimony	3.1U	N	3.1B	N	3.2B	N	2.9U	N	2.7U	N	3.3B	N	2.8U	N	3.4B	N	3.5B	N	2.9U	N	2.8U	N
Arsenic	2.0B		2.5		3.5		1.8B		2.3		2.3B		1.7B		8.4		2.3		4.5		4.7	
Barium	45.5B		35.0B		28.9B		30.4B		32.5B		42.9B		44.5B		82.4		31.2B		39.6B		41.0B	
Beryllium	0.23B		0.18B		0.19B		0.11B		0.17B		0.16B		0.18B		0.37B		0.19B		0.22B		0.25B	
Cadmium	1.5		2.3		2.6		1.5		0.83B		1.7		1.0B		4.2		1.3		4.2		3.6	
Calcium	6230	*	2040	*	1760	*	1580	*	3350	*	3790	*	901B	*	8470	*	2620	*	3270	*	2840	*
Chromium	7.8		13.7		13.6		9.2		9.9		11.5		8.2		25.1		11.7		14.1		19.2	
Cobalt	1.7B		2.9B		3.6B		2.1B		2.3B		2.3B		1.6B		4.9B		3.0B		2.6B		3.3B	
Copper	5.0B		14.7		14.8		5.7B		6.5		8.0		4.0B		13.1		6.2		6.9		9.8	
Iron	6280		12500		18900		10600		10400		11200		6540		25300		10500		8620		10800	
Lead	22.7		21.6		12.7		14.1		18.8		24.3		13.1		29.8		15.3		41.4		37.7	
Magnesium	1590		505B		452B		369B		735B		585B		359B		2530		894B		479B		543B	
Manganese	213	N*	126	N*	150	N*	111	N*	91.1	N*	94.2	N*	49.1	N*	302	N*	98.9	N*	178	N*	179	N*
Mercury	0.13U	N	0.18	N	0.11U	N	0.13U	N	0.15	N	0.17	N	0.11U	N	0.12U	N	0.12U	N	0.14	N	0.12U	N
Nickel	3.4B		4.3B		5.4B		3.6B		2.9B		4.3B		3.5B		11.1		7.0B		8.5B		15.4	
Potassium	476B		517B		403B		393B		370B		505B		406B		586B		576B		360B		476B	
Selenium	0.58B	N	0.33B	N	0.27U	N	0.29B	N	0.32B	N	0.46B	N	0.27U	WN	0.46B	N	0.35B	N	0.38B	N	0.34B	N

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Inorganic Parameter	Sample Identification[a]																			
	02-SS-01		02-SS-02		02-SS-03		02-SS-04		02-SS-05		02-SS-06		02-SS-07		02-SS-08		02-SS-09		02-SS-10		02-SS-10D	
	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]
Silver	0.50U		0.47U		0.45U		0.48U		0.45U		0.46U		0.46U		0.46U		0.45U		0.47U		0.46U	
Sodium	98.5B		32.9B		70.9B		75.3B		26.8B		79.7B		28.0B		113B		35.6B		82.1B		31.2B	
Thallium	0.23U		0.21U		0.21U		0.22U		0.20U		0.21U		0.20U		0.21U		0.20U		0.21U		0.20U	
Vanadium	16.7		20.0		13.1		17.2		17.5		23.9		17.0		45.7		44.0		47.2		50.2	
Zinc	49.2	E	93.8	E	96.8	E	42.4	E	35.8	E	44.2	E	59.9	E	88.8	E	29.1	E	55.6	E	73.1	E
Cyanide	3.2U		3.0U		2.9U		3.1U		2.9U		2.9U		2.9U		3.0U		2.9U		2.9U		2.9U	

[a] Sample Date: 11/4/94, Analysis Date: 11/10,11,14/94.
Concentration Units: microgram(s) per kilogram (ug/kg), dry weight basis.
[c] C = Concentration.
[d] Q = Laboratory Qualifers.

Notes: U - Analyte was not detected, has been reported at the Instrument Detection Limit (IDL).
B - Analyte was detected at a concentrion >IDL, <Contract Required Detection Limit (CDRL). This qualifier is not extremely important.
* - Analyte showed poor precision (indicated on Form 6, Sample Duplicates).
N - Analyte showed poor accuracy (indicated Form 5, Sample Spike Recovery).
W-GFAAS analysis resulted in an analytical spike recovery of greater than 40%, but less than 85% or greater than 115%.
E - (Serial Dilution) Sample results >50 x IDL diluted 5-fold; do not agree with original results within 10 percent difference.

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Inorganic Parameter	Sample Identification[a]																					
	02-SS-11		02-SS-12		02-SS-13		02-SS-14		02-SS-15		02-SS-16		02-SS-17		02-SS-18		02-SS-19		02-SS-20		02-SS-20D	
	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]
Aluminum	6740		6470		9300		5730		5810		5450		4240		5810		7860		5180		7590	
Antimony	2.9U	N	2.4U	N	2.9U	N	3.3U	N	2.9U	N	2.9U	N	3.0U	N	2.9U	N	3.3U	N	2.9U	N	2.9U	N
Arsenic	3.7		2.5		2.5		1.4B	M	2.1B		1.4B		1.8B		3.5		2.3B		1.4B		1.9B	
Barium	36.3B		34.6B		49.2		44.4B		36.2B		22.6B		31.4B		36.7B		35.7B		37.7B		30.9B	
Beryllium	0.31B		0.30B		0.44B		0.27U		0.29B		0.24U		0.24U		0.39B		0.41B		0.35B		0.30B	
Cadmium	1.2		2.5		1.3		1.3B		6.0		0.40B		0.36U		0.98B		0.84B		0.35U		0.36U	
Calcium	4510		3150		2270		1870		2000		727B		1610		1490		1320B		1400		978B	
Chromium	11.5		9.3		21.2		9.8		8.8		6.2		7.1		12.2		14.1		10.7		9.9	
Cobalt	2.2B		2.2B		3.8B		1.4B		2.7B		0.98B		1.9B		2.7B		2.6B		2.5B		2.8B	
Copper	4.7B		6.4		6.3		5.4B		30.6		2.6B		3.5B		8.9		11.3		6.3		4.2B	
Iron	7150		6690		16100		7180		8440		5050		5900		7920		6760		6450		9650	
Lead	28.0		22.0		17.8		29.1		25.8		11.0		18.1	S	29.0		29.7		18.9	S	12.9	
Magnesium	460B		499B		1000B		432B		403B		272B		247B		528B		520B		405B		595B	
Manganese	109		141		122		159		145		42.6		105		143		210		146		128	
Mercury	0.12U		1.0		0.17		0.43		0.15		0.10U		2.6		0.58		0.12U		0.11U		0.11U	
Nickel	3.8B		4.0B		4.2B		2.2B		4.6B		2.5B		3.0B		4.2B		3.2B		3.4B		2.8B	
Potassium	415B		357B		1250		307B		371B		255B		264B		427B		348B		221B		431B	
Selenium	0.29U		0.23U	W	0.28U	W	0.33U	W	0.28U		0.28U	W	0.28U	W	0.30B		0.32U	W	0.29U		0.31B	

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Inorganic Parameter	Sample Identification[a]																					
	02-SS-11		02-SS-12		02-SS-13		02-SS-14		02-SS-15		02-SS-16		02-SS-17		02-SS-18		02-SS-19		02-SS-20		02-SS-20D	
	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]
Silver	0.48U		0.39U		0.47U		0.54U		0.47U		0.48U		0.49U		0.47U		0.54U		0.47U		0.48U	
Sodium	92.4B		39.9B		147B		139B		55.8B		25.4B		122B		124B		353B		146B		404B	
Thallium	0.22U		0.18U		0.21U		0.24U		0.21U		0.21U		0.21U		0.21U		0.24U		0.22U		0.22U	
Vanadium	13.0		14.6		28.5		15.0		12.7		12.4		10.9B		12.7		12.4B		12.4		17.6	
Zinc	57.2	E	47.7	E	44.4	E	219	E	80.8	E	19.2	E	68.1	E	51.1	E	75.2	E	40.3	E	33.1	E
Cyanide	3.1U		2.5U		3.0U		3.4U		3.0U		3.0U		3.1U		3.0U		3.4U		3.1U		3.1U	

[a] Sample Date: 11/14/94, Analysis Date: 11/16,21-23,25,29/94.
Concentration Units: microgram(s) per kilogram (ug/kg), dry weight basis.
[c] C = Concentration.
[d] Q = Laboratory Qualifiers.

Notes: U - Analyte was not detected, has been reported at the Instrument Detection Limit (IDL).
B - Analyte was detected at a concentrion >IDL, <Contract Required Detection Limit (CDRL). This qualifier is not extremely important.
* - Analyte showed poor precision (indicated on Form 6, Sample Duplicates).
N - Analyte showed poor accuracy (indicated Form 5, Sample Spike Recovery).
M-The second set of duplicate injections do not meet the 20% RSD(CV) for GFAAS.
S-The GFAAS analyte was quantitated from a MSA.
W-GFAAS analysis resulted in an analytical spike recovery of greater than 40%, but less than 85% or greater than 115%.
E - (Serial Dilution) Sample results >50 x IDL diluted 5-fold; do not agree with original results within 10 percent difference.

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Inorganic Parameter	Sample Identification[a]																					
	02-SS-21		02-SS-22		02-SS-23		02-SS-24		02-SS-25		02-SS-26		02-SS-27		02-SS-28		02-SS-43		02-SS-44		02-SS-45	
	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]
Aluminum	7330		6820		6050		8740		6850		9590		9990		6370		5280		6970		7410	
Antimony	3.1U	N	2.9U	N	2.9U	N	3.1U	N	2.9U	N	2.7U	N	2.9U	N	3.9U	N	2.9U	N	24.3	N	3.0U	N
Arsenic	1.8B		4.1		3.2		2.6		1.6B		1.5B		1.9B		3.6		1.4B		2.7		1.3B	
Barium	39.3B		41.7B		29.9B		45.8B		26.8B		22.6B		32.6B		25.8B		34.2B		38.8B		29.0	
Beryllium	0.62B		0.41B		0.32B		0.38B		0.23B		0.15B		0.22B		0.43B		0.19B		0.25B		0.18B	
Cadmium	0.36U		0.36U		0.35U		2.9		0.35U		0.33U		0.35U		0.48U		1.7		3.1		0.63B	
Calcium	1550		1040B		1300		2080		1720		1590		1330		5990		1910		2410		1770	
Chromium	15.1	N*	10.4	N*	9.3	N*	17.2	N*	9.5	N*	11.4	N*	12.6	N*	12.0	N*	11.7	N*	16.5	N*	9.5	N*
Cobalt	5.9B		3.3B		2.8B		6.0B		2.0B		1.8B		2.7B		3.5B		1.7B		3.7B		1.7B	
Copper	4.5B		3.6B		3.7B		12.1		5.4B		5.1B		6.3		4.6B		5.5B		12.3		3.8B	
Iron	16900	*	10100	*	8040	*	34500	*	8400	*	10400	*	12300	*	10800	*	7460	*	10600	*	9500	*
Lead	18.4		13.0		12.9		44.0		31.5		10.1		15.3		9.2		21.8		22.3		13.2	
Magnesium	663B		527B		466B		613B		435B		417B		493B		1010B		369B		516B		421B	
Manganese	225		183		142		265		82.8		38.7		84.5		87.2		106		115		89.9	
Mercury	0.13U		0.19		0.11U		0.56		0.11U		0.10U		0.11U		0.16U		4.0		0.12U		7.7	
Nickel	6.3B		4.1B		3.6B		9.1B		3.8B		3.3B		4.5B		5.1B		3.0B		4.9B		4.3B	
Potassium	618B		589B		591B		540B		436B		480B		610B		801B		385B		477B		356B	
Selenium	0.27U		0.26U		0.34B		0.27U		0.25U	W	0.24U		0.31B		0.36U		0.37B		0.31B		0.27U	W

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Inorganic Parameter	Sample Identification[a]																			
	02-SS-21		02-SS-22		02-SS-23		02-SS-24		02-SS-25		02-SS-26		02-SS-27		02-SS-28		02-SS-43		02-SS-44		02-SS-45	
	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]
Silver	0.51U	N	0.48U	N	0.47U	N	0.50U	N	0.47U	N	0.45U	N	0.47U	N	1.1B	N	0.47U	N	0.51U	N	0.49U	N
Sodium	87.7B		92.7B		83.6B		53.0B		32.2B		81.7B		83.9B		345B		25.7B		93.7		83.3B	
Thallium	0.15U		0.14B		0.15U		0.15U		0.14U		0.13U		0.21B		0.19U		0.14U		0.18B		0.14U	
Vanadium	23.1		20.2		16.5		20.5		17.6		24.5		24.4		16.8		12.7		19.1		18.6	
Zinc	75.2		42.5		19.6		64.7		22.8		15.0		91.8		23.4		56.2		295		53.5	
Cyanide	3.2U		3.1U		3.0U		3.3U		2.9U		2.8U		3.0U		4.1U		3.0U		3.3U		3.1U	

[a] Sample Date: 11/15/94, Analysis Date: 11/11-23,21,25,28,29,30/94.
Concentration Units: microgram(s) per kilogram (ug/kg), dry weight basis.
[c] C = Concentration.
[d] Q = Laboratory Qualifiers.

Notes: U - Analyte was not detected, has been reported at the Instrument Detection Limit (IDL).
B - Analyte was detected at a concentrion >IDL, <Contract Required Detection Limit (CDRL). This qualifier is not extremely important.
* - Analyte showed poor precision (indicated on Form 6, Sample Duplicates).
N - Analyte showed poor accuracy (indicated Form 5, Sample Spike Recovery).
W-GFAAS analysis resulted in an analytical spike recovery of greater than 40%, but less than 85% or greater than 115%.
E - (Serial Dilution) Sample results >50 x IDL diluted 5-fold; do not agree with original results within 10 percent difference.

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Inorganic Parameter	Sample Identification[a]							
	02-SS-46		02-SS-47		02-SS-48		02-SS-48D	
	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]
Aluminum	7780		8050		12500		14200	
Antimony	2.8U	N	2.7U	N	2.7U	N	2.7U	N
Arsenic	1.6B		2.4		1.6B		1.2B	
Barium	25.0B		25.3B		20.9B		21.8B	
Beryllium	0.20B		0.20B		0.18B		0.19B	
Cadmium	2.4B		2.4		2460		1.6	
Calcium	3090		3660		15.7		1880	
Chromium	14.1	N*	13.0	N*	2.2B	N*	15.5	N*
Cobalt	2.4B		3.1B		168		2.2B	
Copper	25.2		13.1		14700		233	
Iron	12400	*	19800	*	17.7	*	14200	*
Lead	20.6		27.7		371B		14.9	
Magnesium	452B		520B		48.4		404B	
Manganese	70.7		102		0.11U		50.7	
Mercury	16.6		0.33		5.9B		0.11U	
Nickel	12.6		4.3B		450B		6.0B	
Potassium	547B		449B		0.24U		512B	
Selenium	0.26B		0.25U		0.44U		0.24U	

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Inorganic Parameter	Sample Identification[a]							
	02-SS-46		02-SS-47		02-SS-48		02-SS-48D	
	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]
Silver	0.46U	N	0.44U	N	76.2B	N	0.44U	N
Sodium	38.4B		41.1B		0.13U		73.4B	
Thallium	0.14U		0.20B		26.8		0.13B	
Vanadium	24.9		24.3		26.8		27.9	
Zinc	504		60.5		41.3		46.5	
Cyanide	2.9U		2.9U		2.8U		2.8U	

[a] Sample Date: 11/15/94, Analysis Date: 11/11-23,21,25,28,29,30/94.
Concentration Units: microgram(s) per kilogram (ug/kg), dry weight basis.
[c] C = Concentration.
[d] Q = Laboratory Qualifers.

Notes: U - Analyte was not detected, has been reported at the Instrument Detection Limit (IDL).
B - Analyte was detected at a concentrion >IDL, <Contract Required Detection Limit (CDRL). This qualifier is not extremely important.
* - Analyte showed poor precision (indicated on Form 6, Sample Duplicates).
N - Analyte showed poor accuracy (indicated Form 5, Sample Spike Recovery).
E - (Serial Dilution) Sample results >50 x IDL diluted 5-fold; do not agree with original results within 10 percent difference.

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Inorganic Parameter	Sample Identification[a]													
	02-SS-29		02-SS-30		02-SS-31		02-SS-32		02-SS-33		02-SS-34		02-SS-34D	
	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]
Aluminum	7540		7210		6270		6030		7670		7030		7100	
Antimony	2.9U	N	2.9U	N	2.7U	N	2.9U	N	5.3U	N	3.4U	N	2.9U	N
Arsenic	3.4		2.1U		2.5		2.0B		5.9		2.1B		2.4B	
Barium	25.9B		34.2B		29.5B		42.4B		46.7B		41.1B		35.9B	
Beryllium	0.24U		0.23U		0.22U		0.23U		0.45B		0.30B		0.23U	
Cadmium	0.36U		3.3		0.33U		0.35U		0.65U		0.41U		0.77B	
Calcium	1230		1920		793B		1420		6170		2730		1820	
Chromium	10.2		14.5		14.9		5.7		13.5		9.7		16.0	
Cobalt	2.1B		2.4B		1.7B		2.7B		4.3B		3.3B		2.6B	
Copper	6.2		8.6		2.6B		4.4B		7.6B		4.5B		8.0	
Iron	11400		11300		12500		8910		20200		8490		10900	
Lead	15.7		16.9		6.7		11.9		17.4		13.1		30.2	
Magnesium	408B		479B		277B		1950		1410B		936B		696B	
Manganese	67.3		82.6		21.2		111		307		213		95.0	
Mercury	0.12U		0.17		0.12U		0.11U		0.18U		0.13U		0.21	
Nickel	3.7B		4.8B		2.3B		4.7B		5.7B		5.3B		3.4B	
Potassium	467B		445B		515B		1430		621B		551B		629B	
Selenium	0.26U		0.27U		0.25U		0.27U		0.48U		0.30U		0.27U	

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Inorganic Parameter	Sample Identification[a]													
	02-SS-29		02-SS-30		02-SS-31		02-SS-32		02-SS-33		02-SS-34		02-SS-34D	
	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]	C[c]	Q[d]
Silver	0.47U		0.47U		0.44U		0.47U		12.5		1.7B		0.47U	
Sodium	76.7B		75.7B		28.4B		29.8B		641B		221B		75.7B	
Thallium	0.21B		0.17B		0.22B		0.19B		0.26U		0.19B		0.15U	
Vanadium	22.4		21.2		24.5		21.6		21.4B		14.4		21.2	
Zinc	19.7	E	33.4	E	9.1	E	24.5	E	46.7	E	30.9	E	34.1	E
Cyanide	3.1U		3.0U		2.9U		3.0U		5.5U		3.5U		3.0U	

[a] Sample Date: 11/16/94, Analysis Date: 11/22,28,30/94.
Concentration Units: microgram(s) per kilogram (ug/kg), dry weight basis.
[c] C = Concentration.
[d] Q = Laboratory Qualifers.

Notes: U - Analyte was not detected, has been reported at the Instrument Detection Limit (IDL).
B - Analyte was detected at a concentrion >IDL, <Contract Required Detection Limit (CDRL). This qualifier is not extremely important.
* - Analyte showed poor precision (indicated on Form 6, Sample Duplicates).
N - Analyte showed poor accuracy (indicated Form 5, Sample Spike Recovery).
E - (Serial Dilution) Sample results >50 x IDL diluted 5-fold; do not agree with original results within 10 percent difference.

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Nitroexplosives	Sample Identification[a]										
Parameters	02-SS-01	02-SS-02	02-SS-03	02-SS-04	02-SS-05	02-SS-06	02-SS-07	02-SS-08	02-SS-09	02-SS-10	02-SS-10D
HMX	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U
RDX	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U
1,3,5-trinitrobenzene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
1,3-dinitrobenzene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
tetryl	0.65U	0.65U	0.65U	0.65U	0.65U	0.65U	0.65U	0.65U	0.65U	0.65U	0.65U
nitrobenzene	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U	0.51U#	0.26U	0.26U	0.26U
2,4,6-trinitrotoluene	0.25U	0.25U	0.63+	1.7+	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
4-amino-2,6-dintrotoluene	0.25U	0.25U	0.25U	0.76+	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
2,6-dinitrotoluene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
2,4-dinitrotoluene	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U
2-nitrotoluene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
3-nitrotoluene	0.22U	0.22U	0.22U	0.22U	0.22U	0.22U	0.22U	0.22U	0.22U	0.22U	0.22U

[a] Sample Date: 11/4/94, Analysis Date: 12/13,14,20/94.
Concentration Units: microgram(s) per kilogram (ug/kg), dry weight basis.

Notes: U - Compound was not detected, has been reported at the Contract Required Quantiation Limit (CRQL).
#-Evelated detection limit due to matrix interference.
+-Positive result.

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Nitroexplosives	Sample Identification[a]										
Parameters	02-SS-11	02-SS-12	02-SS-13	02-SS-14	02-SS-15	02-SS-16	02-SS-17	02-SS-18	02-SS-19	02-SS-20	02-SS-20D
HMX	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U
RDX	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U
1,3,5-trinitrobenzene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
1,3-dinitrobenzene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
tetryl	0.65U	0.65U	0.65U	0.65U	0.65U	0.65U	0.65U	0.65U	0.65U	0.65U	0.65U
nitrobenzene	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U	2.5U#	0.26U	0.26U	0.26U	0.26U
2,4,6-trinitrotoluene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
4-amino-2,6-dintrotoluene	0.25U	0.25U	0.25U	0.25+	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
2,6-dinitrotoluene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
2,4-dinitrotoluene	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U
2-nitrotoluene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
3-nitrotoluene	0.22U	0.22U	0.22U	0.22U	0.22U	0.22U	0.22U	0.22U	0.22U	0.22U	0.22U

[a] Sample Date: 11/14/94, Analysis Date: 12/13,14,18,19,21/94.
Concentration Units: microgram(s) per kilogram (ug/kg), dry weight basis.

Notes: U - Compound was not detected, has been reported at the Contract Required Quantiation Limit (CRQL).
#-Evelated detection limit due to matrix interference.
+-Positive result.

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Nitroexplosives Parameters	Sample Identification[a]							
	02-SS-21	02-SS-22	02-SS-23	02-SS-24	02-SS-25	02-SS-26	02-SS-27	02-SS-28
HMX	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U
RDX	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U
1,3,5-trinitrobenzene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
1,3-dinitrobenzene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
tetryl	0.65U	0.65U	0.65U	0.65U	0.65U	0.65U	0.65U	0.65U
nitrobenzene	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U
2,4,6-trinitrotoluene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
4-amino-2,6-dintrotoluene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
2,6-dinitrotoluene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
2,4-dinitrotoluene	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U
2-nitrotoluene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
3-nitrotoluene	0.22U	0.22U	0.22U	0.22U	0.22U	0.22U	0.22U	0.22U

[a] Sample Date: 11/15/94, Analysis Date: 12/8,9,12/94.
Concentration Units: microgram(s) per kilogram (ug/kg), dry weight basis.

Notes: U - Compound was not detected, has been reported at the Contract Required Quantitation Limit (CRQL).

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Nitroexplosives Parameters	Sample Identification[a]						
	02-SS-43	02-SS-44	02-SS-45	02-SS-46	02-SS-47	02-SS-48	02-SS-48D
HMX	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U
RDX	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U
1,3,5-trinitrobenzene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
1,3-dinitrobenzene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
tetryl	0.65U	0.65U	0.65U	0.65U	0.65U	0.65U	0.65U
nitrobenzene	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U
2,4,6-trinitrotoluene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
4-amino-2,6-dinitrotoluene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
2,6-dinitrotoluene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
2,4-dinitrotoluene	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U
2-nitrotoluene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
3-nitrotoluene	0.22U	0.22U	0.22U	0.22U	0.22U	0.22U	0.22U

[a] Sample Date: 11/15/94, Analysis Date: 12/8,9,12/94.
Concentration Units: microgram(s) per kilogram (ug/kg), dry weight basis.

Notes: U - Compound was not detected, has been reported at the Contract Required Quantitation Limit (CRQL).

TABLE 2-8

REMOVAL ACTION
SURFACE SOIL CONFIRMATION SAMPLE RESULTS
SITE 2

Nitroexplosives	Sample Identification[a]						
Parameters	02-SS-29	02-SS-30	02-SS-30D	02-SS-31	02-SS-32	02-SS-33	02-SS-34
HMX	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U
RDX	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U
1,3,5-trinitrobenzene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
1,3-dinitrobenzene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
tetryl	0.65U	0.65U	0.65U	0.65U	0.65U	0.65U	0.65U
nitrobenzene	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U
2,4,6-trinitrotoluene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
4-amino-2,6-dintrotoluene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
2,6-dinitrotoluene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
2,4-dinitrotoluene	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U	0.26U
2-nitrotoluene	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U	0.25U
3-nitrotoluene	0.22U	0.22U	0.22U	0.22U	0.22U	0.22U	0.22U

[a] Sample Date: 11/16/94, Analysis Date: 12/12,13/94.
Concentration Units: microgram(s) per kilogram (ug/kg), dry weight basis.

Notes: U - Compound was not detected, has been reported at the Contract Required Quantitation Limit (CRQL).

TABLE 2-9

RELATIVE RISK RANKING DATA
COLLECTION INVESTIGATION SAMPLE RESULTS
SSA 14

SSA 14
SURFACE SOIL
ORGANICS
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Sample ID.	WP14S3	WP14S1	WP14S2
% Solids	79.3	81.8	77.6
EXPLOSIVES (ug/kg)			
HMX	1100 U	510000	1100 U
RDX	540 U	4900	540 U

TABLE 2-9

RELATIVE RISK RANKING DATA
COLLECTION INVESTIGATION SAMPLE RESULTS
SSA 14

SSA 14
SURFACE SOIL
ORGANICS
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Sample ID. % Solids	MINIMUM NONDETECTED	MAXIMUM NONDETECTED	MINIMUM DETECTED	MAXIMUM DETECTED	LOCATION OF MAXIMUM DETECTED	FREQUENCY OF DETECTION
EXPLOSIVES (ug/kg)						
HMX	1100 U	1100 U	510000	510000	WP14S1	1/3
RDX	540 U	540 U	4900	4900	WP14S1	1/3

TABLE 2-9

RELATIVE RISK RANKING DATA
COLLECTION INVESTIGATION SAMPLE RESULTS
SSA 14

SSA 14
SEDIMENT
ORGANICS
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Sample ID.	WP14H1	WP14H2
% Solids	22.8	21.5
EXPLOSIVES (ug/kg)		
HMX	1100 U	1700

TABLE 2-9

RELATIVE RISK RANKING DATA
COLLECTION INVESTIGATION SAMPLE RESULTS
SSA 14

SSA 14
SEDIMENT
ORGANICS
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Sample ID. % Solids	MINIMUM NONDETECTED	MAXIMUM NONDETECTED	MINIMUM DETECTED	MAXIMUM DETECTED	LOCATION OF MAXIMUM DETECTED	FREQUENCY OF DETECTION
EXPLOSIVES (ug/kg)						
HMX	1100 U	1100 U	1700	1700	WP14H2	1/2

TABLE 2-9

RELATIVE RISK RANKING DATA
COLLECTION INVESTIGATION SAMPLE RESULTS
SSA 14

SSA 14
SURFACE WATER
ORGANICS
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Sample ID.	WP14Q1	WP14Q2	WP14Q3	WP14Q4	WP14Q5
EXPLOSIVES (ug/L)					
HMX	1.2 U	0.21 J	1.1 U	1.1 U	1.4 U
RDX	0.6 U	0.65	0.52 U	0.52 U	0.69 U
Amino-DNTs	0.22 U	0.43	0.19 U	0.19 U	0.25 U

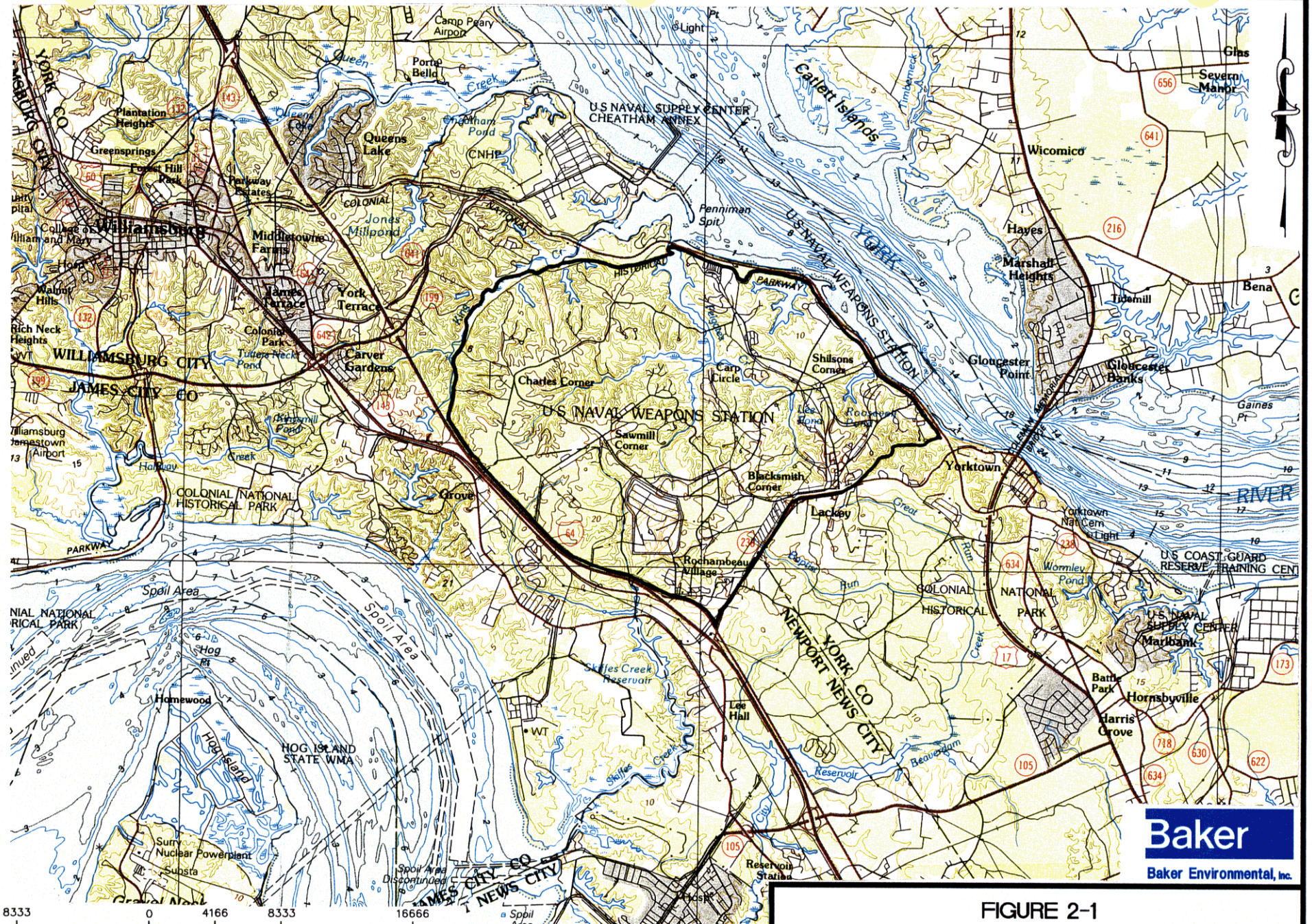
TABLE 2-9

RELATIVE RISK RANKING DATA
COLLECTION INVESTIGATION SAMPLE RESULTS
SSA 14

SSA 14
SURFACE WATER
ORGANICS
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Sample ID.	MINIMUM NONDETECTED	MAXIMUM NONDETECTED	MINIMUM DETECTED	MAXIMUM DETECTED	LOCATION OF MAXIMUM DETECTED	FREQUENCY OF DETECTION
EXPLOSIVES (ug/L)						
HMX	1.1 U	1.4 U	0.21 J	0.21 J	WP14Q2	1/5
RDX	0.52 U	0.69 U	0.65	0.65	WP14Q2	1/5
Amino-DNTs	0.19 U	0.25 U	0.43	0.43	WP14Q2	1/5

SECTION 2.0 FIGURES

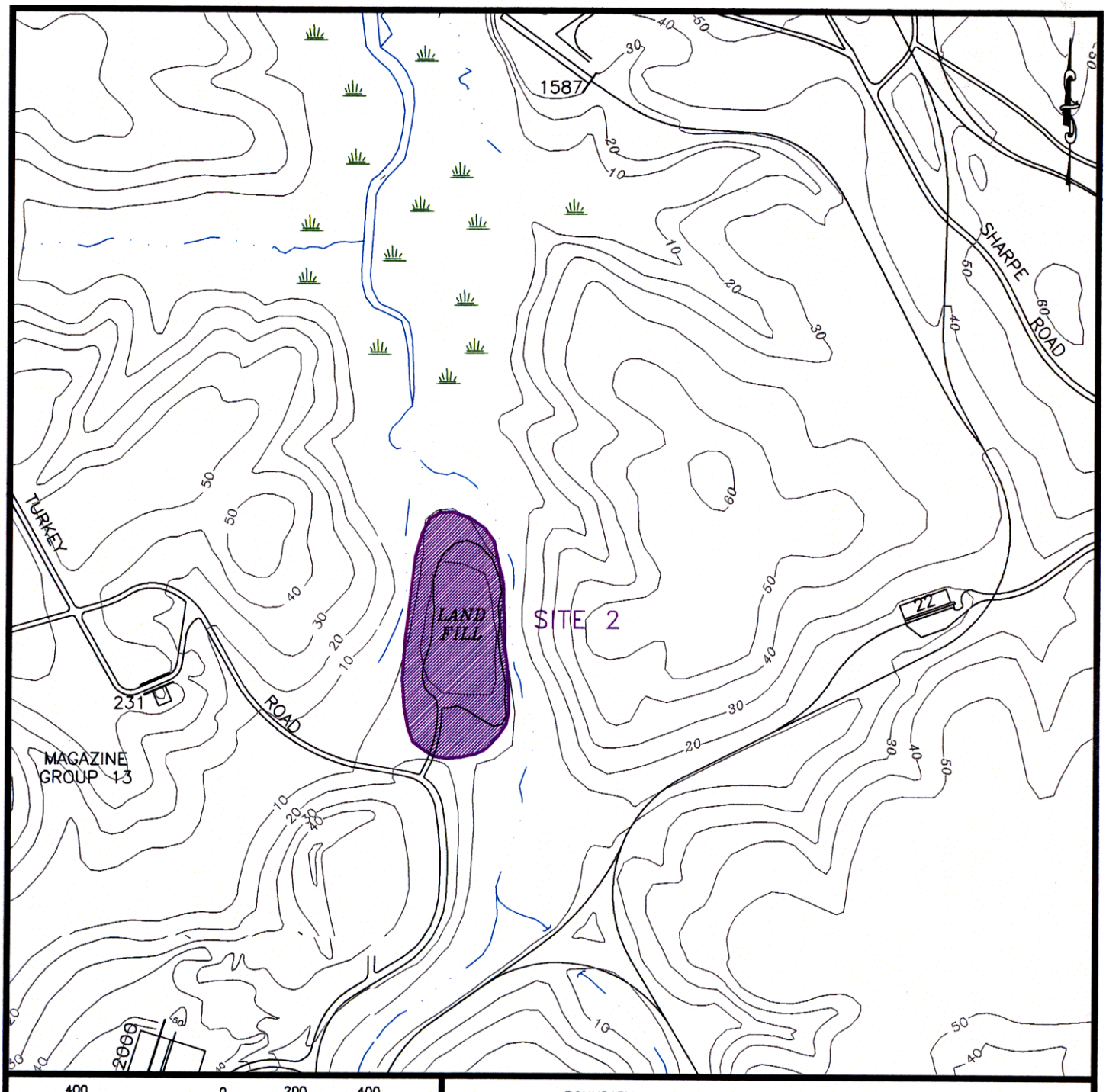


SOURCE: U.S.G.S. 1:100,000–SCALE PLANIMETRIC MAP, WILLIAMSBURG, VIRGINIA, 1984.

Baker

Baker Environmental, Inc.

FIGURE 2-1
LOCATION OF NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

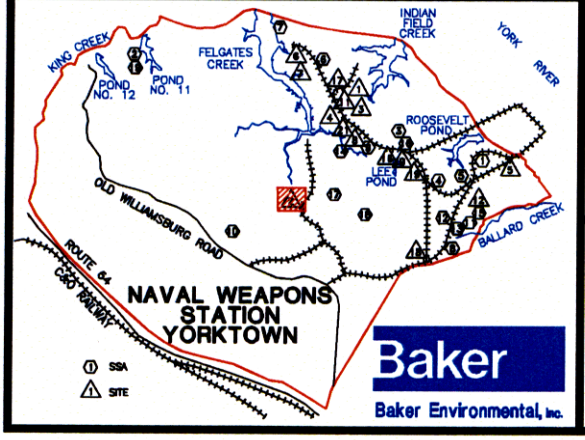


400 0 200 400

1 inch = 400 ft.

BOUNDARY
DRAINAGE
EDGE OF PAVEMENT
MARSH
RAILROAD
FENCE
STRUCTURE
REMEDIAL INVESTIGATION SITE

363503WP



Baker

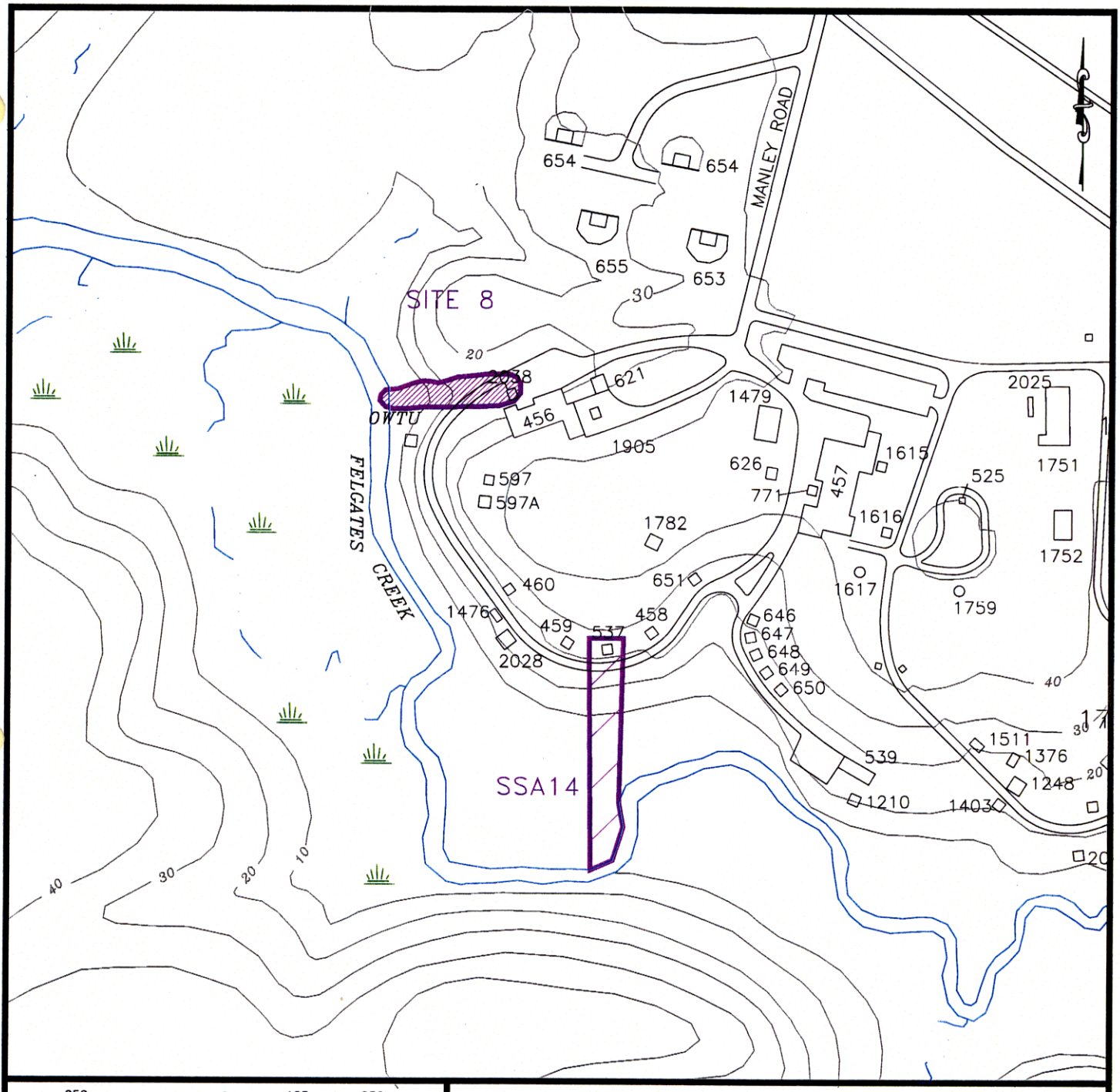
Baker Environmental, Inc.

FIGURE 2-2

SITE 2

NAVAL WEAPONS STATION YORKTOWN

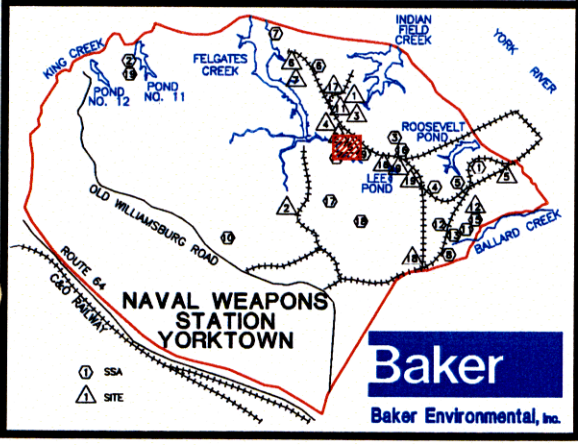
YORKTOWN, VIRGINIA



250 0 125 250

1 inch = 250 ft.

BOUNDARY
DRAINAGE
EDGE OF PAVEMENT
MARSH
RAILROAD
FENCE
STRUCTURE
REMEDIAL INVESTIGATION SITE



Baker

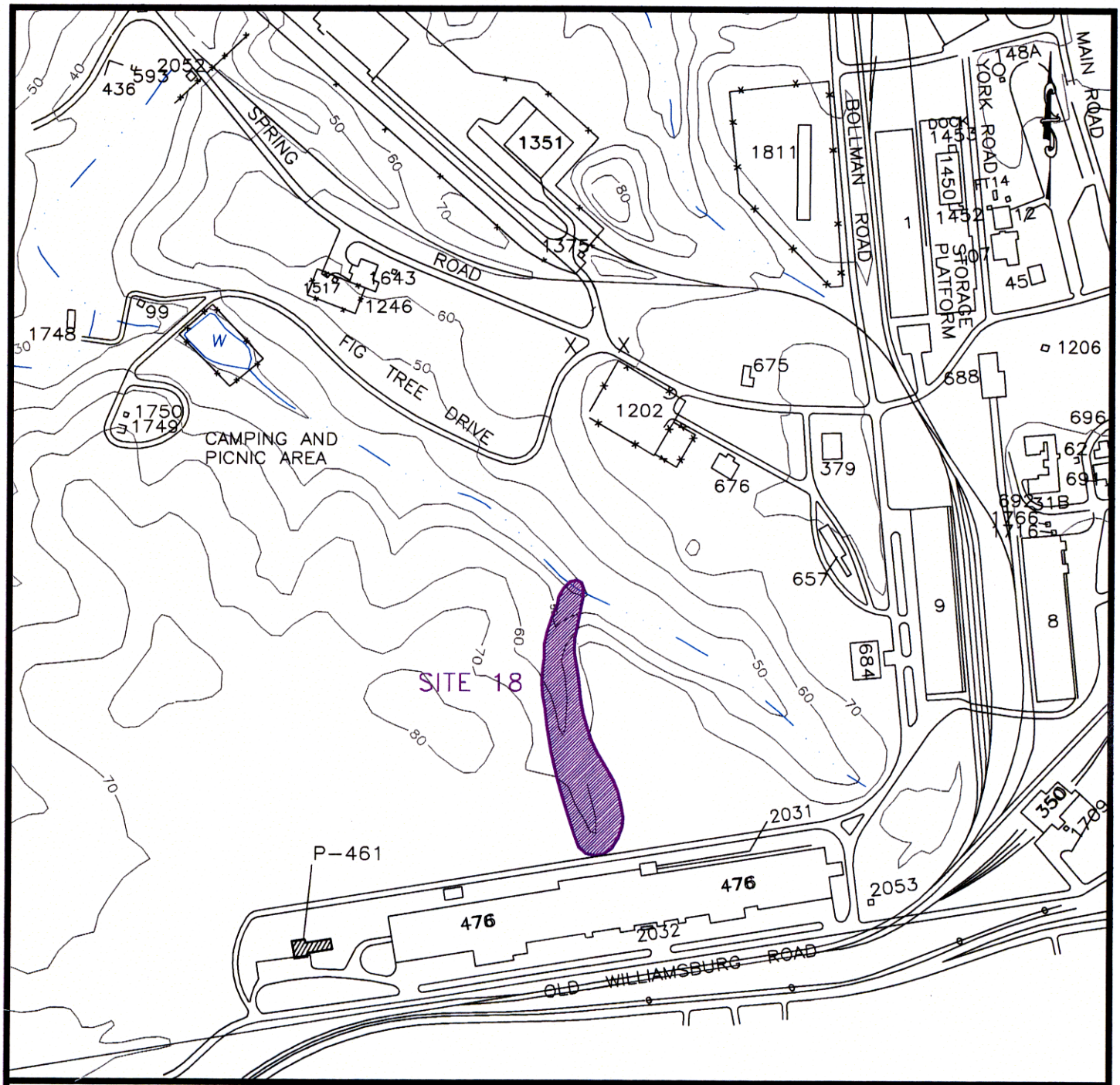
Baker Environmental, Inc.

363502WP

FIGURE 2-3

SITE 8 AND SSA 14

NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA



400 0 200 400

1 inch = 400 ft.

BOUNDARY
DRAINAGE
EDGE OF PAVEMENT
MARSH
RAILROAD
FENCE
STRUCTURE
REMEDIAL INVESTIGATION SITE

363501WP

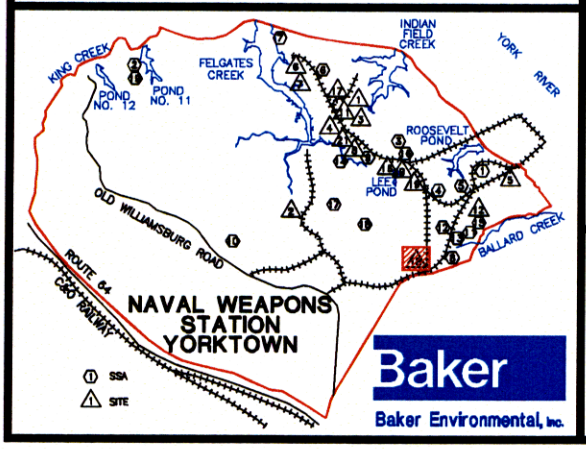


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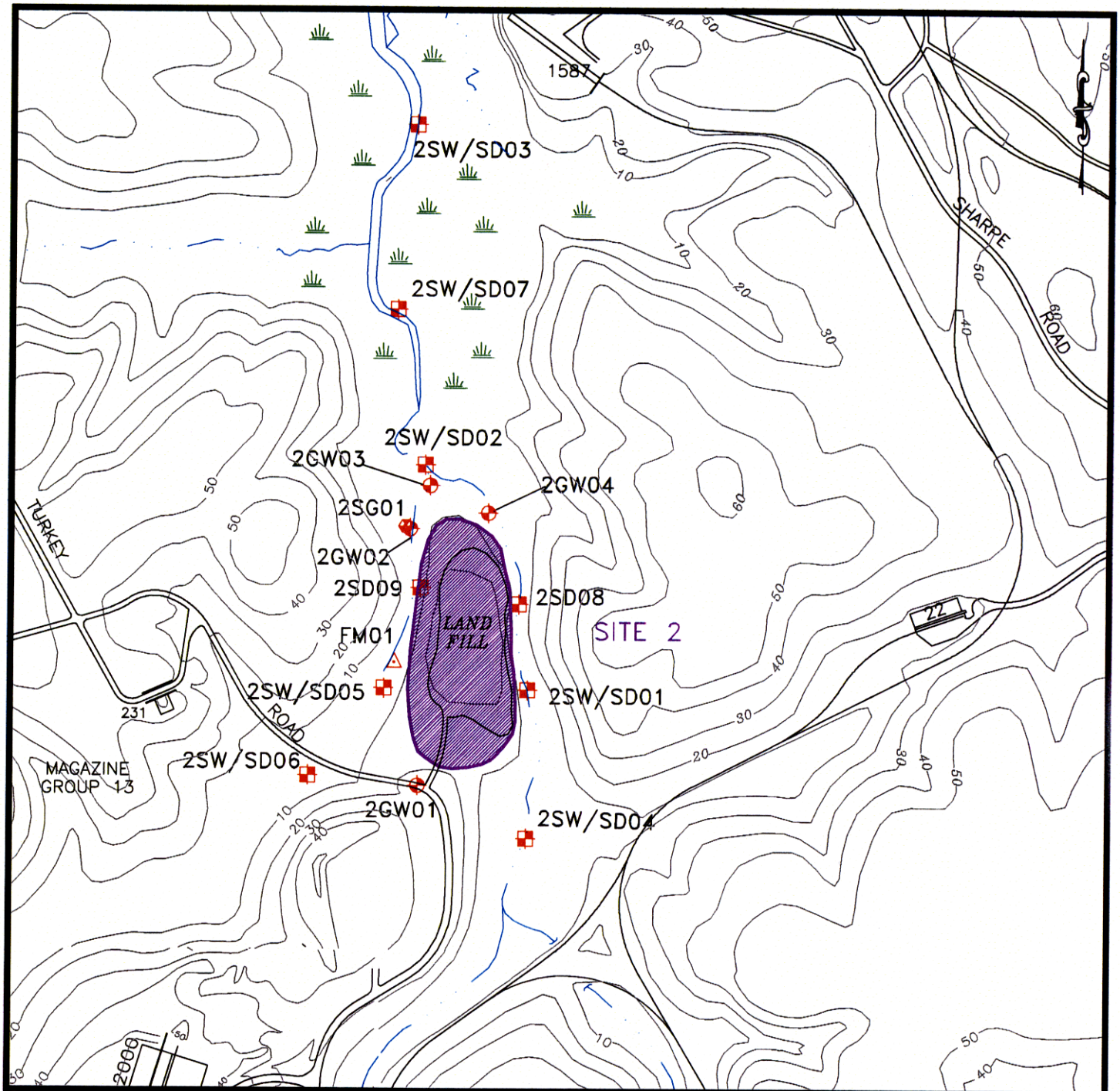
FIGURE 2-4

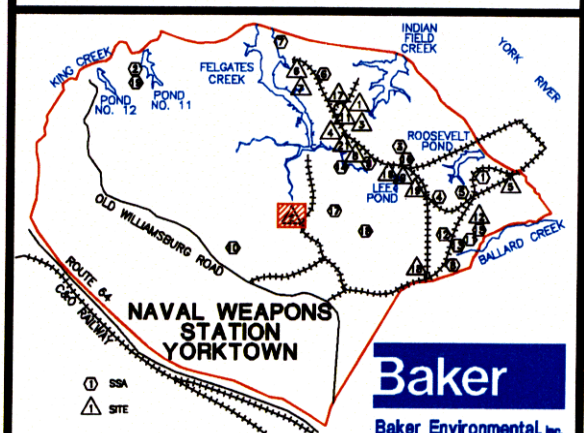
SITE 18

NAVAL WEAPONS STATION YORKTOWN — YORKTOWN, VIRGINIA



400 0 200 400

1 inch = 400 ft.



Baker

Baker Environmental, Inc.

BOUNDARY
DRAINAGE
EDGE OF PAVEMENT
MARSH
RAILROAD
FENCE
STRUCTURE
REMEDIAL INVESTIGATION SITE

2GW03 EXISTING MONITORING WELL LOCATION

2SW/SD04 ROUND ONE SURFACE WATER/SEDIMENT SAMPLING LOCATION

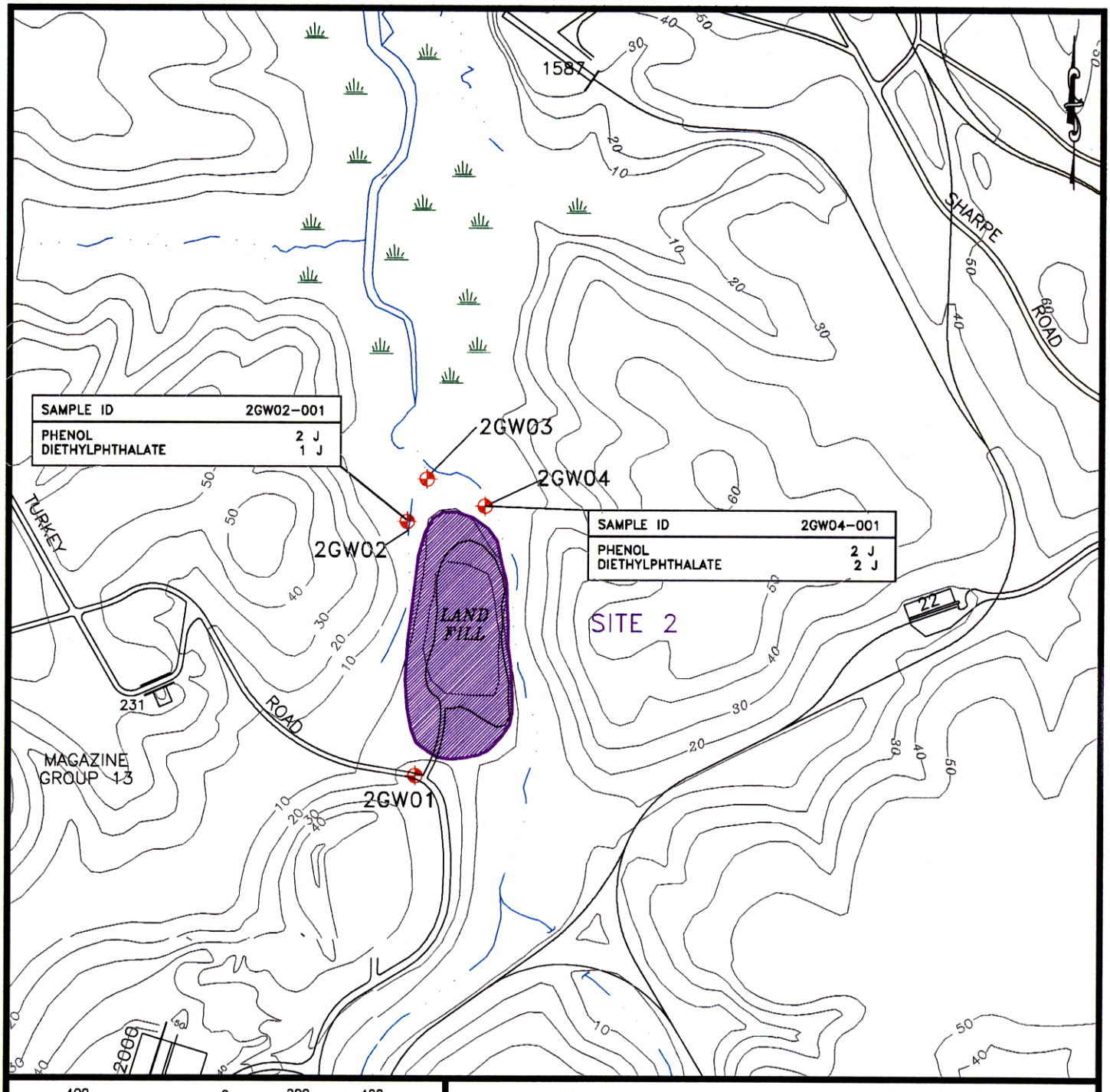
2SG01 STAFF GAUGE LOCATION

FM01 STREAM FLOW MEASUREMENT LOCATION

363504WP

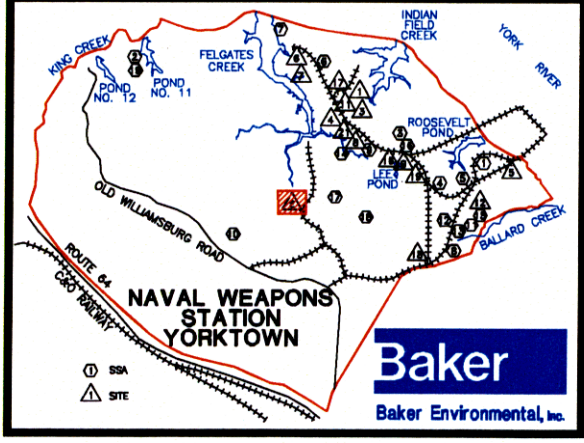
FIGURE 2-5
ROUND ONE RI - SAMPLING LOCATIONS AND MONITORING WELLS
SITE 2

NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA



400 0 200 400

1 inch = 400 ft.



Baker

Baker Environmental, Inc.

BOUNDARY
DRAINAGE
EDGE OF PAVEMENT
MARSH
RAILROAD
FENCE
STRUCTURE
REMEDIAL INVESTIGATION SITE

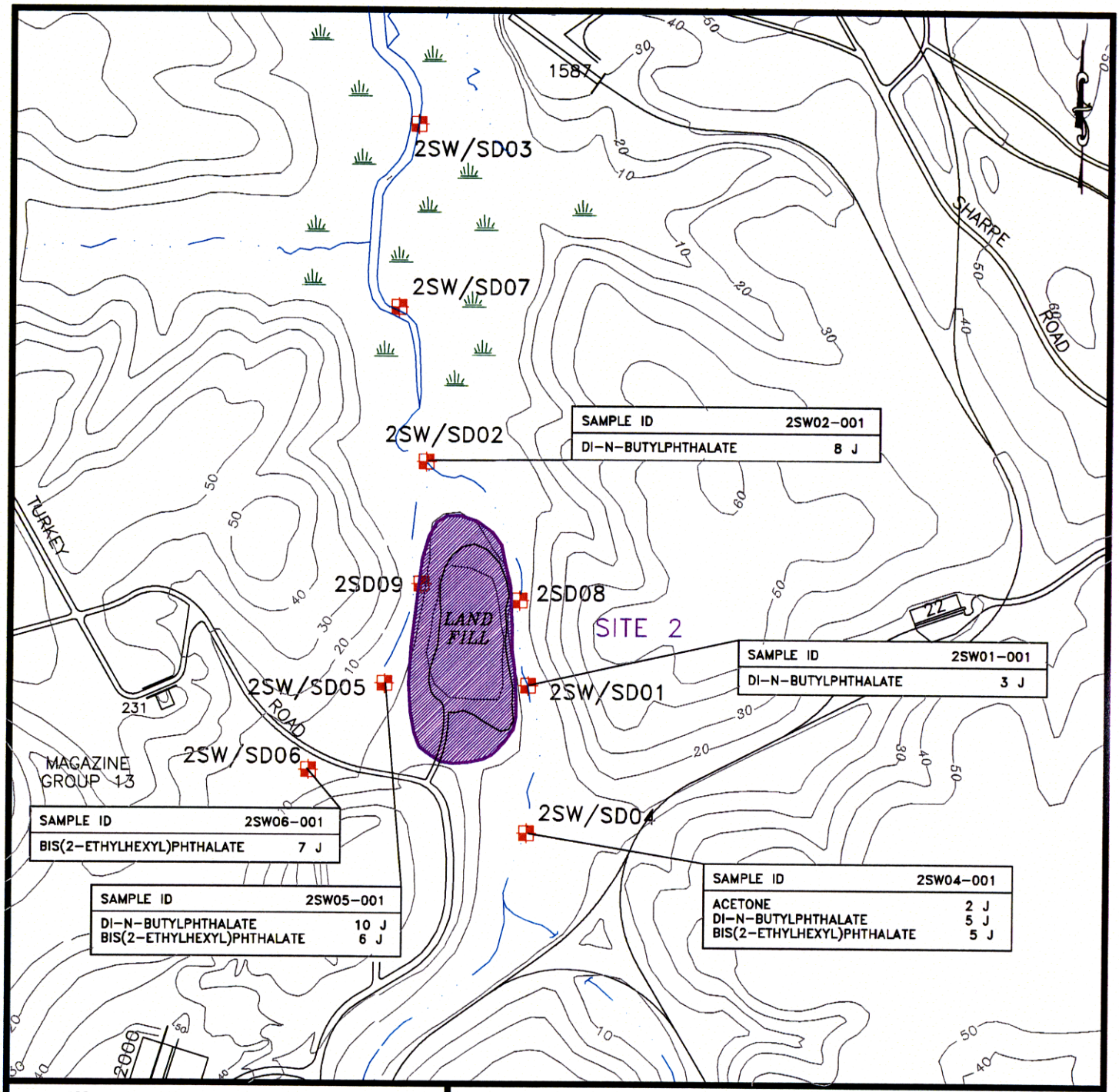
2GW03 EXISTING MONITORING WELL LOCATION

NOTE: ANALYTICAL RESULTS REPORTED IN MICROGRAMS PER LITER (ug/L).

363507WP

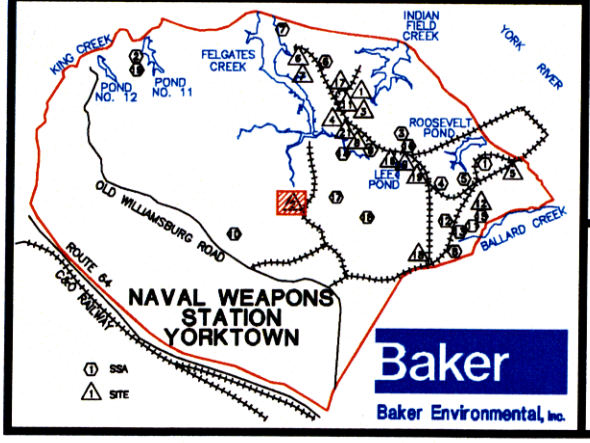
FIGURE 2-6
ROUND ONE RI - SELECT ANALYTICAL RESULTS FOR ORGANICS IN GROUNDWATER SITE 2

NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA



400 0 200 400

1 inch = 400 ft.



BOUNDARY
DRAINAGE
EDGE OF PAVEMENT
MARSH
RAILROAD
FENCE
STRUCTURE
REMEDIAL INVESTIGATION SITE

2SW/SD04 ROUND ONE SURFACE WATER/SEDIMENT SAMPLING LOCATION

NOTE: ANALYTICAL RESULTS REPORTED IN MICROGRAMS PER LITER (ug/L).

363508WP

FIGURE 2-7
ROUND ONE RI - SELECT ANALYTICAL RESULTS FOR ORGANICS IN SURFACE WATER SITE 2

NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

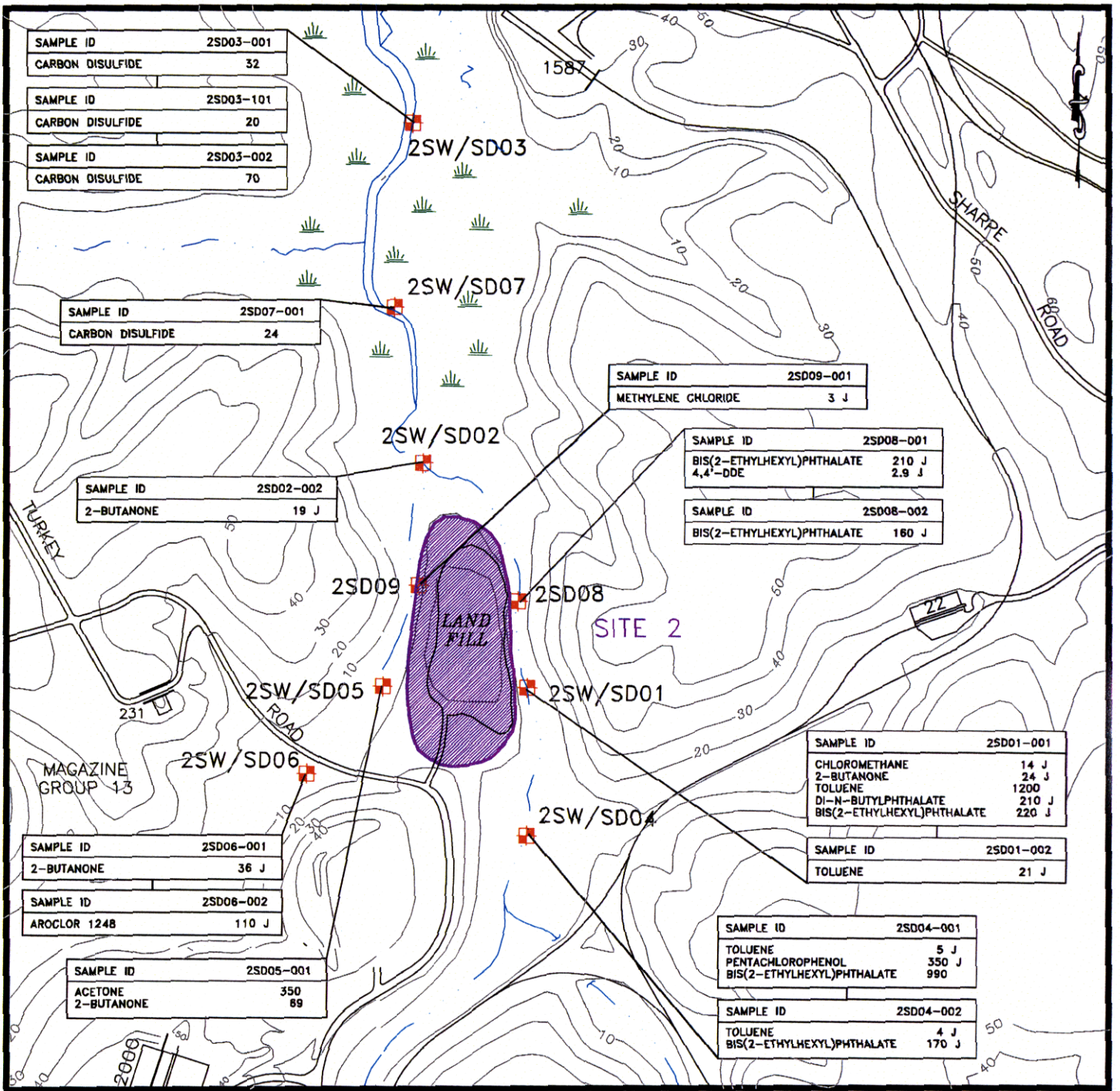
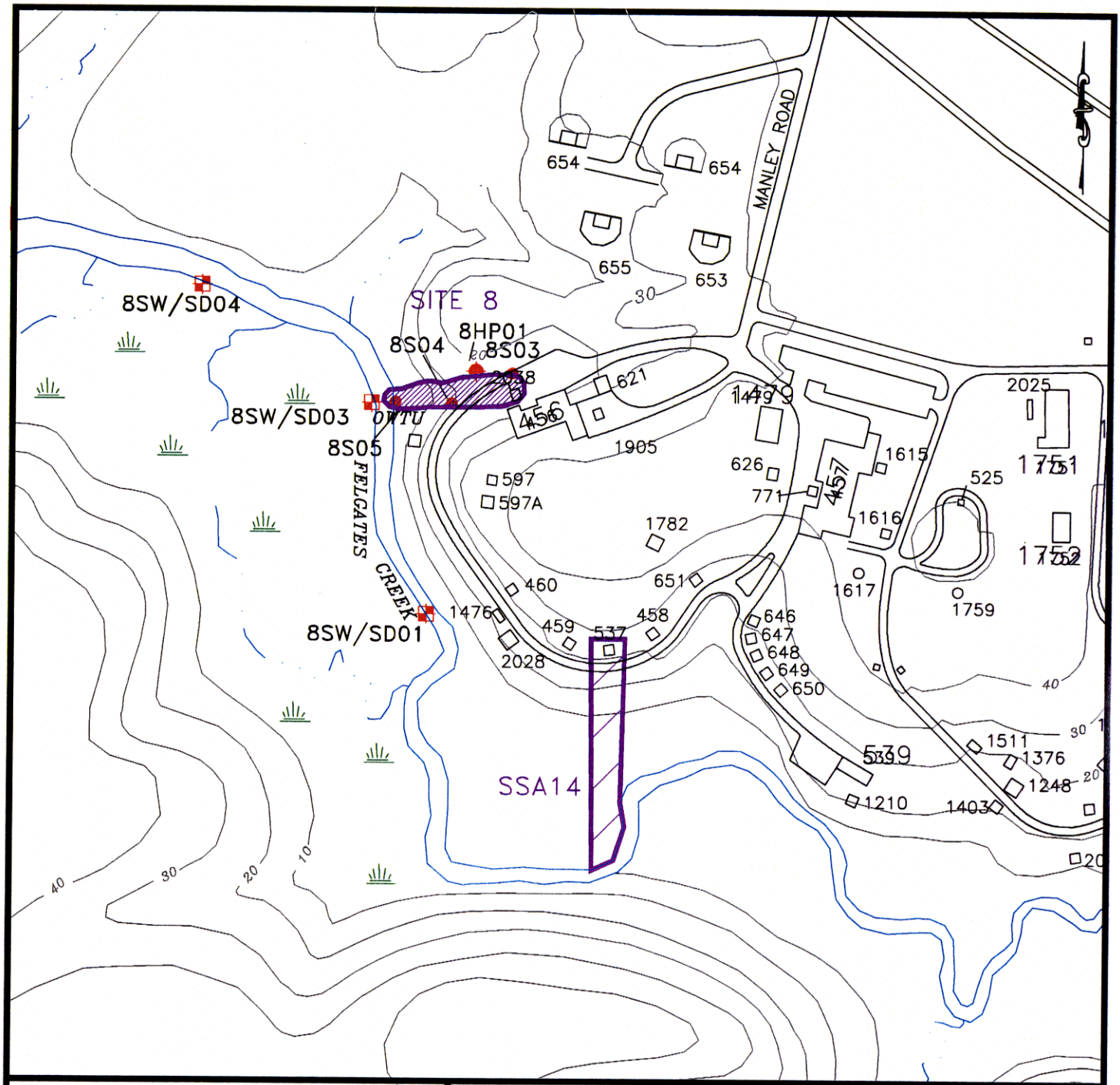


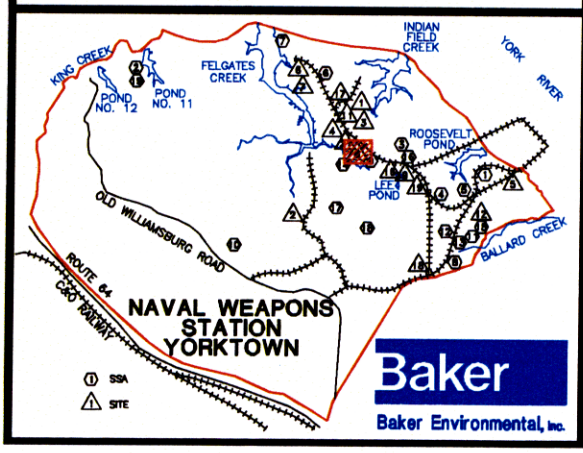
FIGURE 2-8
ROUND ONE RI - SELECT ANALYTICAL RESULTS FOR ORGANICS IN SEDIMENT SITE 2

NAVAL WEAPONS STATION YORKTOWN — YORKTOWN, VIRGINIA



250 0 125 250

1 inch = 250 ft.



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BOUNDARY
DRAINAGE
EDGE OF PAVEMENT
MARSH
RAILROAD
FENCE
STRUCTURE
REMEDIAL INVESTIGATION SITE

8SW/SD04 ROUND ONE SURFACE WATER/ SEDIMENT SAMPLING LOCATION

8S05 ROUND ONE RI SURFACE SOIL SAMPLE LOCATION

8HP01 HYDROPUNCH SAMPLE LOCATION

363505WP

FIGURE 2-9
ROUND ONE RI - SAMPLING LOCATIONS
SITE 8

NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

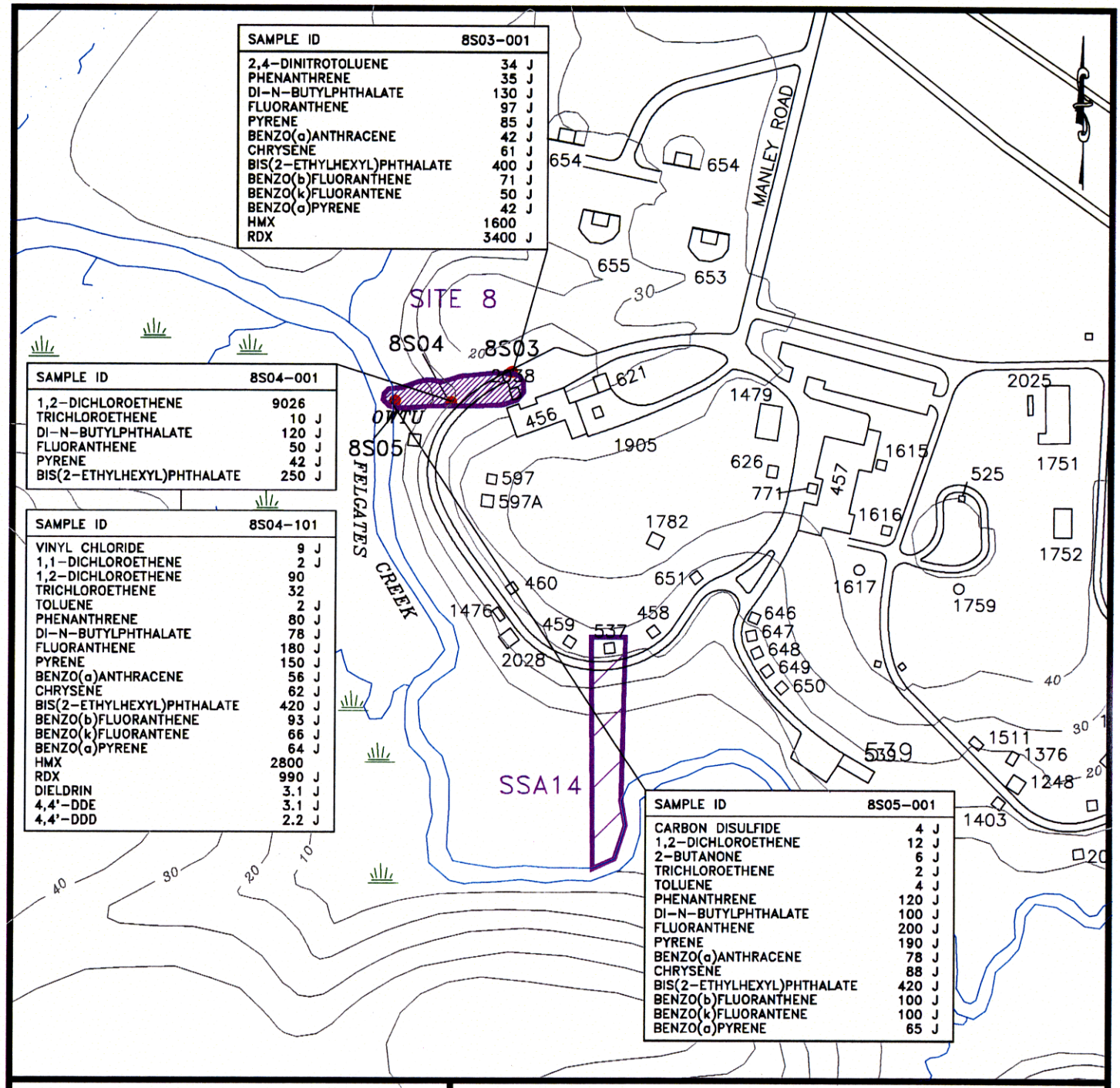


FIGURE 2-10
ROUND ONE RI - ANALYTICAL RESULTS FOR ORGANICS DETECTED IN SURFACE SOIL SITE 8

NAVAL WEAPONS STATION YORKTOWN — YORKTOWN, VIRGINIA

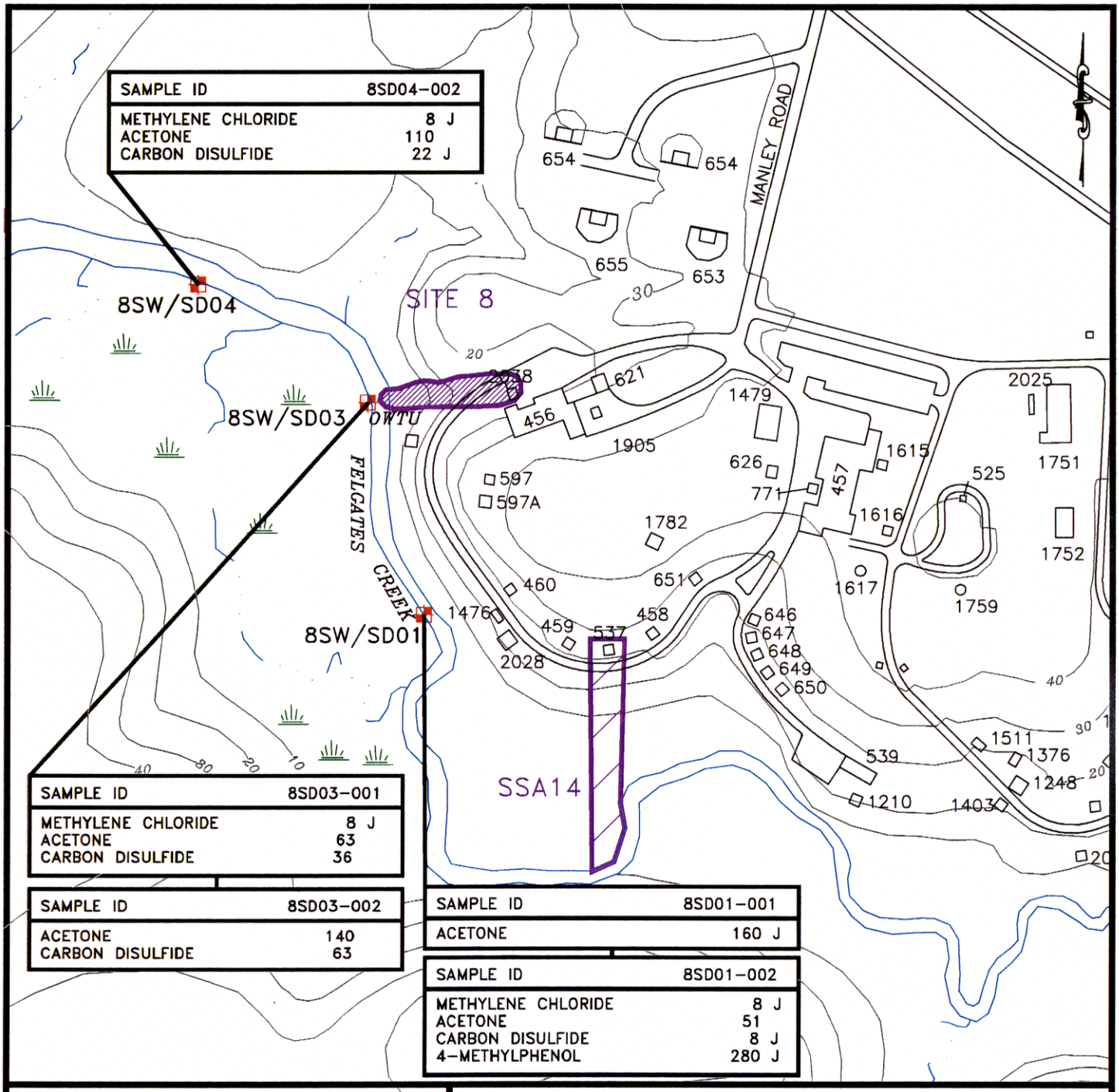
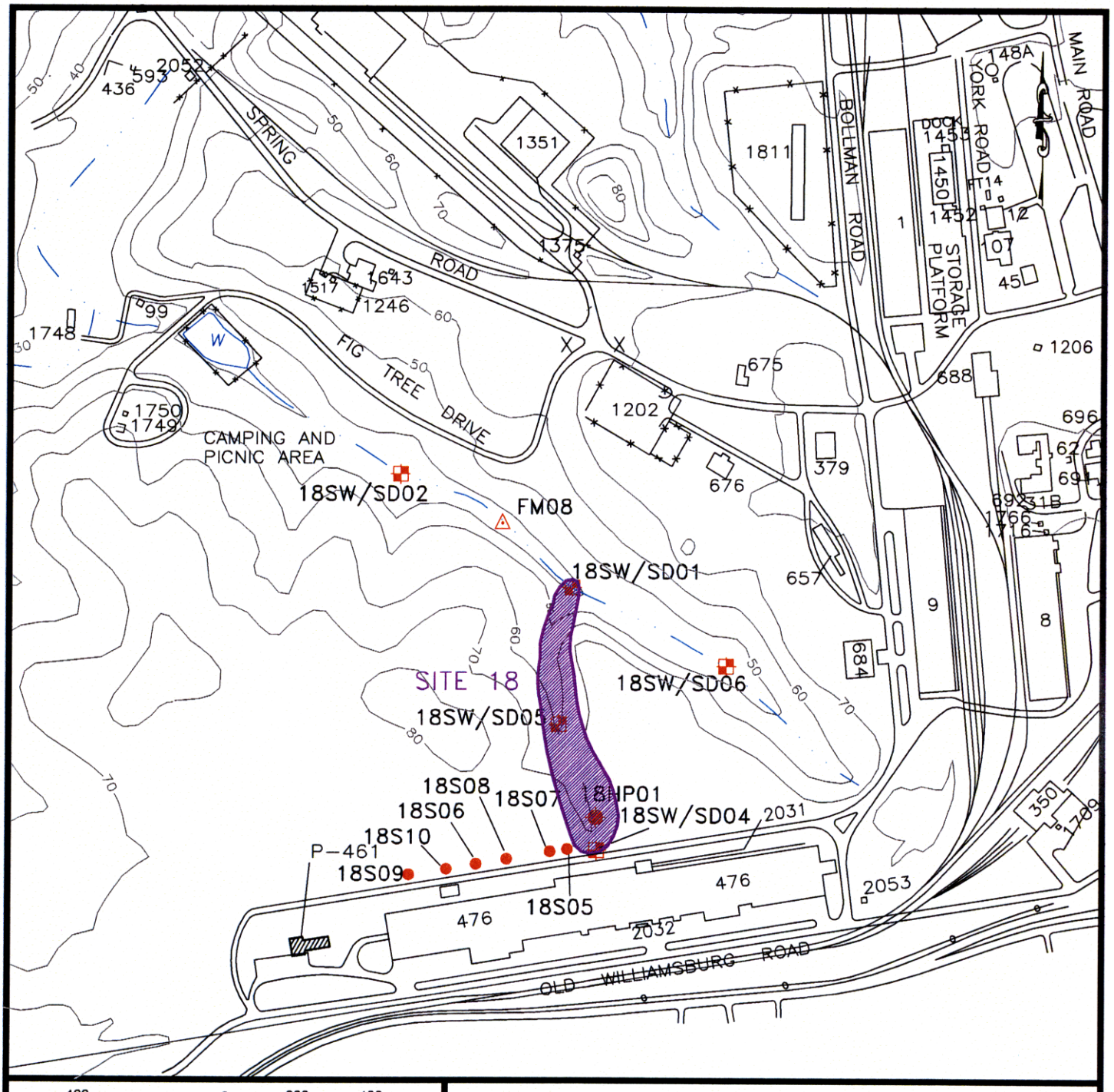


FIGURE 2-11
ROUND ONE RI - SELECT ANALYTICAL RESULTS FOR ORGANICS DETECTED IN SEDIMENT SITE 8

NAVAL WEAPONS STATION YORKTOWN — YORKTOWN, VIRGINIA

363510WP



400 0 200 400

1 inch = 400 ft.

BOUNDARY
DRAINAGE
EDGE OF PAVEMENT
MARSH
RAILROAD
FENCE
STRUCTURE
REMEDIAL INVESTIGATION SITE

18SW/SD02 ROUND ONE RI SURFACE WATER/ SEDIMENT SAMPLING LOCATION

FM08 STREAM FLOW MEASUREMENT STATION

18HP01 HYDROPUNCH SAMPLE LOCATION

18S09 ROUND ONE RI SURFACE SOIL SAMPLE LOCATION

363506WP

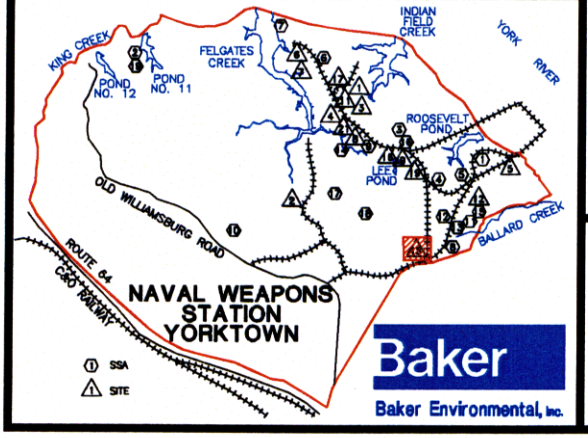


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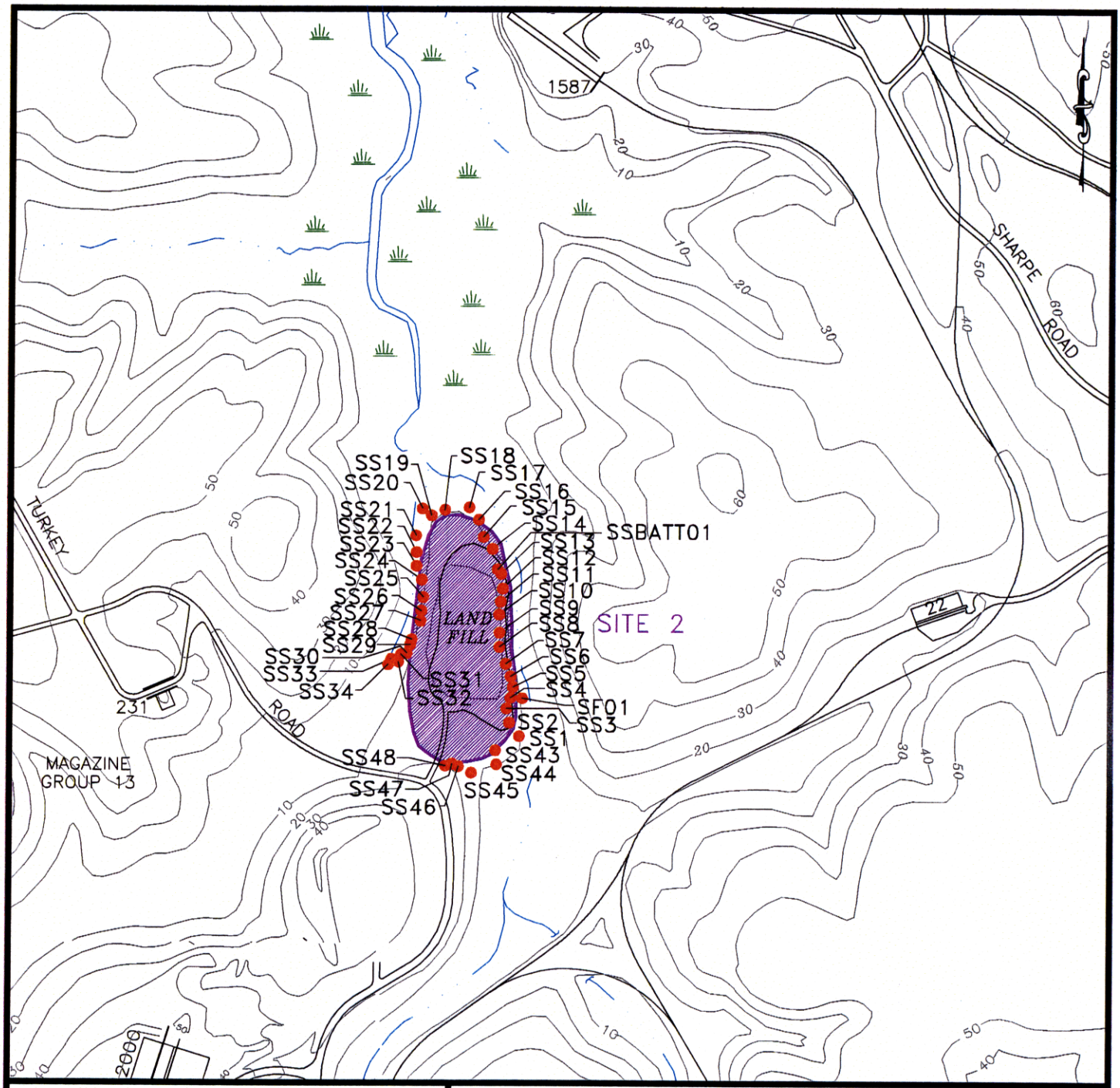
FIGURE 2-12
ROUND ONE RI - SURFACE SOIL, SURFACE WATER, SEDIMENT, AND GROUNDWATER SAMPLING LOCATIONS SITE 18

NAVAL WEAPONS STATION YORKTOWN

YORKTOWN, VIRGINIA



400 0 200 400

1 inch = 400 ft.

BOUNDARY
DRAINAGE
EDGE OF PAVEMENT
MARSH
RAILROAD
FENCE
STRUCTURE
REMEDIAL INVESTIGATION SITE

SS1 SOIL SAMPLE LOCATION

363512WP

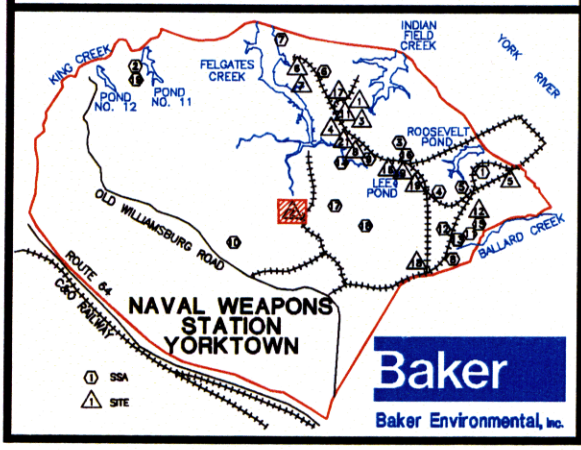
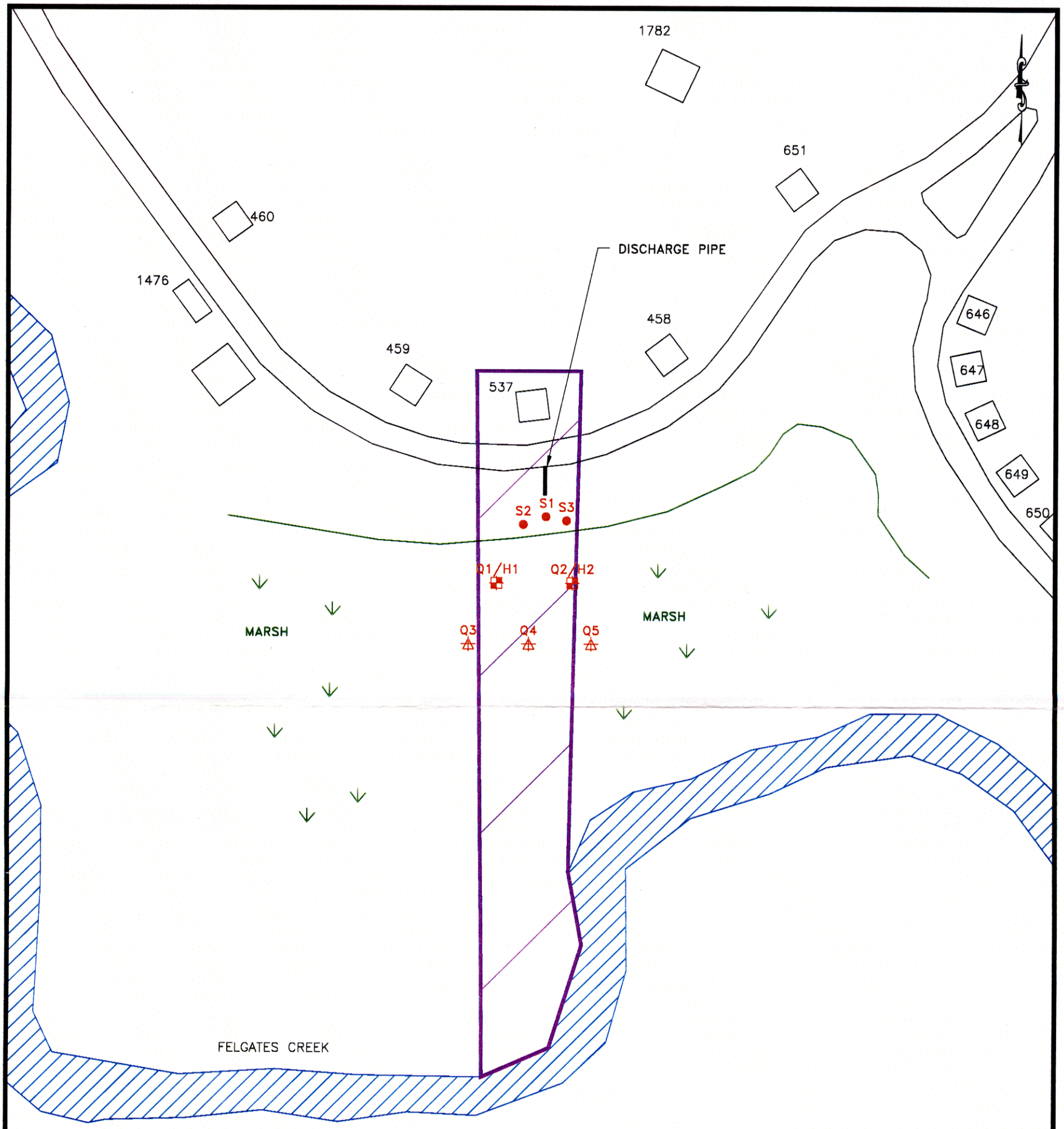


FIGURE 2-13
REMOVAL ACTION
SOIL SAMPLING LOCATIONS
SITE 2

NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA



60 0 30 60

1 inch = 60 ft.

363513WP

Baker

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LEGEND

S1 – SURFACE SOIL SAMPLE LOCATION

Q1/H1 – SURFACE WATER/SEDIMENT SAMPLE LOCATION

Q3 – SURFACE WATER SAMPLE LOCATION (SAMPLE LOCATIONS ARE APPROXIMATE)

SOURCE OF BASE MAPPING: NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA.

FIGURE 2-14
RELATIVE RISK RANKING DATA COLLECTION INVESTIGATION SAMPLING LOCATIONS SITE SCREENING AREA (SSA) 14

NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

3.0 CONCEPTUAL SITE MODELS

Conceptual site models have been used in developing the Site-Specific Work Plan to focus field sampling efforts and to ensure that potentially affected environmental media will be evaluated during this program's sampling effort. Preliminary conceptual site models consider all reasonable current and future potential exposures under a no-action scenario. This section presents the preliminary conceptual site models for Sites 2, 8, 18, and SSA 14. Analytical results from previous investigations presented in Section 2.0 form the basis for the development of these preliminary models.

Under the current potential exposure scenario, access to Sites 2, 8, and SSA 14 at WPNSTA Yorktown is limited to Station employees (i.e., military and civilian), authorized to work in the restricted area of the Station, and ecological receptors (i.e., fish and deer). Although Site 18 is not located in the restricted area, access to it is limited to those with access to the industrial area of the Station. Station employees could potentially contact chemicals of potential concern (COPCs) in soil, and sediment. Terrestrial and aquatic ecological receptors also could be exposed to COPCs in those media in which they live or feed.

Although the property use at WPNSTA Yorktown is not anticipated to change in the foreseeable future because of its importance as a weapons storage facility, a future potential residential use scenario will be evaluated as part of the human health risk assessment required by the USEPA Region III. Therefore, the future residential development of Sites 2, 8, 18, and SSA 14 will include potential exposure to adult and child residents, as well as future construction workers.

3.1 Conceptual Site Model for Site 2 - Turkey Road Landfill

The preliminary conceptual model for Site 2 is presented in Figure 3-1. The primary source area includes the former disposal area located along the perimeter of the site. A removal action was conducted at Site 2 in 1994. COPCs may include SVOCs, PCBs, and selected inorganics. Potential release mechanisms include stormwater runoff, leaching of contaminants in soil to groundwater, and advective aqueous transport in the direction of groundwater flow. Potentially affected media include surface and subsurface soil, groundwater, surface water, and sediment. Potential human health receptors may include current (infrequent) adult civilian workers, future residents, and future

construction workers. Potential ecological receptors may include plants, invertebrates, and fish in Felgates Creek. Terrestrial receptors also could be exposed to COPCs in soil, surface water, and sediment.

3.2 Conceptual Model for Site 8 - NEDED Explosives - Contaminated Wastewater Discharge Area

The preliminary conceptual model for Site 8 is presented in Figure 3-2. The primary source area includes the former drainage area emanating from Site 8 and discharging to Felgates Creek. COPCs may include VOCs, SVOCs, nitramine compounds, and selected inorganics. Potential release mechanisms include stormwater runoff/drainage, leaching of contaminants in soil to groundwater, and advective aqueous transport in the direction of groundwater flow. Potentially affected media include surface and subsurface soil, groundwater, surface water, and sediment. Potential human health receptors may include current (infrequent) adult civilian workers, future residents, and future construction workers. Potential ecological receptors may include plants, invertebrates, and fish in Felgates Creek. Terrestrial receptors also could be exposed to COPCs in soil, surface water, and sediment.

3.3 Conceptual Model for Site 18 - Building 476 Discharge Area

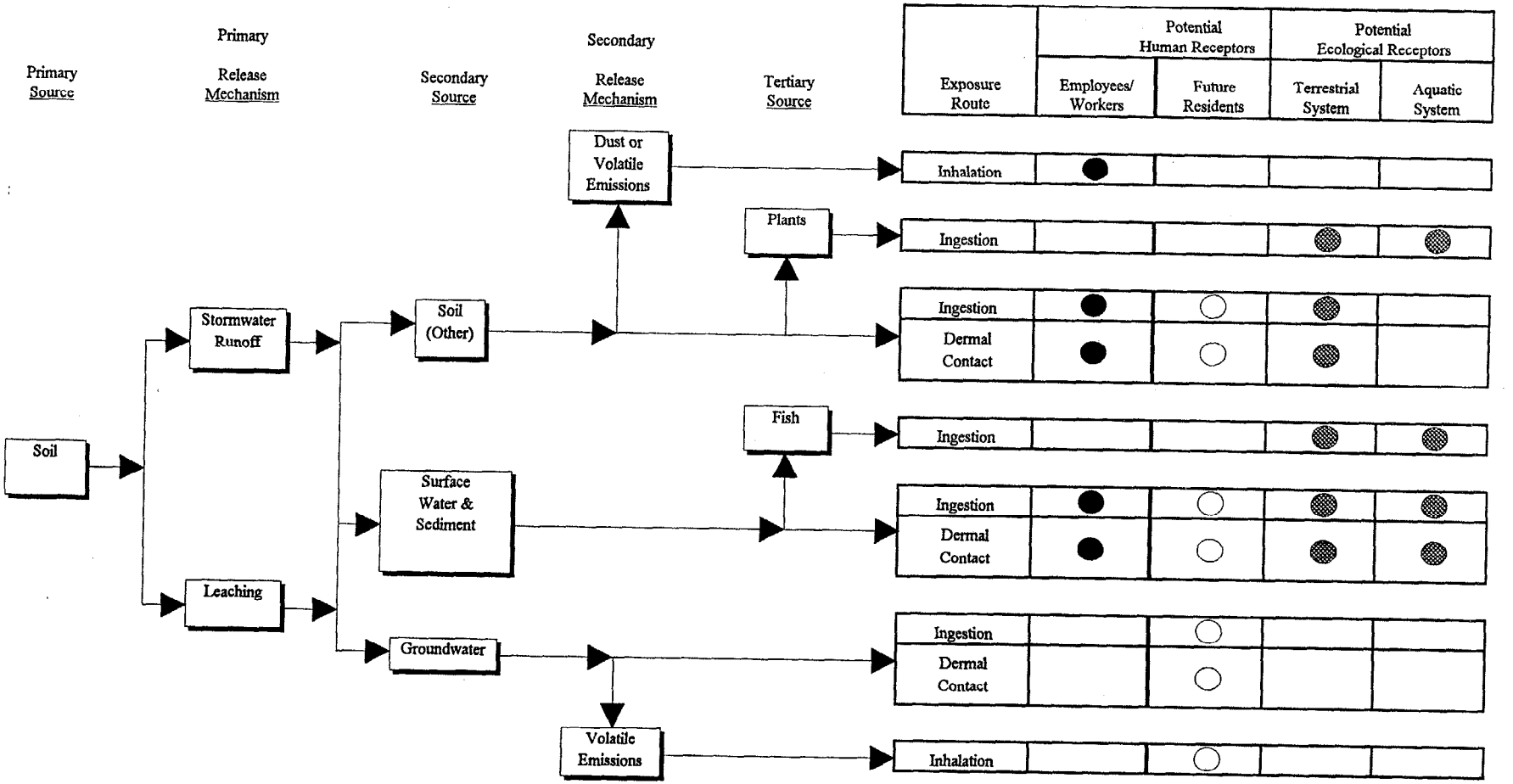
The preliminary conceptual model for Site 18 is presented in Figure 3-2. The primary source area includes the former drainage area emanating from the industrial area and discharging to Lee Pond. COPCs may include VOCs and selected inorganics. Potential release mechanisms include stormwater runoff/drainage, leaching of contaminants in soil to groundwater, and advective aqueous transport in the direction of groundwater flow. Potentially affected media include surface and subsurface soil, groundwater, surface water, and sediment. Potential human health receptors may include current (infrequent) adult civilian workers, future residents, and future construction workers. Potential ecological receptors may include plants, invertebrates, and fish in Lee Pond. Terrestrial receptors also could be exposed to COPCs in soil, surface water, and sediment.

3.4 Conceptual Model for SSA 14 - Building 537 - Discharge to Felgates Creek

The preliminary conceptual model for SSA 14 is presented in this Figure 3-2. The primary source area includes the soil/sediment at the discharge of the pipeline emanating from Building 537 (discharging to Felgates Creek). COPCs may include nitramine compounds and selected inorganics. Potential release mechanisms include stormwater runoff, erosion of soil/sediment on the Felgates Creek stream bank, leaching of contaminants in soil to groundwater, leaking of contaminants from the underground discharge pipe to subsurface soil and groundwater, and advective aqueous transport in the direction of groundwater flow. Potentially affected media include surface and subsurface soil, groundwater, surface water, and sediment. Potential human health receptors may include current (infrequent) adult civilian workers, future residents, and future construction workers. Potential ecological receptors may include plants, invertebrates, and fish in Felgates Creek. Terrestrial receptors also could be exposed to COPCs in soil, surface water, and sediment.

SECTION 3.0 FIGURES

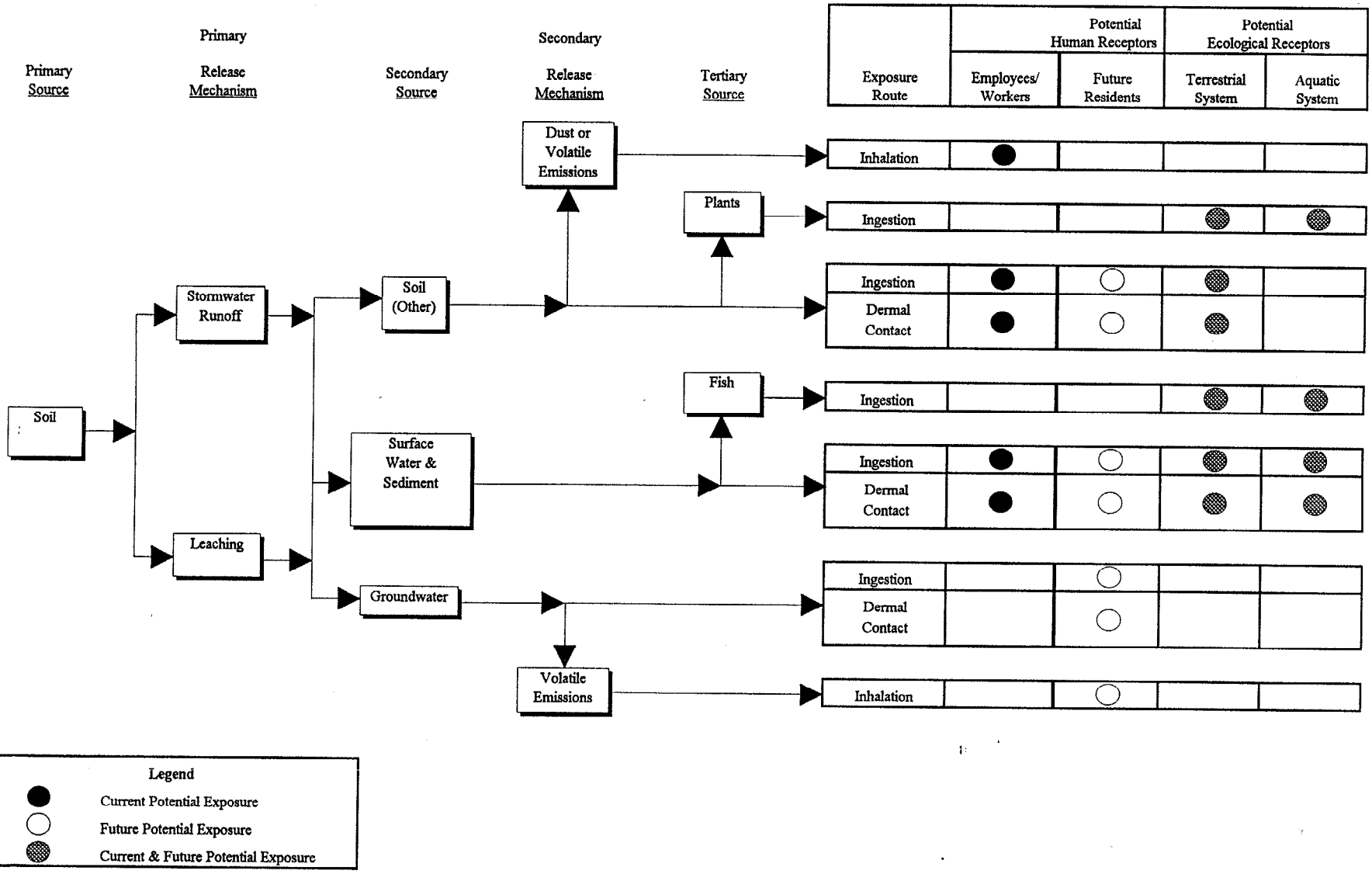
FIGURE 3-1
CONCEPTUAL SITE MODEL
SITE 2, TURKEY ROAD LANDFILL
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA



Legend

- Current Potential Exposure
- Future Potential Exposure
- Current & Future Potential Exposure

FIGURE 3-2
CONCEPTUAL SITE MODEL
SITES 8 AND 18, SSA 14
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA



LS35431.XLS

4.0 TECHNICAL APPROACH

This section presents the types and numbers of environmental and associated QC samples to be collected, the sample locations, and the required analytical parameters for which the samples will be tested. Interpretation of the site-specific data will allow the nature and extent of contamination at Sites 2, 8, 18, and SSA 14 to be evaluated. The details regarding the sample collection are included in the specific sections of the Master FSP (Baker, 1994); appropriate sections are referenced within this document. All sample analytical methods are located in Section 6.0 of the Master QAPP (Baker, 1994).

The sample locations presented in this plan are approximate and have been chosen based upon knowledge of site conditions and professional judgement. Any of these locations may be modified in the field based upon conditions such as access restrictions, underground or overhead utilities, or site historical information that becomes available after approval of these plans.

Any major deviation from the required field procedures will be discussed with LANTDIV, the Station, USEPA Region III, and VDEQ for approval before these changes are incorporated into the field program.

4.1 Site 2 - Turkey Road Landfill

Based on the results of the Round One RI, a removal action was conducted at Site 2 in 1994. Analytical results from the Round One RI and confirmatory samples collected as part of the removal action have been utilized in developing the sampling approach for the Round Two RI at Site 2.

Aquatic ecological investigations were not conducted during the Round One RI. This information is necessary for developing the Ecological Risk Assessment (ERA). As such, the field investigation also will include tasks at Site 2 to determine the extent of contamination in the surface water and sediment, and to provide data for human and ecological risk assessments. Analytical data obtained during this investigation will be compared to the USEPA Region III Risk-Based Concentration (RBC) Table (October 20, 1995).

4.1.1 Soil Investigation

Surface soil samples will not be collected at Site 2 during the Round Two RI. Surface soil samples collected as part of the removal actions (confirmatory samples) at this site will be utilized in the human health and ecological risk assessments. These samples were collected around the site periphery because waste was primarily disposed in these areas. Subsurface soil samples will be collected from soil borings advanced at Site 2 during this Round Two RI.

Subsurface soil borings will be advanced at Site 2 for the collection of subsurface soil samples and installation of monitoring wells for groundwater sampling. Throughout the following sections (Sites 2, 8, 18, and SSA 14 soil boring/monitoring well installation sections) the hydrogeologic units within the shallow aquifer system are referenced based on results of the Round One RI, Baker's previous investigations, and Brockman and Richardson (1992). The specific units referenced within the text (i.e., Columbia and Cornwallis Cave aquifers) and their respective depths may change according to site conditions. Although the text that may state that a monitoring well will be installed within a particular hydrogeological unit (Columbia aquifer), it may be determined when advancing the soil boring that the unit is missing; and therefore, the monitoring well will be installed at the location where enough groundwater occurs to allow collection of groundwater samples. The objective is to install monitoring wells within a hydrogeological unit where groundwater samples may be collected to define the potential vertical or horizontal extent of contamination.

Hollow-stem augering techniques will be used to advance the soil borings. Subsurface soil samples will be collected via split-spoon sampling methods in general accordance with the procedures outlined in the American Society for Testing and Materials (ASTM) Standard Method for Penetration Test and Split-Barrel Sampling of Soil (Designation D1586, ASTM, 1984). Split-spoons of 24-inch (nominal) length, and 2-inch (nominal) outer diameter (OD) will typically be used throughout the investigation. Split-spoon samples will be collected continuously below a depth of 1.0 foot below ground surface (bgs). At the discretion of the Baker Field Geologist (when sufficient lithologic/hydrogeologic data has been collected), split-spoon sampling frequency may be completed at 3- or 5-foot intervals.

The Baker Field Geologist will visually inspect each split spoon sample and record a lithologic description and observations regarding the appearance, consistency, color, and moisture of the soil,

and other pertinent information such as evidence of contamination. The Standard Penetration Test (SPT) blow counts also will be recorded. In addition, a 10.2 electron volt (eV) photoionization detector (PID) will be used to screen the samples to detect the presence of specific analytes with an ionization potential less than or equal to the eV capacity of the lamp (10.2 eV for the instrument used for this investigation). Soil boring procedures are outlined in Section 3.9 of the Master FSP (Baker, 1994).

Ten soil borings will be advanced at the site (Figure 4-1) and numbered 2SB05 through 2SB14. The numbering scheme was developed to follow the Round One RI samples, which ended with the designation 2SB04. The soil boring locations have been selected to determine the vertical extent of contaminants (SVOCs, Aroclor-1254) detected in the confirmation samples collected during the removal action. Three of the soil borings (2SB05, 2SB06, and 2SB07) will be converted to monitoring wells to replace 2GW02, 2GW03, and 2GW04 (which are currently under water and will be abandoned).

Two subsurface soil samples will be collected from each of the ten soil borings; one subsurface soil sample will be collected from just above the water table and a second subsurface soil sample will be collected from within the zone of apparent contamination (typically from the area with the highest PID reading, odor, or visible evidence of contamination), for a total of 20 environmental subsurface soil samples. If no contamination is apparent, the second sample will be collected from a mid-point in the soil boring. In addition, one sample will be collected within the aquifer material at one location. This sample (along with one collected above the water table) will be analyzed for grain size (sieve/hydrometer), bulk density, and cation exchange capacity (CEC) to obtain information on the migration potential of contaminants at the site.

In addition to the above, subsurface soil samples collected at Site 2 that are submitted to the laboratory will be analyzed for TCL VOCs, semivolatile organic compounds (SVOCs), nitramine compounds, pesticides, PCBs, Target Analyte List (TAL) inorganics, total organic carbon (TOC), pH, and nitrate/nitrite. A summary of the number of samples to be collected (including quality assurance/quality control [QA/QC] samples) and the analytical parameters is presented, by medium, in Tables 4-1 and 4-2.

4.1.2 Groundwater Investigation

The following subsections describe the activities to be conducted during the groundwater investigation at Site 2.

4.1.2.1 Well Installation

Four existing groundwater monitoring wells (2GW01, 2GW02, 2GW03, and 2GW04) were sampled during the Round One RI. During a recent site visit, 2GW02, 2GW03, and 2GW04 were inundated with surface water from the tributaries bordering the site (Figure 2-5). As part of the Round Two RI, these three monitoring wells will be abandoned and replaced by three newly installed monitoring wells (2GW05, 2GW06, and 2GW07 - Figure 4-1).

The proposed monitoring wells will be used in conjunction with existing monitoring well 2GW01 to form a groundwater monitoring well network to evaluate the nature and extent of potential groundwater contamination in the vicinity of Site 2.

It is anticipated that the proposed monitoring wells will be screened in the Cornwallis Cave aquifer (i.e., the Columbia aquifer is absent here). The type of monitoring well (i.e., Type II or III) to be installed will be determined after lithologic data from each soil boring that is to be converted to a monitoring well has been evaluated. If a layer of low hydraulic conductivity (i.e., semi-confining or confining layer) at least 3-feet thick is encountered, a Type III well will be installed. A 10-inch diameter steel surface casing will be installed into this layer and the casing will be grouted in place. The cement-bentonite grout will be permitted to set for 12 to 24 hours prior to resumption of drilling through the casing. Monitoring wells will be constructed and be screened at least 15 feet into the deeper confined aquifer. If it is determined that there is no low hydraulic conductivity zone (confining unit), Type II monitoring wells will be installed to the selected interval. The procedures for well installation, well completion, and well development are described in the Master FSP, Section 3.10, 3.11, and 3.12, respectively (Baker, 1994).

One shelby tube will be collected within the Cornwallis Cave or the Yorktown-Eastover confining unit (whichever unit is encountered). This sample will be analyzed for grain size

(sieve/hydrometer), atterberg limit, vertical hydraulic conductivity, moisture content, pH, and oxidation-reduction potential (Eh).

4.1.2.2 Well Development

Prior to groundwater sampling, the newly installed monitoring wells will be developed by removing water from each well and discharging it to the ground on site (see Section 4.6.2, Investigation Derived Waste). Additional details for well development are found in Section 3.12 of the Master FSP (Baker, 1994). During development, overpumping and surging methods may be utilized to better remove silt and particulates.

Development will consist of removing a minimum of three to five well volumes of water, plus the volume of any water added during the drilling or installation process. Development will continue until the water is relatively clear; until three successive measurements of pH, specific conductance, and temperature stabilize; or until 6 hours of development have passed (whichever comes first). Development information, including water clarity, pH, specific conductivity, and temperature, will be recorded in the field logbook. Appendix A, Section F201 of the Master Project Plans presents the Standard Operating Procedures (SOPs) for "On-Site Water Quality Testing" (Baker, 1994).

4.1.2.3 Groundwater Sampling

One round of groundwater samples will be collected from the newly installed and currently existing monitoring wells at Site 2 for a total of four environmental samples. Prior to groundwater sampling, three to five well volumes will be purged from each well. Purging will be accomplished in the shallow wells using low flow pumps. The main purpose of low-flow purging technique is to reduce turbidity (i.e., suspended sediment/soil particles) in the groundwater samples. Turbidity in groundwater samples may result in higher inorganic concentrations.

Field measurements of turbidity, Eh, pH, temperature, dissolved oxygen (DO), and specific conductivity will be taken after each well volume. Purging will be complete when three successive field measurements of each parameter are within 10 percent of each other and turbidity stabilizes (i.e., less than 5 nephelometric turbidity units [NTUs], if practicable). Monitoring wells will be

sampled using a low flow pump. Monitoring well purging and groundwater sampling procedures also are detailed in Section 3.15 of the Master FSP (Baker, 1994).

Groundwater samples will be analyzed for TCL organics (VOCs, SVOCs, pesticides/PCBs), nitramines compounds), TAL inorganics (total and dissolved), TOC, nitrate/nitrite, total dissolved solids (TDS), total suspended solids (TSS), bromide, chloride, orthophosphorous, sulfate, and dissolved methane. These parameters have been selected based on the results of the Round One RI and removal action data. Tables 4-1 and 4-2 summarize the environmental samples (and QA/QC samples) to be collected and the analytical parameters for these samples.

4.1.2.4 Hydrologic Measurements

Hydrologic measurements consisting of groundwater levels, staff gauge measurements, and in situ hydraulic conductivity tests in monitoring wells will be recorded. The measurements will aid in determining groundwater fluctuation, flow direction, and relationship to surface water.

Groundwater Level Measurements

Water level measurements will be collected at the existing wells and from newly-installed and developed monitoring wells on a weekly basis. These measurements will be taken at least twice during the field investigation. This will allow for an evaluation of groundwater flow direction. The procedures for water level measurements are detailed in Section 3.17 of the Master FSP (Baker, 1994).

In Situ Hydraulic Conductivity Tests

The hydraulic conductivity of the aquifer in the near vicinity of the monitoring well will be measured using in situ hydraulic conductivity (slug) test. The slug tests will be performed on select, newly installed monitoring wells after groundwater sampling is completed. Slug tests will be conducted using solid PVC slugs and recorded using Hermit™ data loggers or equivalent. The procedures for slug tests are found in Section 3.16 of the Master FSP.

Staff Gauges

One staff gauge will be installed in each tributary along Site 2 and at the northern end of Site 2 where the tributaries merge together for a total of three staff gauges. The three staff gauge locations are shown on Figure 4-1. Water level measurements from the staff gauges and the monitoring wells will be collected on a weekly basis. Data collected from the staff gauges will help assess the groundwater and surface water interaction and will provide boundary data for groundwater modeling, which may be completed in the future.

4.1.2.5 Monitoring Well Abandonment

Existing monitoring wells 2GW02, 2GW03, and 2GW04 will be abandoned during this Round Two RI in accordance with the VDEQ procedures that are presented in Section 3.1.3 of the Master FSP (Baker, 1994).

4.1.3 Surface Water/Sediment Investigation

Surface water and sediment investigations will be conducted along the unnamed drainage ways that border Site 2. Data from these studies will be used to assess potential impacts to the environment from Site 2 and will be used in the ERA.

Nine surface water/sediment sampling stations have been identified to characterize the drainage ways that border Site 2 (Figure 4-2). These sampling locations were chosen to coincide with the aquatic ecological sampling described in Section 4.1.4. Sample locations 2SW/SD01, 2SW/SD02, and 2SW/SD03 will address conditions in the drainage area downstream of the site. Sample locations 2SW/SD04, 2SW/SD05, 2SW/SD06, and 2SW/SD07 will address conditions in the drainage ways adjacent to the site. Sample locations 2SW/SD08 and 2SW/SD09 will address conditions in the drainage ways upstream of, and presumably unaffected by Site 2. The results from the Round Two RI will be compared to ecologically similar background areas (Baker, 1995a).

In addition, three sediment samples will be collected in the wetland to evaluate potential impacts to this area. These three samples, 2SD10, 2SD11, and 2SD12, will be collected at locations depicted on Figure 4-2.

At each sampling location, an effort will be made to collect each surface water sample at midstream. The samples will be collected as described in Section 3.7.1 of the Master FSP (Baker, 1994). Surface water samples will be collected at each station prior to obtaining the sediment samples to minimize possible turbidity effects from sampling. Downstream stations will be sampled first, with subsequent samples taken while moving upstream.

At each of the nine surface water locations mentioned above, a surface (0- to 4-inch) and a subsurface (4- to 8-inch) sediment sample will be collected for a total of 18 samples. The methods of collection are described in Section 3.7.2 of the Master FSP (Baker, 1994).

All surface water and sediment samples will be analyzed for TCL organics, nitramine compounds, TAL inorganics, TOC, cyanide, nitrate/nitrite, grain size (sediment only), and pH (sediment pH shall be measured in the laboratory). These analyses were selected to meet the needs of the ERA. In addition, analyses for pH, temperature, DO, salinity, and specific conductivity will be performed on surface water samples in the field immediately following sample collection. Specific water quality measurement procedures will be performed according to the "On-site Water Quality Testing" SOP in Appendix A, Section F201 of the Master Project Plans (Baker, 1994). Tables 4-1 and 4-2 summarize the environmental samples (and QA/QC samples) to be collected and the analytical parameters for these samples.

4.1.4 Aquatic Ecological Investigation

An aquatic ecological investigation will be conducted at each of the nine surface water/sediment locations as shown in Figure 4-2. These studies will be used to assess potential ecological impacts to benthic macroinvertebrate and fish populations, if present in Felgates Creek. Site-specific considerations were incorporated into the overall sample station selection process. The information from the Final Habitat Evaluation for Sites 1, 2, 3, 4, 6, 7, 8, 9, 11, 12, 16, 17, 18, 19, and 21 (Baker, 1995b) was used to qualitatively evaluate the variability of the media to be sampled.

Benthic macroinvertebrate samples will be collected from midstream sampling points of the water body at each station. Three replicate samples will be collected with a standard Ponar grab sampler. These samples will be archived for future taxonomic analysis, if required, and results will be used to calculate species diversity and density. For surveying the fish populations, the upstream portion

of the drainage way will be sampled with gill nets, trot lines, hoop nets, or haul seines depending on site-specific conditions.

Representative fish samples will be collected and frozen (and stored) from each of the surface water/sediment locations shown on Figure 4-2. If contaminants are detected within the surface water/sediment samples, the fish sample associated with the surface water/sediment location will be analyzed for the specific contaminants (i.e., TCL organics or TAL inorganics) detected at the location. Further details of the sample collection techniques are found in Section 3.18 of the Master FSP (Baker, 1994).

4.2 East Branch of Felgates Creek (Site 8 and SSA 14)

Site 8 and SSA 14 are both located along the East Branch of Felgates Creek. SSA 14 is located approximately 800 feet upstream of Site 8 (Figure 2-3). Due to their proximity, the surface water/sediment and aquatic ecological investigations for these sites will be combined. For example, one sampling station located between the two sites could serve as both an upstream sampling station for Site 8 and as a downstream sampling station for SSA 14.

4.2.1 Surface Water/Sediment Investigation

Surface water and sediment investigations will be conducted in the East Branch of Felgates Creek, near Site 8 and SSA 14. Data from these studies will be used to assess potential impacts to the environment from Site 8 and SSA 14 and will be used in the ERA.

Six surface water/sediment sampling stations have been identified to characterize the East Branch of Felgates Creek in this area (Figure 4-3). These sample locations were chosen to coincide with the aquatic ecological sampling described in Section 4.2.2. Sample locations will address the following conditions:

A14SW/SD01	-	upstream of SSA 14
A14SW/SD02	-	adjacent to SSA 14
A14SW/SD03/ 8SW/SD01	-	downstream of SSA 14 and upstream of Site 8

8SW/SD02 - adjacent to Site 8

8SW/SD03 - downstream of Site 8

The results from the Round Two RI will be compared to ecologically similar background study areas (Baker, 1995a).

At each sampling location, an effort will be made to collect each surface water sample at midstream. The samples will be collected as described in Section 3.7.1 of the Master FSP (Baker, 1994). Surface water samples will be collected at each station prior to obtaining the sediment samples to minimize possible turbidity effects from sampling. Downstream stations will be sampled first, with subsequent samples taken while moving upstream.

At each of the six surface water locations mentioned above, a surface (0- to 4-inch) and a subsurface (4- to 8-inch) sediment sample will be collected for a total of 12 samples. The methods of collected are described in Section 3.7.2 of the Master FSP (Baker, 1994).

All surface water and sediment samples will be analyzed for TCL organics, nitramine compounds, TAL inorganics, TOC, cyanide, nitrate/nitrite, grain size (sediment only), and pH (sediment pH shall be measured in the laboratory). These analyses were selected to meet the needs of the ERA. In addition, analyses for pH, temperature, DO, salinity, and specific conductivity will be performed on surface water samples in the field immediately following sample collection. Specific water quality measurement procedures will be performed according to the "On-Site Water Quality Testing" SOP in Appendix A, Section F201 of the Master Project Plans (Baker, 1994). Tables 4-3 and 4-4 summarize the environmental samples to be collected and the analytical parameters for these samples.

4.2.2 Aquatic Ecological Investigation

An aquatic ecological investigation will be conducted at each of the six surface water/sediment locations as shown in Figure 4-3. These studies will be used to assess potential ecological impacts to benthic macroinvertebrate and fish populations, if present, in the East Branch of Felgates Creek. Site-specific considerations were incorporated into the overall sample station selection process. The

information from the Habitat Evaluation (Baker, 1995b) was used to qualitatively evaluate the variability of the media to be sampled.

Benthic macroinvertebrate samples will be collected from midstream sampling points of the water body at each station. Three replicate samples will be collected with a standard Ponar grab sampler. These samples will be archived for future taxonomic analysis, if required, results will be used to calculate species diversity and density. For surveying the fish populations, the upstream portion of the drainage way will be sampled with gill nets, trot lines, hoop nets, or haul seines depending on site-specific conditions.

Representative fish samples will be collected and frozen (and stored) from each of the surface water/sediment locations shown on Figure 4-3. If contaminants are detected within the surface water/sediment samples, the fish sample associated with the surface water/sediment location will be analyzed for the specific contaminants (i.e., TCL organics or TAL inorganics) detected at the location. Further details of the sample collection techniques are found in Section 3.18 of the Master FSP (Baker, 1994).

4.3 Site 8 - NEDED Explosives - Contaminated Wastewater Discharge Area

The results of the Round One RI conducted at Site 8 indicated that surface soil, groundwater, and sediment have been impacted by former site operations. Contaminants include VOCs, SVOCs, and nitramine compounds. Analytical results from the Round One RI have been utilized in developing the sampling approach for the Round Two RI at Site 8.

This section describes the soil and groundwater investigation activities that will be conducted at Site 8 under the Round Two RI. Surface water/sediment and aquatic ecological investigation activities are presented in Section 4.2 (East Branch of Felgates Creek).

4.3.1 Soil Investigation

The soil investigation for Site 8 will include the collection of 9 surface and 18 subsurface soil samples. Surface soil samples will be collected at the soil boring locations in accordance with the

methods presented in Section 3.8 of the Master FSP (Baker, 1994). Subsurface soil samples will be collected during soil boring and monitoring well installations.

4.3.1.1 Surface Soil Sampling

Nine surface soil samples will be collected at Site 8 from the 0- to- 6 inch bgs interval and analyzed for TCL SVOCs, TCL pesticides/PCBs, nitramine compounds, TAL inorganics, TOC, nitrate/nitrite, pH, and CEC. The surface soil sampling locations will correspond to the soil boring locations for the shallow monitoring wells (Figure 4-4). The nine surface soil samples will be labeled 8SS06 through 8SS14. The numbering scheme was developed to follow the Round One RI samples, which ended with the designation 8SS05.

The Round One RI surface soil sample results indicated positive detections of VOCs, SVOCs, nitramine compounds, and inorganics. As such, the Round Two surface soil samples will be collected for two primary reasons: to obtain surface soil information to be used in the baseline RA and ERA and to determine the extent of the surface soil contamination at the site. The Master FSP, Section 3.8, describes the surface soil sampling procedures. A summary of the number of samples to be collected (including QA/QC samples) and the analytical parameters is presented, by medium, in Tables 4-5 and 4-6.

4.3.1.2 Subsurface Soil Boring and Sampling

Subsurface soil borings will be advanced at Site 8 for collection of subsurface soil samples and installation of monitoring wells for groundwater sampling.

Hollow-stem augering techniques will be used to advance the soil borings. Subsurface soil samples will be collected via split-spoon sampling methods in general accordance with the procedures outlined in the ASTM Standard Method for Penetration Test and Split-Barrel Sampling of Soil (Designation D1586, ASTM, 1984). Split-spoons of 24-inch (nominal) length, and 2-inch (nominal) OD will typically be used throughout the investigation. Split-spoon samples will be collected continuously below a depth of 1.0 feet bgs. At the discretion of the Baker Field Geologist, split-spoon sampling may be completed at 3- or 5-foot intervals.

The Baker Field Geologist will visually inspect each split spoon sample and record a lithologic description and observations regarding the appearance, consistency, color, and moisture of the soil and other pertinent information such as evidence of contamination. The SPT blow counts also will be recorded. In addition, a 10.2 eV PID will be used to screen the samples to detect the presence of specific analytes with an ionization potential less than or equal to the eV capacity of the lamp (10.2 eV for the instrument used for this investigation). Soil boring procedures are outlined in Section 3.9 of the Master FSP (Baker, 1994).

Ten soil borings will be advanced at the site (Figure 4-4) and numbered 8SB01 through 8SB09 for the shallow soil borings and 8SB01A for the deep boring. Soil samples will be collected from nine of the soil borings; no samples will be collected in the boring that will be converted into a deep well. Three of the soil borings (8SB01, 8SB02, 8SB03) will be converted to shallow monitoring wells (8GS01, 8GW02, 8GW03). One soil boring (8SB01A) will be converted into a deep monitoring well (8GW01A) and the remaining six will be grouted to surface grade upon completion.

The soil borings and monitoring wells will be installed at Site 8 to address the following:

8SB04 through 8SB09 (soil borings)	- Delineate horizontal and vertical extent of soil contamination within the drainage area.
8GW01, 8GW02, and 8GW03 (shallow wells)	- Delineate the horizontal extent of groundwater contaminants detected in Round One RI HydroPunch™ sample. It is anticipated that these wells will be installed in the Cornwallis Cave aquifer.
8GW01D (deep well)	- Delineate the vertical extent of groundwater contaminants detected in Round One RI HydroPunch™ sample. It is anticipated that this well will be installed in the Yorktown/Eastover aquifer.

Two subsurface soil samples will be collected from each of the 10 borings; one subsurface soil sample will be collected from just above the water table and a second subsurface soil sample will

be collected from within the area of apparent contamination (typically from the area with the highest PID reading, odor, or visible evidence of contamination), for a total of 18 environmental subsurface soil samples (subsurface soil samples will not be collected from the deep monitoring well boring). If no contamination is apparent, the second sample will be collected from a mid-point in the soil boring. In addition, one sample will be collected within the aquifer material at one location. This sample (along with one collected above the water table) will be analyzed for pH, grain size (sieve/hydrometer), bulk density, and cation exchange capacity to obtain information on the migration potential of contaminants at the site.

In addition to the above, subsurface soil samples collected at Site 8 that are submitted to the laboratory will be analyzed for TCL organics, nitramine compounds, TAL inorganics, TOC, and nitrate/nitrite. A summary of the number of samples to be collected (including QA/QC samples) and the analytical parameters is presented, by media, in Tables 4-5 and 4-6.

4.3.1.3 Summary

Nine surface soil and 18 subsurface soil samples will be collected at Site 8. The sampling procedures are described in Section 3.8 and 3.9 of the Master FSP (Baker, 1994). Based on the results of the Round One RI, the soil samples will be analyzed for TCL VOCs (excluding surface soil), TCL SVOCs, TCL pesticides/PCBs, nitramine compounds, TAL inorganics, TOC, and nitrate/nitrite in addition to select samples to be analyzed for engineering parameters. A summary of the number of samples to be collected (including QA/QC samples) and the analytical parameters is presented, by medium, in Tables 4-5 and 4-6.

4.3.2 Groundwater Investigation

The following section describes the activities to be conducted during the groundwater investigation at Site 8.

4.3.2.1 Well Installation

Three shallow monitoring wells will be installed (8GW01, 8GW02, 8GW03) at the site to aid in defining the horizontal extent of groundwater contamination and to obtain data pertinent to the site

hydrogeology (i.e., groundwater flow direction). The monitoring wells have been located on the banks of the drainage way because the interior of the area is inaccessible for drilling equipment. In addition, wells installed in the drainage way would be prone to flooding. The monitoring well locations are shown on Figure 4-4.

One deep monitoring well also will be installed (8GW01A) at Site 8 to evaluate the vertical extent of contamination and will be nested with a shallow monitoring well (8GW01).

The type of monitoring well (i.e., Type II or III) to be installed will be determined after lithologic data from each soil boring that is to be converted to a monitoring well has been evaluated. If a layer of low hydraulic conductivity (i.e., semi-confining or confining unit) at least 3-feet thick is encountered, a Type III well will be installed. A 10-inch diameter steel surface casing will be installed into this layer and the casing will be grouted in place. The cement-bentonite grout will be permitted to set for 12 to 24 hours prior to resumption of drilling through the casing. Monitoring wells will be constructed and be screened at least 15 feet into the deeper confined aquifer. If it is determined that there is no low hydraulic conductivity zone (confining unit), Type II monitoring wells will be installed to intercept the first occurrence of groundwater that is not a perched zone. The procedures for well installation, well completion, and well development are described in the Master FSP, Sections 3.10, 3.11, and 3.12, respectively (Baker, 1994).

During installation of the deep monitoring well, one thin walled (shelby) tube sample may be collected if a confining unit is encountered. The sample will be analyzed for grain size (sieve/hydrometer), atterberg limit, vertical hydraulic conductivity, moisture content, pH, and Eh.

4.3.2.2 Well Development

Prior to groundwater sampling, the newly installed monitoring wells will be developed by removing water from each well and discharging it to the ground on site (see Section 4.6.2, Investigation Derived Waste). Additional details for well development are found in Section 3.12 of the Master FSP (Baker, 1994). During development, overpumping and surging methods may be utilized to better remove silt and particulates.

Development will consist of removing a minimum of three to five well volumes of water, plus the volume of any water added during the drilling or installation process. Development will continue until the water is relatively clear; until three successive measurements of ph, specific conductance, and temperature stabilize; or until 6 hours of development have passed (whichever comes first). Development information, including water clarity, pH, specific conductivity, and temperature, will be recorded in the field logbook. Appendix A, Section F201 of the Master Project Plans presents the SOPs for "On-Site Water Quality Testing" (Baker, 1994).

4.3.2.3 Groundwater Sampling

One round of groundwater samples will be collected from the newly installed monitoring wells at Site 8 for a total of four environmental samples. Prior to groundwater sampling, three to five well volumes will be purged from each well. Purging will be accomplished in the shallow wells using low flow pumps; for the deep well, a Wattera Pump will be used. The main purpose of low-flow purging technique is to reduce turbidity (i.e., suspended sediment/soil particles) in the groundwater samples. Turbidity in groundwater samples may result in detection of higher inorganic concentrations.

Field measurements of turbidity, Eh, pH, temperature, DO, and specific conductivity will be taken after each well volume. Purging will be complete when three successive field measurements of each parameter are within 10 percent of each other and turbidity stabilizes (i.e., less than 5 NTUs, if practicable). Monitoring wells will be sampled using either a low flow pump (for shallow wells) or using a disposable polyethylene bailer (for deep wells). Monitoring well purging and groundwater sampling procedures also are detailed in Section 3.15 of the Master FSP (Baker, 1994).

Groundwater samples will be analyzed for TCL organics, TAL inorganics (total and dissolved), TOC, nitrate, nitrite, TDS, TSS, bromide, chloride, orthophosphorous, sulfate, and dissolved methane. These parameters have been selected based on the results of the Round One RI. Tables 4-5 and 4-6 summarize the environmental samples (and QA/QC samples) to be collected and the analytical parameters for these samples.

4.3.2.4 Hydrologic Measurements

Hydrologic measurements consisting of groundwater level, staff gauge measurements and in situ hydraulic conductivity tests in monitoring wells will be recorded. The measurements will aid in determining groundwater fluctuation and relationship to surface water.

Groundwater Level Measurements

Water level measurements will be collected from newly-installed and developed monitoring wells on a weekly basis. These measurements will be taken at least twice during the field investigation. This will allow for an evaluation of groundwater flow direction. The procedures for water level measurements are detailed in Section 3.17 of the Master FSP (Baker, 1994).

Hollow-stem augering techniques will be used to advance the soil borings. Subsurface soil samples will be collected via split-spoon sampling methods in general accordance with the procedures outlined in the ASTM Standard Method for Penetration Test and Split-Barrel Sampling of Soil (Designation D1586, ASTM, 1984). Split-spoons of 24-inch (nominal) length, and 2-inch (nominal) OD will typically be used throughout the investigation. Split-spoon samples will be collected continuously below a depth of 1.0 feet bgs. At the discretion of the Baker Field Geologist, split-spoon sampling may be completed at 3- or 5-foot intervals.

The Baker Field Geologist will visually inspect each split spoon sample and record a lithologic description and observations regarding the appearance, consistency, color, and moisture of the soil and other pertinent information such as evidence of contamination. The SPT blow counts also will be recorded. In addition, a 10.2 eV PID will be used to screen the samples to detect the presence of specific analytes with an ionization potential less than or equal to the eV capacity of the lamp (10.2 eV for the instrument used for this investigation). Soil boring procedures are outlined in Section 3.9 of the Master FSP (Baker, 1994).

Staff Gauges

One staff gauge will be installed at the end of the drainageway in the tributary to Felgates Creek. The staff gauge location is shown on Figure 4-4. Water level measurements from the staff gauge

and the monitoring wells will be collected on a weekly basis. Data collected from the staff gauge will help assess the groundwater and surface water interaction and will provide boundary data for groundwater modeling, which may be completed in the future.

In Situ Hydraulic Conductivity Tests

The hydraulic conductivity of the aquifer in the near vicinity of the monitoring well will be measured using in situ hydraulic conductivity (slug) test. The slug tests will be performed on select, newly installed monitoring wells after groundwater sampling is completed. Slug tests will be conducted using solid PVC slugs and recorded using Hermit™ data loggers or equivalent. The procedures for slug tests are found in Section 3.16 of the Master FSP.

4.4 Site 18 Building Discharge Area

The results of the Round One RI conducted at Site 18 indicated that inorganics in surface soil and sediment were detected above Round One background levels. Copper and zinc in surface water exceeded state and federal criteria, but not at the furthest downstream sampling point in or in the branch northeast of Building 476. Inorganic concentrations in filtered groundwater samples did not exceed state or federal criteria. Based on the Final Round One RI results, a risk screening, followed by a no further remedial action plan was recommended for Site 18. However, additional data will be collected during the Round Two RI to support this recommendation.

This section describes the soil, groundwater, surface water, and sediment investigation activities that will be conducted at Site 18 under the Round Two RI.

4.4.1 Soil Investigation

The soil investigation for Site 18 will include the collection of both surface and subsurface soil samples. Surface soil samples will be collected in accordance with methods presented in Section 3.8 of the Master FSP (Baker, 1994). Subsurface soil samples will be collected during soil boring installations.

4.4.1.1 Surface Soil Sampling

Three surface soil samples will be collected at soil boring locations and three surface soil samples will be collected in the swale area. All of these samples will be collected from the 0- to 6-inch bgs interval and will be analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, nitramine compounds, TAL inorganics, TOC, nitrate/nitrite, pH, and CEC. The sampling locations are shown on Figure 4-5. The six surface soil samples will be labeled 18SS11 through 18SS16. The numbering scheme was developed to follow the Round One RI samples which ended with the designation 18SS10.

The Round Two RI surface soil samples will be collected for two primary reasons: to obtain surface soil information to be used in the baseline RA and ERA and to support the recommendation of the Round One RI that no further remedial action be conducted at the site. The Master FSP, Section 3.8 (Baker, 1994), describes the surface soil sampling procedures. A summary of the number of samples to be collected (including QA/QC samples) and the analytical parameters is presented, by medium, in Tables 4-7 and 4-8.

4.4.1.2 Subsurface Soil Boring and Sampling

Three subsurface soil borings will be advanced at Site 18 for the collection of subsurface soil samples and installation of monitoring wells for groundwater sampling. Hollow-stem augering techniques will be used to advance the soil borings. Subsurface soil samples will be collected via split-spoon sampling methods in general accordance with the procedures outlined in the ASTM Standard Method for Penetration Test and Split-Barrel Sampling of Soil (Designation D1586, ASTM, 1984). Split-spoons of 24-inch (nominal) length, and 2-inch (nominal) OD will typically be used throughout the investigation. Split-spoon samples will be collected continuously below a depth of 1.0 feet bgs. At the discretion of the Baker Field Geologist, split-spoon sampling may be completed at 3- or 5-foot intervals.

The Baker Field Geologist will visually inspect each split spoon sample and record a lithologic description and observations regarding the appearance, consistency, color, and moisture of the soil and other pertinent information such as evidence of contamination. The SPT blow counts also will be recorded. In addition, a 10.2 eV PID will be used to screen the samples to detect the presence

of specific analytes with an ionization potential less than or equal to the eV capacity of the lamp (10.2 eV for the instrument used for this investigation). Soil boring procedures are outlined in Section 3.9 of the Master FSP (Baker, 1994).

Three soil borings will be advanced at the site (Figure 4-5) and numbered 18SB01 through 18SB03. The soil boring locations have been selected to determine the horizontal and vertical extent of the soil contamination within the drainage area. The soil borings (18SB01, 18SB02, 18SB03) will be converted to shallow monitoring wells (18GW01, 18GW02, 18GW03).

Two subsurface soil samples will be collected from each of the three soil borings; one subsurface soil sample will be collected from just above the water table and a second subsurface soil sample will be collected from within the area of apparent contamination (typically from the area with the highest PID reading, odor, or visible evidence of contamination), for a total of six environmental subsurface soil samples. If no contamination is apparent, the second sample will be collected from a mid-point in the soil boring. In addition, one sample will be collected within the aquifer material at one location. This sample (along with one collected above the water table) will be analyzed for grain size (sieve/hydrometer), bulk density, and CEC to obtain information on the migration potential of contaminants at the site.

In addition to the above, subsurface soil samples collected at Site 18 that are submitted to the laboratory will be analyzed for TCL inorganics, nitramine compounds, TAL inorganics, TOC, pH, and nitrate/nitrite. A summary of the number of samples to be collected (including QA/QC samples) and the analytical parameters is presented, by medium, in Table 4-7 and 4-8.

4.4.1.3 Summary

Six surface soil and six subsurface soil samples will be collected at Site 18. The sampling procedures are described in Section 3.8 and 3.9 of the Master FSP (Baker, 1994). Based on the results of the Round One RI, the soil samples will be analyzed for TCL VOCs (excluding surface soil), TCL SVOCs, TCL pesticides/PCBs, nitramine compounds, TAL inorganics, TOC, and nitrate/nitrite in addition to select samples to be analyzed for engineering parameters. A summary of the number of samples to be collected (including QA/QC samples) and the analytical parameters is presented, by medium, in Tables 4-7 and 4-8.

4.4.2 Groundwater Investigation

The following section describes the activities to be conducted during the groundwater investigation at Site 18.

4.4.2.1 Well Installation

Three shallow monitoring wells (18GW01, 18GW02, 18GW03) will be installed at the site to evaluate whether groundwater quality has been impacted by former site operations and to obtain data pertinent to the site hydrogeology (i.e., groundwater flow direction). The monitoring well locations are shown on Figure 4-5. It is anticipated that these monitoring wells will be installed in the Cornwallis Cave aquifer.

The type of monitoring well (i.e., Type II or III) to be installed will be determined after lithologic data from each soil boring that is to be converted to a monitoring well has been evaluated. If a layer of low hydraulic conductivity (i.e., semi-confining or confining unit) at least 3-feet thick is encountered, a Type III well will be installed. A 10-inch diameter steel surface casing will be installed into this layer and the casing will be grouted in place. The cement-bentonite grout will be permitted to set for 12 to 24 hours prior to resumption of drilling through the casing. Monitoring wells will be constructed and be screened at least 15 feet into the deeper confined aquifer. If there is no low hydraulic conductivity zone (confining unit), Type II monitoring wells will be installed to intercept the first occurrence of groundwater that is not a perched zone. The procedures for well installation, well completion, and well development are described in the Master FSP, Sections 3.10, 3.11, and 3.12, respectively (Baker, 1994).

One shelby tube will be collected within the Cornwallis Cave or the Yorktown-Eastover confining unit (whichever is encountered). This sample will be analyzed for grain size (sieve/hydrometer), atterberg limit, vertical hydraulic conductivity, moisture content, pH, and Eh.

4.4.2.2 Well Development

Prior to groundwater sampling, the newly installed monitoring well will be developed by removing water from each well and discharging it to the ground on site (see Section 4.6.2, Investigation Derived Waste). Additional details for well development are found in Section 3.12 of the Master FSP (Baker, 1994). During development overpumping and surging methods may be utilized to better remove silt and particulates.

Development will consist of removing a minimum of three to five well volumes of water, plus the volume of any water added during the drilling or installation process. Development will continue until the water is relatively clear; until three successive measurements of ph, specific conductance, and temperature stabilize; or until 6 hours of development have passed (whichever comes first). Development information, including water clarity, pH, specific conductivity, and temperature, will be recorded in the field logbook. Appendix A, Section F201 of the Master Project Plans presents the SOPs for "On-Site Water Quality Testing" (Baker, 1994).

4.4.2.3 Groundwater Sampling

One round of groundwater samples will be collected from the newly installed monitoring wells at Site 18 for a total of three environmental samples. Prior to groundwater sampling, three to five well volumes will be purged from the well. Purging will be accomplished using low flow pumps. The main purpose of the low-flow purging technique is to reduce turbidity (i.e., suspended sediment/soil particles) in the groundwater samples. Turbidity in groundwater samples may result in higher inorganic concentrations.

Field measurements of turbidity, Eh, pH, temperature, DO, and specific conductivity will be taken after each well volume. Purging will be complete when three successive field measurements of each parameter are within 10 percent of each other and turbidity stabilizes (i.e., less than 5 NTUs, if practicable). Monitoring wells will be sampled using a low flow pump. Monitoring well purging and groundwater sampling procedures also are detailed in Section 3.15 of the Master FSP (Baker, 1994).

Groundwater samples will be analyzed for TCL organics and TAL inorganics (total and dissolved), TOC, nitrate/nitrite, TDS, TSS, bromide, chloride, orthophosphorous, sulfate, and dissolved methane. These parameters have been selected based on the results of the Round One RI. Tables 4-7 and 4-8 summarize the environmental samples (and QA/QC samples) to be collected and the analytical parameters for these samples.

4.4.2.4 Hydrologic Measurements

Hydrologic measurements consisting of groundwater level measurements and in situ hydraulic conductivity tests in monitoring wells will be recorded. This will allow for an evaluation of groundwater flow direction.

Groundwater Level Measurements

Water level measurements will be collected from newly-installed and developed monitoring wells on a weekly basis. These measurements will be taken at least twice during the field investigation. This will allow for an evaluation of groundwater flow direction. The procedures for water level measurements are detailed in Section 3.17 of the Master FSP (Baker, 1994).

In Situ Hydraulic Conductivity Tests

The hydraulic conductivity of the aquifer in the near vicinity of the monitoring well will be measured using in situ hydraulic conductivity (slug) test. The slug tests will be performed on select, newly installed monitoring wells after groundwater sampling is completed. Slug tests will be conducted using solid PVC slugs and recorded using Hermit™ data loggers or equivalent. The procedures for slug tests are found in Section 3.16 of the Master FSP.

4.4.3 Surface Water/Sediment Investigation

Surface water and sediment investigations will be conducted at Site 18 Data from these studies will be used to assess potential impacts to the environment from Site 18 and will be used in the ERA.

Four surface water/sediment sampling stations have been identified to characterize the downstream of Site 18 (Figure 4-6). The results from the Round Two RI will be compared to ecologically similar background study areas (Baker, 1995a).

At each sampling location, an effort will be made to collect each surface water sample at midstream. The samples will be collected as described in Section 3.7.1 of the Master FSP (Baker, 1994). Surface water samples will be collected at each station prior to obtaining the sediment samples to minimize possible turbidity effects from sampling. Downstream stations will be sampled first, with subsequent samples taken while moving upstream.

At each of the four surface water locations mentioned above, a surface (0- to 4-inch) and a subsurface (4- to 8-inch) sediment sample will be collected for a total of eight samples. The methods of collected are described in Section 3.7.2 of the Master FSP (Baker, 1994).

All surface water and sediment samples will be analyzed for TCL organics, nitramine compounds, TAL inorganics, TOC, nitrate/nitrite, cyanide, grain size (sediment only), and pH (sediment pH shall be measured in the laboratory). These analyses were selected to meet the needs of the ERA. In addition, analyses for pH, temperature, DO, salinity, and specific conductivity will be performed on surface water samples in the field immediately following sample collection. Specific water quality measurement procedures will be performed according to the "On-Site Water Quality Testing" SOP in Appendix A, Section F201 of the Master Project Plans (Baker, 1994). Tables 4-7 and 4-8 summarize the environmental samples to be collected and the analytical parameters for these samples.

4.5 SSA 14 - Building 537 Discharge to Felgates Creek

The results of the Relative Risk Ranking Data Collection Investigation conducted at SSA 14 indicate that surface soil, surface water, and sediment have been impacted by former site operations. Nitramine compounds were detected in each of these media. Analytical results from this investigation have been utilized in developing the sampling approach for the Round Two RI at SSA 14.

This section describes the soil and groundwater investigation activities that will be conducted at SSA 14 under the Round Two RI. Surface water/sediment and aquatic ecological investigation activities are presented in Section 4.2 (East Branch of Felgates Creek).

4.5.1 Soil Investigation

The soil investigation for Site 14 will include the collection of both surface and subsurface soil samples. Surface soil samples will be collected in accordance with methods presented in Section 3.8 of the Master FSP (Baker, 1994). Subsurface soil samples will be collected during soil boring installations.

4.5.1.1 Surface Soil Sampling

Four surface soil samples will be collected at the soil boring locations from the 0- to 6-inch bgs interval and analyzed for TCL SVOCs, TCL pesticides/PCBs, nitramine compounds, TAL inorganics, TOC, pH, CEC, and nitrate/nitrite. The sampling locations are shown on Figure 4-7. The four surface soil samples will be labeled A14SS01 through A14SS04.

The results of the Relative Risk Ranking Data Collection Investigation indicated that surface soil in the vicinity of the discharge pipe (Figure 4-7) has been impacted by nitramine compound contamination. As such, the Round Two RI surface soil samples will be collected for two primary reasons: to obtain surface soil information to be used in the baseline RA and ERA and to evaluate the extent of surface soil contamination at the site. The Master FSP, Section 3.8 (Baker, 1994), describes the surface soil sampling procedures. A summary of the number of samples to be collected (including QA/QC samples) and the analytical parameters is presented by medium in Tables 4-9 and 4-10.

4.5.1.2 Subsurface Soil Boring and Sampling

Four subsurface soil borings will be advanced at SSA 14 for the collection of subsurface soil samples and the installation of one monitoring well for groundwater sampling. Hollow-stem augering techniques will be used to advance the soil borings. Subsurface soil samples will be collected via split-spoon sampling methods in general accordance with the procedures outlined in

the ASTM Standard Method for Penetration Test and Split-Barrel Sampling of Soil (Designation D1586, ASTM, 1984). Split-spoons of 24-inch (nominal) length, and 2-inch (nominal) OD will typically be used throughout the investigation. Split-spoon samples will be collected continuously below a depth of 1.0 feet bgs. At the discretion of the Baker Field Geologist, split-spoon sampling may be completed at 3- or 5-foot intervals.

The Baker Field Geologist will visually inspect each split spoon sample and record a lithologic description and observations regarding the appearance, consistency, color, and moisture of the soil and other pertinent information such as evidence of contamination. The SPT blow counts also will be recorded. In addition, a 10.2 eV PID will be used to screen the samples to detect the presence of specific analytes with an ionization potential less than or equal to the eV capacity of the lamp (10.2 eV for the instrument used for this investigation). Soil boring procedures are outlined in Section 3.9 of the Master FSP (Baker, 1994).

Four soil borings will be advanced at the site (Figure 4-7) and numbered A14SB01 through A14SB04. Three of the soil borings are located at the end of the discharge pipe on the stream bank of Felgates Creek to intercept contaminants that may have been discharged from the pipe. It is unlikely that this area will be accessible for a drill rig. The soil borings will, therefore, be advanced using hand augering techniques, as described in Section 3.9 of the Master FSP (Baker, 1994). One soil boring will be advanced upgradient of the discharge pipe. The soil boring locations have been selected to determine the horizontal and vertical extent of soil contamination within the drainage area. One soil boring (A14SB01) will be converted to a shallow monitoring well (A14GW01)

Two subsurface soil samples will be collected from each of the three soil borings; one subsurface soil sample will be collected from just above the water table and a second subsurface soil sample will be collected from within the apparent contamination (typically from the area with the highest PID reading, odor, or visible evidence of contamination) for a total of eight environmental subsurface soil samples. If no contamination is apparent, the second sample will be collected from a mid-point in the soil boring. In addition, one sample will be collected within the aquifer material at one location. This sample (along with one collected above the water table) will be analyzed for grain size (sieve/hydrometer), bulk density, and CEC to obtain information on the migration potential of contaminants at the site.

In addition to the above, subsurface soil samples collected at SSA 14 that are submitted to the laboratory will be analyzed for TCL organics, nitramine compounds, TAL inorganics, TOC, and nitrate/nitrite. A summary of the number of samples to be collected (including QA/QC samples) and the analytical parameters is presented, by medium, in Table 4-9 and 4-10.

4.5.1.3 Summary

Four surface soil and eight subsurface soil samples will be collected at SSA 14 The sampling procedures are described in Section 3.8 and 3.9 of the Master FSP (Baker, 1994). Based on the results of the Relative Risk Ranking Data Collection Investigation, the soil samples will be analyzed for TCL VOCs (excluding surface soil), TCL SVOCs, TCL pesticides/PCBs, nitramine compounds, TAL inorganics, TOC, and nitrate/nitrite in addition to select samples to be analyzed for engineering parameters. A summary of the number of samples to be collected (including QA/QC samples) and the analytical parameters is presented, by medium, in Tables 4-9 and 4-10.

4.5.2 Groundwater Investigation

The following section describes the activities to be conducted during the groundwater investigation at SSA 14.

4.5.2.1 Well Installation

One shallow monitoring well (A14GW01) will be installed at the site to evaluate whether groundwater quality has been impacted by former site operations and to obtain data pertinent to the site hydrogeology. The monitoring well locations are shown on Figure 4-7. It is anticipated that this monitoring well will be installed in the Cornwallis Cave aquifer.

The data from the proposed monitoring well will be used in conjunction with data from the monitoring wells at Site 8 to form a groundwater monitoring well network for evaluating the nature and extent of groundwater contamination in this vicinity.

The type of monitoring well (i.e., Type II or III) to be installed will be determined after lithologic data from each soil boring that is to be converted to a monitoring well has been evaluated. If a layer

of low hydraulic conductivity (i.e., semi-confining or confining unit) is encountered, a Type III well will be installed. A 10-inch diameter steel surface casing will be installed into this layer and the casing will be grouted in place. The cement-bentonite grout will be permitted to set for 12 to 24 hours prior to resumption of drilling through the casing. Monitoring wells will be constructed and be screened at least 15 feet into the deeper confined aquifer. If there is no low hydraulic conductivity zone (confining unit), Type II monitoring wells will be installed to intercept the first occurrence of groundwater that is not a perched zone. The procedures for well installation, well completion, and well development are described in the Master FSP, Sections 3.10, 3.11, and 3.12, respectively (Baker, 1994).

One shelby tube will be collected within the Cornwallis Cave or the Yorktown-Eastover confining unit (whichever is encountered). This sample will be analyzed for grain size (sieve/hydrometer), atterberg limit, vertical hydraulic conductivity, moisture content, pH, and Eh.

4.5.2.2 Well Development

Prior to groundwater sampling, the newly installed monitoring well will be developed by removing water from the well and discharging it to the ground on site (see Section 4.6.2, Investigation Derived Waste). Additional details for well development are found in Section 3.12 of the Master FSP (Baker, 1994). During development overpumping and surging methods may be utilized to better remove silt and particulates.

Development will consist of removing a minimum of three to five well volumes of water, plus the volume of any water added during the drilling or installation process. Development will continue until the water is relatively clear; until three successive measurements of pH, specific conductance, and temperature stabilize; or until 6 hours of development have passed (whichever comes first). Development information, including water clarity, pH, specific conductivity, and temperature, will be recorded in the field logbook. Appendix A, Section F201 of the Master Project Plans presents the SOPs for "On-Site Water Quality Testing" (Baker, 1994).

4.5.2.3 Groundwater Sampling

One groundwater sample will be collected from the newly installed monitoring well at SSA 14. Prior to groundwater sampling, three to five well volumes will be purged from the well. Purging will be accomplished using low flow pumps. The main purpose of the low-flow purging technique is to reduce turbidity (i.e., suspended sediment/soil particles) in the groundwater samples. Turbidity in groundwater samples may result in higher inorganic concentrations.

Field measurements of turbidity, Eh, pH, temperature, DO, and specific conductivity will be taken after each well volume. Purging will be complete when three successive field measurements of each parameter are within 10 percent of each other and turbidity stabilizes (i.e., less than 5 NTUs, if practicable). The monitoring well will be sampled using a low flow pump. Monitoring well purging and groundwater sampling procedures also are detailed in Section 3.15 of the Master FSP (Baker, 1994).

Groundwater samples will be analyzed for TCL organics and TAL inorganics (total and dissolved), TOC, nitrate/nitrite, TDS, TSS, bromide, chloride, orthophosphorous, sulfate, and dissolved methane. These parameters have been selected based on the results of the Relative Risk Ranking Data Collection Investigation. Tables 4-9 and 4108 summarize the environmental samples (and QA/QC samples) to be collected and the analytical parameters for these samples.

4.5.2.4 Hydrologic Measurements

Hydrologic measurements consisting of groundwater level, staff gauge measurements and in situ hydraulic conductivity tests in monitoring wells will be recorded. The measurements will aid in determining groundwater fluctuation and its relationship to surface water.

Groundwater Level Measurements

Water level measurements will be collected from the newly developed and installed monitoring well well at SSA 14 on a weekly basis in conjunction with measurements collected at Site 8 monitoring wells. These measurements will be taken at least twice during the field investigation. This will

allow for an evaluation of groundwater flow direction. The procedures for water level measurements are detailed in Section 3.17 of the Master FSP (Baker, 1994).

In Situ Hydraulic Conductivity Tests

The hydraulic conductivity of the aquifer in the near vicinity of the monitoring well will be measured using in situ hydraulic conductivity (slug) test. The slug tests will be performed on select newly installed monitoring wells after groundwater sampling is completed. Slug test will be conducted using solid PVC slugs and recorded using Hermit™ data loggers or equivalent. The procedures for slug tests are found in Section 3.16 of the Master FSP.

Staff Gauges

One staff gauge will be installed at the end of the drainageway in the tributary to Felgates Creek. The staff gauge location is shown on Figure 4-7. Water level measurements from the staff gauge and the monitoring well will be collected on a weekly basis. Data collected from the staff gauge will help assess the groundwater and surface water interaction and will provide boundary data for groundwater modeling, which may be completed in the future.

4.6 Other Field Activities

Other field activities will be performed during the investigation that are not site-specific. These include land surveying and investigation derived waste (IDW) disposal.

4.6.1 Land Surveying

All newly installed and existing monitoring well/subsurface soil boring locations and surface soil sampling locations will be surveyed to Station bench mark; this includes elevation to mean sea level msl) as well as reference to Virginia State Plane Coordinates. The locations of surface water, sediment, and aquatic ecological sampling points will not be surveyed, but instead estimated in the field and located on the existing WPNSTA Yorktown Station Maps.

Details of the surveying procedures are described in the Master FSP, Section 3.21 (Baker, 1994).

4.6.2 Investigation Derived Waste Management

Wastes generated during the field investigation will include soil from subsurface borings (cuttings), groundwater (from developing and purging wells), decontamination fluids (steam cleaning water and decontamination chemicals), and miscellaneous items such as gloves, Tyvek®, and other used personal protective equipment (PPE). The soil cuttings (from borings and well installation), groundwater (purge and development water), and steam cleaning decontamination water will be returned to the site from which it originated. The decontamination chemicals and miscellaneous items will be properly contained until disposal .

IDW management (soil and groundwater) will be conducted in accordance with guidance from USEPA's Guide to Management of Investigation-Derived Wastes, which is presented in Appendix A. The document states that "most IDW (with the exception of non-indigenous IDW) generated during the course of the investigation are intrinsic elements of the site and should be managed with other wastes from the site, consistent with final remedy." The analytical results from the previous investigations conducted at these sites indicate that soil and groundwater generated during field investigative activities would not be classified as hazardous waste. In addition, Round Two Remedial investigations have been performed at eight sites at WPNSTA Yorktown. All of the composite samples collected from roll-off boxes (soil) and tankers (development, purge and steam cleaning decontamination water) have been determined as non-hazardous. The IDW management procedures are described below.

Soil

Soil generated (soil cuttings and split-spoon samples) during field investigative activities will be spread on the ground in the immediate vicinity of the borings. If the soil is suspected to be contaminated based upon physical observation (i.e., sight, smell) or high HNu PID readings, it will be segregated in a 55-gallon drum and labeled according to procedures specified in Section 3.26.2 of the Master FSP (Baker, 1994). The drums will be placed on wooden pallets in a secure area at the site until a disposal method is determined.

After completion of field activities, a composite soil sample will be collected from the drums and analyzed for full Toxicity Characteristic Leaching Procedure (TCLP) and Resource Conservation and Recovery Act (RCRA) characteristics as noted in the Master FSP, Section 3.26.4 (Baker, 1994).

Liquid

Liquid generated during field activities includes development and purge water from monitoring wells (groundwater), decontamination water from steam cleaning activities, and decontamination fluids containing solvents and acids. These will be segregated and stored as noted below.

Development, purge, and decontamination (generated by steam cleaning only) water from the site will be discharged on the ground. If the water is suspected to be contaminated (noted by HNu PID reading or other field measurements) it will be segregated into 55-gallon drums and labeled as noted in the Master FSP, Section 3.26.3 (Baker, 1994). Drums will be placed on wooden pallets in a secure area at the site until a disposal method is determined.

Decontamination water containing acids and solvents used for cleaning small sampling equipment will be segregated from the other decontamination water into 55-gallon drums. This will avoid possible contamination of a large volume of water and increasing disposal costs. The drum will be labeled, placed on a pallet, and left at a secure area at one of the sites until final disposition is determined.

After all field activities are completed, a composite water sample will be collected from each drum and analyzed for TAL inorganics and RCRA characteristics as noted in the Master FSP, Section 3.26.4 (Baker, 1994).

Personal Protective Equipment

Items of PPE that may have come into contact with potentially contaminated materials, such as disposable gloves, Tyvek®, and disposable bailers, will be decontaminated as appropriate and double bagged in plastic bags, and placed in the trash dumpster at Baker's field trailer.

4.7 General Field Operations

General field operations will be headquartered at an office trailer located on the Station near Building 1806. The office trailer is equipped with electricity and a telephone. The field office will be where the field team will meet at the beginning and end of each day, where a field sign-in book will be located, and where the site manager will coordinate all Station investigative operations. Further details of project management are described in Section 5.0. a separate, smaller trailer also is necessary for the purpose of equipment storage. This includes equipment such as HNu PID meters, pH meters, specific conductivity meters, sample bottles, PPE, and decontamination equipment.

4.7.1 Sample Analysis

Samples for TCL organics (VOCs, SVOCs, pesticides, and PCBs) and TAL inorganics will be analyzed using CLP methods with Level D Quality Assurance/Quality Control (QA/QC). Other analytical parameters, such as TSS, TDS, nitramine compounds, TOC, sieve and hydrometer, will be analyzed using USEPA SW 846 using Level C QA/QC procedures or other methods as appropriate. These analytical methods, their contract required detection limits or practical quantitation limits, and QA/QC procedures are described in the Master QAPP (Section 6.0).

A summary of analyses by individual sample is presented in Tables 4-1 and 4-3. These tables will be used to track samples collected in the field and submitted to the laboratory for analysis.

4.7.2 Data Validation

Data validation will be performed by an independent data validator for all samples collected, using Level D guidelines. The procedures for validation will follow the appropriate Level D guidelines listed in the Naval Energy and Environmental Support Activity (NEESA) guidance document (NEESA 20.2-047B). Further details concerning data validation are found in the Master QAPP Section 7.0 (Baker, 1994). Data that are evaluated and do not pass the validation will still be reported and flagged with qualifiers.

4.7.3 Data Assembly and Interpretation

Data assembly will include activities such as incorporating the newly acquired data into the existing data base; documenting field activities; summarizing field information such as pH, specific conductivity, temperature, salinity, and Eh; creating soil boring logs, monitoring well development and purging forms; and developing water level monitoring charts. Also, data assembly will include review and compilation of the previously existing data from the Round One RI.

Data interpretation will include review of the compiled data and construction of maps and charts showing items such as geologic cross-sections, groundwater contour maps, statistical analyses of sampling results, and other similar items. It is anticipated that data collected from Sites 11 and 17 may be combined for certain media interpretation (such as groundwater, surface water, and sediment) because of the close proximity of the sites, similar types of contaminants, and similar receptors.

4.7.4 Baseline Risk Assessment

The baseline RA will be comprised of two risk evaluations - human health and ecological. The procedures to be followed, methods of data analysis, and criteria for risk characterization are detailed in the Master Work Plan, Section 4.5 (Baker, 1994) and will not be repeated here. The Baseline RA will be included as a separate chapter in the RI Report.

4.7.5 Remedial Investigation Report

a RI Report will be prepared which includes a summary of the activities accomplished during the field investigation, tabulation and interpretation of data, and a discussion of the nature and extent of contamination associated with each site. Analytical data sheets and laboratory analytical results will not be included in the report, but rather will be provided to USEPA Region III, LANTDIV, and WPNSTA Yorktown under separate cover as requested. As noted above, the baseline RA will be included as a separate section in the RI Report. Depending upon the results of the sampling, each site may be discussed separately or combined for different media (as noted above).

4.7.6 Feasibility Study

The FS will be conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act as amended by the Superfund Amendments and Reauthorization Act. The FS will utilize background information, as well as the data generated during the RI, to evaluate various remedial alternatives and to identify those alternatives that provide the most appropriate, cost-effective solutions for site remediation. Details of the FS process are described in the Master Work Plan, Section 5.0 (Baker, 1994).

4.7.7 Meetings

Progress meetings will be held periodically throughout the RI process to update USEPA Region III and VDEQ personnel on project progress and findings and to discuss any items related to successful completion of the project. It is anticipated that these progress meetings will be held on a monthly basis, either at USEPA Region III headquarters in Philadelphia, Pennsylvania or via a telephone conference call.

Restoration Advisory Board (RAB) meetings will be held at WPNSTA Yorktown for review of major project deliverables such as the RI and FS Reports.

4.8 References

American Society for Testing and Materials. 1984. Standard Method for Penetration Test and Split-Barrel Sampling of Soil. ASTM Method D1586-84, Annual Book of Standards, ASTM, Philadelphia, Pennsylvania.

Baker Environmental, Inc. 1995a. Final Summary of Background Constituent Concentrations and Characterization of the Biotic Community from the York River Drainage Basin, Naval Weapons Station Yorktown, Yorktown, Virginia. July 1995.

Baker Environmental, Inc. 1995. Final Habitat Evaluation for Sites 1, 2, 3, 4, 6, 7, 8, 9, 11, 12, 16, 17, 18, 19, and 21 Naval Weapons Station Yorktown, Yorktown, Virginia. July 1995.

Baker Environmental, Inc. 1994. Final Master Project Plans, Naval Weapons Station Yorktown, Yorktown, Virginia. June 1994.

Brockman, A.R. and D.L. Richardson. 1992. Hydrogeologic Framework of the Shallow Aquifer System of Yorktown, Virginia. Prepared in cooperation with York County Department of Environmental Services. USGS Water Resources Investigation Report 92-4111.

United States Environmental Protection Agency. 1996. "Risk-Based Concentration Summary Table, January-June 1996." Region III, Philadelphia, Pennsylvania.

SECTION 4.0 TABLES

TABLE 4-1

SUMMARY OF ANALYSES
SITE 2
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Medium	Sample ID	TCL Organics				TAL Inorganics		TOC	Nitrate/ Nitrite	Other	QA/QC Samples	
		TCL VOCs	TCL SVOCs	TCL Pesticides/ PCBs	Nitramines/ Nitroaromatics	Total[1]	Dissolved				Duplicate	MS/MSD
Subsurface Soil	2SB01-XX	X	X	X	X	X		X	X	pH		
	2SB01-YY	X	X	X	X	X		X	X	pH		
	2SB02-XX	X	X	X	X	X		X	X	pH		
	2SB02-YY	X	X	X	X	X		X	X	pH		
	2SB03-XX	X	X	X	X	X		X	X	pH		
	2SB03-YY	X	X	X	X	X		X	X	pH		
	2SB04-XX	X	X	X	X	X		X	X	pH		
	2SB04-YY	X	X	X	X	X		X	X	pH		
	2SB05-XX	X	X	X	X	X		X	X	pH	X	X
	2SB05-YY	X	X	X	X	X		X	X	pH		
	2SB06-XX	X	X	X	X	X		X	X	pH		
	2SB06-YY	X	X	X	X	X		X	X	pH		
	2SB07-XX	X	X	X	X	X		X	X	pH		
	2SB07-YY	X	X	X	X	X		X	X	pH		
	2SB08-XX	X	X	X	X	X		X	X	pH		
	2SB08-YY	X	X	X	X	X		X	X	pH		
	2SB09-XX	X	X	X	X	X		X	X	pH		
	2SB09-YY	X	X	X	X	X		X	X	pH[2], GS, BD, CEC		

TABLE 4-1 (Continued)

SUMMARY OF ANALYSES
SITE 2
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Medium	Sample ID	TCL Organics				TAL Inorganics		TOC	Nitrate/ Nitrite	Other	QA/QC Samples	
		TCL VOCs	TCL SVOCs	TCL Pesticides/ PCBs	Nitramines/ Nitroaromatics	Total[1]	Dissolved				Duplicate	MS/MSD
Subsurface Soil (continued)	2SB09-ZZ							X	X	GS, BD, CEC, pH		
	2SB10-XX	X	X	X	X	X		X	X	pH		
	2SB10-YY	X	X	X	X	X		X	X	pH, CEC, BD, GS	X	
	2SB10-ZZ							X	X	GS, BD, CEC, pH		
Groundwater	2GW01-001	X	X	X	X	X	X	X	X	TDS, TSS, BCPSM		
	2GW05-001	X	X	X	X	X	X	X	X	TDS, TSS, BCPSM		
	2GW06-001	X	X	X	X	X	X	X	X	TDS, TSS, BCPSM	X	X
	2GW07-001	X	X	X	X	X	X	X	X	TDS, TSS, BCPSM		
Surface Water	2SW01-01	X	X	X	X	X	X	X	X			
	2SW02-01	X	X	X	X	X	X	X	X			
	2SW03-01	X	X	X	X	X	X	X	X			
	2SW04-01	X	X	X	X	X	X	X	X		X	X
	2SW05-01	X	X	X	X	X	X	X	X			
	2SW06-01	X	X	X	X	X	X	X	X			
	2SW07-01	X	X	X	X	X	X	X	X			
	2SW08-01	X	X	X	X	X	X	X	X			
	2SW09-01	X	X	X	X	X	X	X	X			

TABLE 4-1 (Continued)

SUMMARY OF ANALYSES
SITE 2
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Medium	Sample ID	TCL Organics				TAL Inorganics		TOC	Nitrate/ Nitrite	Other	QA/QC Samples	
		TCL VOCs	TCL SVOCs	TCL Pesticides/ PCBs	Nitramines/ Nitroaromatics	Total[1]	Dissolved				Duplicate	MS/MSD
Sediment	2SD01-01	X	X	X	X	X		X	X	GS, pH		
	2SD01-02	X	X	X	X	X		X	X	GS, pH		
	2SD02-01	X	X	X	X	X		X	X	GS, pH		
	2SD02-02	X	X	X	X	X		X	X	GS, pH		
	2SD03-01	X	X	X	X	X		X	X	GS, pH		
	2SD03-02	X	X	X	X	X		X	X	GS, pH		
	2SD04-01	X	X	X	X	X		X	X	GS, pH		
	2SD04-02	X	X	X	X	X		X	X	GS, pH		
	2SD05-01	X	X	X	X	X		X	X	GS, pH	X	X
	2SD05-02	X	X	X	X	X		X	X	GS, pH		
	2SD06-01	X	X	X	X	X		X	X	GS, pH		
	2SD06-02	X	X	X	X	X		X	X	GS, pH		
	2SD07-01	X	X	X	X	X		X	X	GS, pH		
	2SD07-02	X	X	X	X	X		X	X	GS, pH		
	2SD08-01	X	X	X	X	X		X	X	GS, pH		
	2SD08-02	X	X	X	X	X		X	X	GS, pH		
	2SD09-01	X	X	X	X	X		X	X	GS, pH		
	2SD09-02	X	X	X	X	X		X	X	GS, pH	X	
	2SD10-10	X	X	X	X	X		X	X	GS, pH		

TABLE 4-1 (Continued)

SUMMARY OF ANALYSES
SITE 2
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Medium	Sample ID	TCL Organics				TAL Inorganics		TOC	Nitrate/ Nitrite	Other	QA/QC Samples	
		TCL VOCs	TCL SVOCs	TCL Pesticides/ PCBs	Nitramines/ Nitroaromatics	Total[1]	Dissolved				Duplicate	MS/MSD
Sediment (continued)	2SD10-02	X	X	X	X	X		X	X	GS, pH	X	X
	2SD11-01	X	X	X	X	X		X	X	GS, pH		
	2SD11-02	X	X	X	X	X		X	X	GS, pH		
	2SD12-01	X	X	X	X	X		X	X	GS, pH		
	2SD12-02	X	X	X	X	X		X	X	GS, pH		

Notes:

(1) Total TAL inorganics includes cyanide
(2) CEC, TOC, Nitrate/Nitrite, Grain Size, and Bulk Density should be analyzed in subsurface soil just above the water table and in each aquifer encountered.

CEC = Cation Exchange Capacity
BD = Bulk Density
GS = Grain Size
BCPSM = Bromide, Chloride, Orthophosphorous, Sulfate, Dissolved Methane
TDS = Total Dissolved Solids
TSS = Total Suspended Solids

TABLE 4-2

SUMMARY OF ENVIRONMENTAL AND QUALITY CONTROL SAMPLES AND ANALYTICAL PARAMETERS
SITE 2
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Sample Type	Number of Environmental Samples	Analytical Parameters	Number of Duplicates	Number of MS/MSDs	Number of Trip Blanks	Number of Rinsate Blanks
Subsurface Soil (soil borings)	20	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics, Cyanide, TOC, Nitrate/Nitrite, CEC(1), BD(1), GS(1), pH	2	1	5	5
Monitoring Wells - Groundwater(2)(3)	4	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics (total and dissolved), Cyanide, TOC, Nitrate/Nitrite, TDS/TSS, BCPSM	1	1	1	1
Surface Water(4)(5)	9	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics (total and dissolved), Cyanide, TOC, Nitrate/Nitrite	1	1	1	1
Sediment (18 associated with surface water)	24(6)	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics, Cyanide, TOC, Grain Size, Nitrate/Nitrite, pH	3	2	1	1

Notes:

(1) Analyzed in two soil boring locations: just above the water table and in each aquifer.
(2) Field parameters including pH, specific conductivity, temperature, Eh, D.O., and turbidity will be measured in the field, as appropriate.
(3) Assumes one round of sampling of new and existing monitoring wells.
(4) Seven benthic macroinvertebrate samples collected in association with surface water and sediment sampling.
(5) Field parameters including pH, specific conductivity, temperature, D.O., salinity, and turbidity will be measured in the field, as appropriate.
(6) Nine locations with two sediment samples per location.

TABLE 4-3

SUMMARY OF ANALYSES
EAST BRANCH FELGATES CREEK
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Medium	Sample ID	TCL Organics				TAL Inorganics		TOC	Nitrate/ Nitrite	Other	QA/QC Samples	
		TCL VOCs	TCL SVOCs	TCL Pesticides/ PCBs	Nitramines/ Nitroaromatics	Total[1]	Dissolved				Duplicate	MS/MSD
Surface Water	8SW01-01	X	X	X	X	X		X	X			
	8SW02-01	X	X	X	X	X		X	X			
	8SW03-01	X	X	X	X	X		X	X		X	X
	A14SW01-01	X	X	X	X	X		X	X			
	A14SW02-01	X	X	X	X	X		X	X			
	A14SW03-01	X	X	X	X	X		X	X			
Sediment	8SD01-01	X	X	X	X	X		X	X	Grain Size, pH	X	X
	8SD01-02	X	X	X	X	X		X	X	Grain Size, pH		
	8SD02-01	X	X	X	X	X		X	X	Grain Size, pH		
	8SD02-02	X	X	X	X	X		X	X	Grain Size, pH		
	8SD03-01	X	X	X	X	X		X	X	Grain Size, pH		
	8SD03-02	X	X	X	X	X		X	X	Grain Size, pH		
	A14SD01-01	X	X	X	X	X		X	X	Grain Size, pH		
	A14SD01-02	X	X	X	X	X		X	X	Grain Size, pH	X	
	A14SD02-01	X	X	X	X	X		X	X	Grain Size, pH		
	A14SD02-02	X	X	X	X	X		X	X	Grain Size, pH		
	A14SD03-01	X	X	X	X	X		X	X	Grain Size, pH		
	A14SD03-02	X	X	X	X	X		X	X	Grain Size, pH		

Notes:

[1] Total TAL inorganics includes cyanide

TABLE 4-4

SUMMARY OF ENVIRONMENTAL AND QUALITY CONTROL SAMPLES AND ANALYTICAL PARAMETERS
EAST BRANCH FELGATES CREEK
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Sample Type	Number of Environmental Samples	Analytical Parameters	Number of Duplicates	Number of MS/MSDs	Number of Trip Blanks	Number of Rinsate Blanks
Surface Water[1][2]	6	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics (total and dissolved), Cyanide, TOC, Nitrate/Nitrite	1	1	1	1
Sediment (associated with surface water)	12[3]	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics, Cyanide, TOC, Grain Size, Nitrate/Nitrite, pH	2	1	1	1

Notes:

(1) Seven benthic macroinvertebrate samples collected in association with surface water and sediment sampling.
(2) Field parameters including pH, specific conductivity, temperature, D.O., salinity, and turbidity will be measured in the field, as appropriate.
(3) Six locations with two sediment samples per location.

TABLE 4-5

SUMMARY OF ANALYSES
SITE 8
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Medium	Sample ID	TCL Organics				TAL Inorganics		TOC	Nitrate/ Nitrite	Other	QA/QC Samples	
		TCL VOCs	TCL SVOCs	TCL Pesticides/PCBs	Nitramines/ Nitroaromatics	Total[1]	Dissolved				Duplicate	MS/MSD
Surface Soil	8SS01		X	X	X	X		X	X	pH, CEC		
	8SS02		X	X	X	X		X	X	pH, CEC		
	8SS03		X	X	X	X		X	X	pH		
	8SS04		X	X	X	X		X	X	pH	X	X
	8SS05		X	X	X	X		X	X	pH		
	8SS06		X	X	X	X		X	X	pH		
	8SS07		X	X	X	X		X	X	pH		
	8SS08		X	X	X	X		X	X	pH		
	8SS09		X	X	X	X		X	X	pH, CEC		
Subsurface Soil	8SB01-XX	X	X	X	X	X		X	X	pH, CEC		
	8SB01-YY	X	X	X	X	X		X	X	pH, CEC		
	8SB02-XX	X	X	X	X	X		X	X	pH, CEC		
	8SB02-YY	X	X	X	X	X		X	X	pH, CEC		
	8SB03-XX	X	X	X	X	X		X	X	pH		
	8SB03-YY	X	X	X	X	X		X	X	pH		
	8SB04-XX	X	X	X	X	X		X	X	pH		
	8SB04-YY	X	X	X	X	X		X	X	pH		
	8SB05-XX	X	X	X	X	X		X	X	pH	X	X
	8SB05-YY	X	X	X	X	X		X	X	pH		

TABLE 4-5 (Continued)

SUMMARY OF ANALYSES
SITE 8
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Medium	Sample ID	TCL Organics				TAL Inorganics		TOC	Nitrate/ Nitrite	Other	QA/QC Samples	
		TCL VOCs	TCL SVOCs	TCL Pesticides/PCBs	Nitramines/ Nitroaromatics	Total[1]	Dissolved				Duplicate	MS/MSD
	8SB06-XX	X	X	X	X	X		X	X	pH		
	8SB06-YY	X	X	X	X	X		X	X	pH		
	8SB07-XX	X	X	X	X	X		X	X	pH		
	8SB07-YY	X	X	X	X	X		X	X	pH		
	8SB08-XX	X	X	X	X	X		X	X	pH		
	8SB08-YY	X	X	X	X	X		X	X	pH		
	8SB09-XX	X	X	X	X	X		X	X	pH		
	8SB09-YY	X	X	X	X	X		X	X	GS, BD, CEC, pH[2]	X	
	8SB09-ZZ							X	X	GS, BD, CEC, pH[2]		
Groundwater	8GW01-001	X	X	X	X	X	X	X	X	TDS, TSS, BCPSM		
	8GW01A-001	X	X	X	X	X	X	X	X	TDS, TSS, BCPSM		
	8GW02-001	X	X	X	X	X	X	X	X	TDS, TSS, BCPSM		
	8GW03-001	X	X	X	X	X	X	X	X	TDS, TSS, BCPSM	X	X

Notes:

(1) = Total TAL inorganics includes cyanide
(2) = CEC, TOC, Nitrate/Nitrite, GS, and BD should be analyzed in subsurface soil just above the water table and in each aquifer encountered.

TDS = Total Dissolved Solids
TSS = Total Suspended Solids
BCPSM = Bromide, Chloride, Sulfate, Orthophosphorous, Dissolved Methane

TABLE 4-6

SUMMARY OF ENVIRONMENTAL AND QUALITY CONTROL SAMPLES AND ANALYTICAL PARAMETERS
SITE 8
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Sample Type	Number of Environmental Samples	Analytical Parameters	Number of Duplicates	Number of MS/MSDs	Number of Trip Blanks	Number of Rinsate Blanks
Surface Soil	9	TCL SVOCs, TCL Pest/PCBs, Nitramines/nitroaromatics, TAL Inorganics,Cyanide, TOC, Nitrate/Nitrite, pH	1	1	0	1
Subsurface Soil (soil borings)	18	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, Nitramines/nitroaromatics, TAL Inorganics, Cyanide, Nitrate/Nitrite, TOC, CEC (1), BD (1), GS (1), pH	2	1	1	1
Monitoring Wells - Groundwater(2)(3)	4	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, Nitramines/nitroaromatics, TAL Inorganics (total and dissolved), Cyanide, Nitrate/Nitrite, TOC, TDS, TSS, BCPSM	1	1	1	1

Notes:

(1) Analyzed in one soil boring location: just above the water table and in each aquifer encountered.

(2) Field parameters including pH, specific conductivity, temperature, Eh, and turbidity will be measured in the field, as appropriate.

(3) Assumes one round of sampling of new monitoring wells.

TABLE 4-7

SUMMARY OF ANALYSES
SITE 18
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Medium	Sample ID	TCL Organics				TAL Inorganics		TOC	Nitrate/ Nitrite	Other	QA/QC Samples	
		TCL VOCs	TCL SVOCs	TCL Pesticides/ PCBs	Nitramines/ Nitroaromatics	Total[1]	Dissolved				Duplicate	MS/MSD
Surface Soil	18SS11	X	X	X	X	X		X	X	pH, CEC	X	X
	18SS12	X	X	X	X	X		X	X	pH, CEC		
	18SS13	X	X	X	X	X		X	X	pH		
	18SB01-00	X	X	X	X	X		X	X	pH		
	18SB02-00	X	X	X	X	X		X	X	pH		
	18SB03-00	X	X	X	X	X		X	X	pH		
Subsurface Soil	18SB01-XX	X	X	X	X	X		X	X	pH		
	18SB01-YY	X	X	X	X	X		X	X	pH		
	18SB02-XX	X	X	X	X	X		X	X	pH	X	X
	18SB02-YY	X	X	X	X	X		X	X	GS, BD, pH, CEC[2]		
	18SB02-ZZ							X	X	GS, BD, pH, CEC		
	18SB03-XX	X	X	X	X	X		X	X	pH		
	18SB03-YY	X	X	X	X	X		X	X	GS, BD, pH, CEC		
	18SB03-ZZ							X	X	GS, BD, pH, CEC		
Groundwater	18GW01-001	X	X	X	X	X	X	X	X	TDS, TSS, BCSPM	X	X
	18GW02-001	X	X	X	X	X	X	X	X	TDS, TSS, BCSPM		
	18GW03-001	X	X	X	X	X	X	X	X	TDS, TSS, BCSPM		

TABLE 4-7 (Continued)

SUMMARY OF ANALYSES
SITE 18
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Medium	Sample ID	TCL Organics				TAL Inorganics		TOC	Nitrate/ Nitrite	Other	QA/QC Samples	
		TCL VOCs	TCL SVOCs	TCL Pesticides/ PCBs	Nitramines/ Nitroaromatics	Total[1]	Dissolved				Duplicate	MS/MSD
Surface Water	18SW07	X	X	X	X	X		X	X		X	X
	18SW08	X	X	X	X	X		X	X			
	18SW09	X	X	X	X	X		X	X			
	18SW10	X	X	X	X	X		X	X			
Sediment	18SD07-01	X	X	X	X	X		X	X	pH, GS		
	18SD07-02	X	X	X	X	X		X	X	pH, GS		
	18SD08-01	X	X	X	X	X		X	X	pH, GS		
	18SD08-02	X	X	X	X	X		X	X	pH, GS	X	X
	18SD09-01	X	X	X	X	X		X	X	pH, GS		
	18SD09-02	X	X	X	X	X		X	X	pH, GS		
	18SD10-01	X	X	X	X	X		X	X	pH, GS		
	18SD10-02	X	X	X	X	X		X	X	pH, GS		

Notes:

[1] Total TAL inorganics includes cyanide
[2] CEC, TOC, Nitrate/Nitrite, Grain Size, and Bulk Density should be analyzed in subsurface soil just above the water table and in each aquifer encountered

CEC = Cation Exchange Capacity
GS = Grain Size
BD = Bulk Density
TDS = Total Dissolved Solids
TSS = Total Suspended Solids
BCSPM = Bromide, Chloride, Sulfate, Orthophosphorous, Dissolved Methane

TABLE 4-8

SUMMARY OF ENVIRONMENTAL AND QUALITY CONTROL SAMPLES AND ANALYTICAL PARAMETERS
SITE 18
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Sample Type	Number of Environmental Samples	Analytical Parameters	Number of Duplicates	Number of MS/MSDs	Number of Trip Blanks	Number of Rinsate Blanks
Surface Soil	6	TCL VOCs, SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics, Cyanide, TOC, Nitrate/Nitrite, pH	1	1	1	1
Subsurface Soil (soil borings)	6	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics, Cyanide, TOC, Nitrate/Nitrite, CEC(1), BD(1), GS(1), pH	1	1	1	1
Monitoring Wells - Groundwater(2)(3)	3	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics (total and dissolved), Cyanide, TOC, Nitrate/Nitrite, TDS, TSS, BCSPM	1	1	1	1
Surface Water(2)	4	TCL VOCs, SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics, Cyanide, TOC, Nitrate/Nitrite	1	1	1	1
Sediment	8	TCL VOCs, SVOCs, TCL Pest/PCBs, Nitramines, TAL Inorganics, Cyanide, TOC, Nitrate/Nitrite, pH, Grain Size	1	1	1	1

Notes:

(1) Analyzed in two soil boring locations: just above the water table and in each aquifer
(2) Field parameters including pH, specific conductivity, temperature, Eh, D.O. and turbidity will be measured in the field, as appropriate.
(3) Assumes one round of sampling of new monitoring wells.

TABLE 4-9

SUMMARY OF ANALYSES
SITE SCREENING AREA 14
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Medium	Sample ID	TCL Organics				TAL Inorganics		TOC	Nitrate/ Nitrite	Other	QA/QC Samples	
		TCL VOCs	TCL SVOCs	TCL Pesticides/ PCBs	Nitramines/ Nitroaromatics	Total[1]	Dissolved				Duplicate	MS/MSD
Surface Soil	A14SS01		X	X	X	X		X	X	pH, CEC	X	X
	A14SS02		X	X	X	X		X	X	pH, CEC		
	A14SS03		X	X	X	X				pH		
Subsurface Soil	A14SB01-XX	X	X	X	X	X		X	X	pH		
	A14SB01-YY	X	X	X	X	X		X	X	pH		
	A14SB02-XX	X	X	X	X	X		X	X	pH	X	X
	A14SB02-YY	X	X	X	X	X		X	X	pH		
	A14SB03-XX	X	X	X	X	X		X	X	pH		
	A14SB03-YY	X	X	X	X	X		X	X	GS, BD, CEC, pH[2]		
	A14SB03-ZZ							X	X	GS, BD, CEC, pH[2]		
Groundwater	A14GW01-001	X	X	X	X	X	X	X	X	TDS, TSS, BCSPM	X	X

Notes:

[1] Total TAL inorganics includes cyanide.
[2] CEC, TOC, Nitrate/Nitrite, GS, and BD should be analyzed in subsurface soil just above the water table and in each aquifer encountered.

CEC = Cation Exchange Capacity
BCPSM = Bromide, Chloride, Sulfates, Orthophosphorous, Dissolved Methane
TDS = Total Dissolved Solids
TSS = Total Suspended Solids
GS = Grain Size
BD = Bulk Density

TABLE 4-10

SUMMARY OF ENVIRONMENTAL AND QUALITY CONTROL SAMPLES AND ANALYTICAL PARAMETERS
SITE SCREENING AREA 14
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Sample Type	Number of Environmental Samples	Analytical Parameters	Number of Duplicates	Number of MS/MSDs	Number of Trip Blanks	Number of Rinsate Blanks
Surface Soil	3	TCL SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics, Cyanide, TOC, Nitrate/Nitrite, pH, CEC	1	1	0	1
Subsurface Soil (soil borings)	6	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics, TOC,Cyanide, Nitrate/Nitrite, pH, CEC(1), BD(1), GS(1)	1	1	2	2
Monitoring Wells - Groundwater(2)(3)	1	TCL VOCs, TCL SVOCs, TCL Pest/PCBs, Nitramines/Nitroaromatics, TAL Inorganics (total and dissolved), Cyanide, TOC, Nitrate/Nitrite, TDS, TSS, BCSPM	1	1	1	1

Notes:

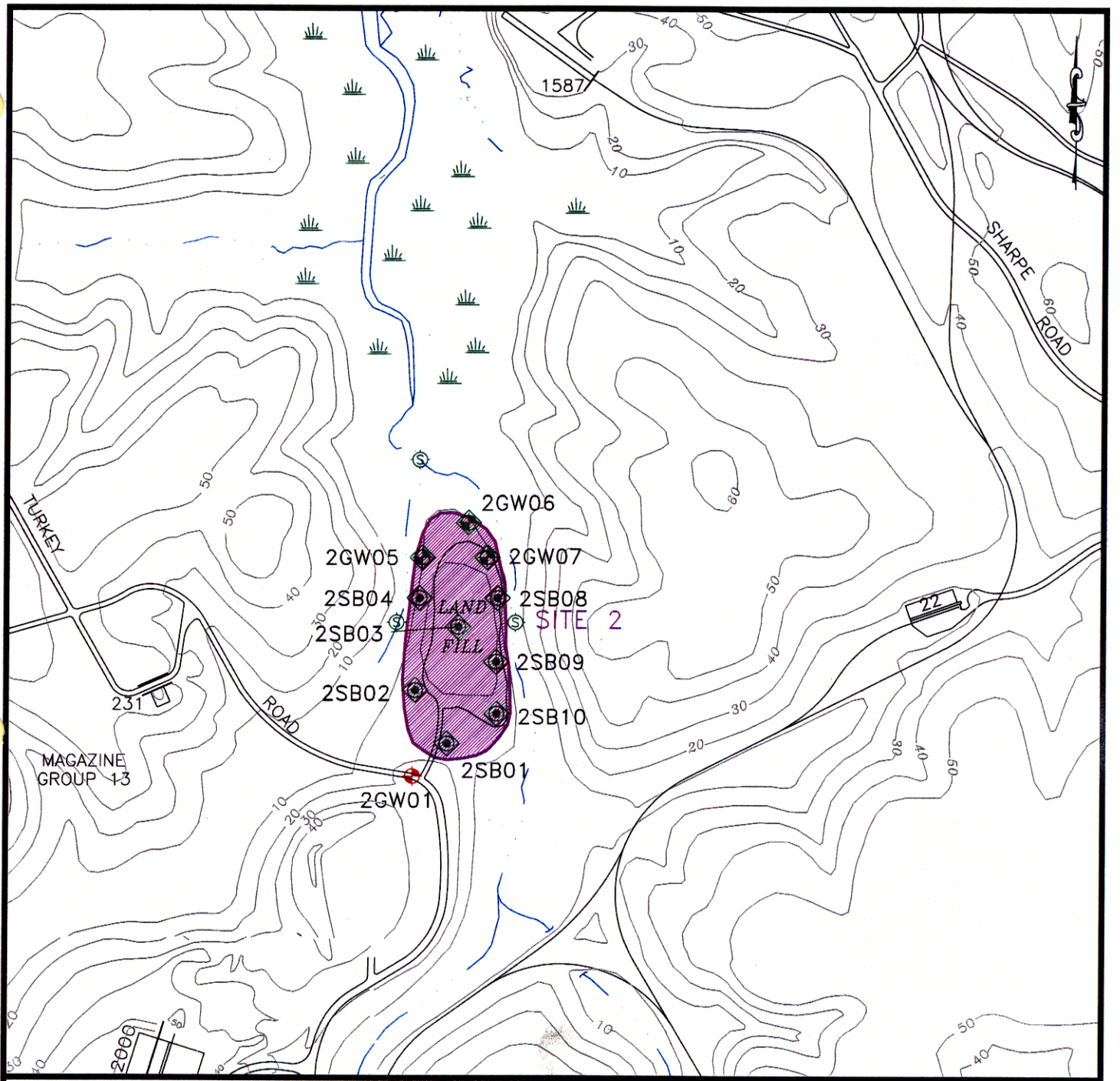
(1) Analyzed in one soil boring location: just above the water table and in each aquifer encountered.

(2) Field parameters including pH, specific conductivity, temperature, Eh, D.O., and turbidity will be measured in the field, as appropriate.

(3) Assumes one round of sampling of new monitoring well.

CEC = Cation Exchange Capacity
BD = Bulk Density
GS = Grain Size
BCPSM = Bromide, Chloride, Sulfates, Orthophosphorous, Dissolved Methane
TDS = Total Dissolved Solids
TSS = Total Suspended Solids

SECTION 4.0 FIGURES



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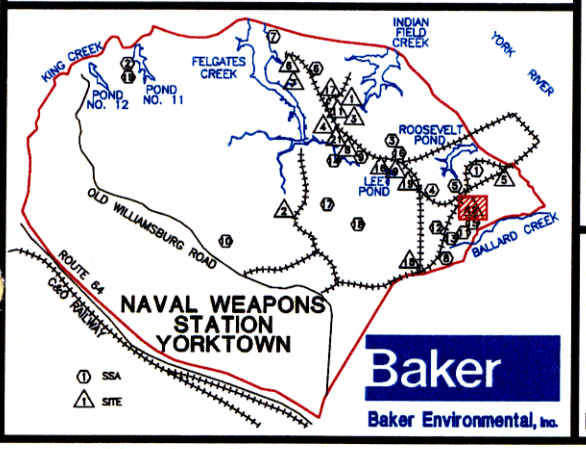
1 inch = 400 ft.



BOUNDARY
DRAINAGE
EDGE OF PAVEMENT
MARSH
RAILROAD
FENCE
STRUCTURE
REMEDIAL INVESTIGATION SITE

2GW01 EXISTING MONITORING WELL LOCATION

PROPOSED SOIL BORING/ MONITORING WELL LOCATION

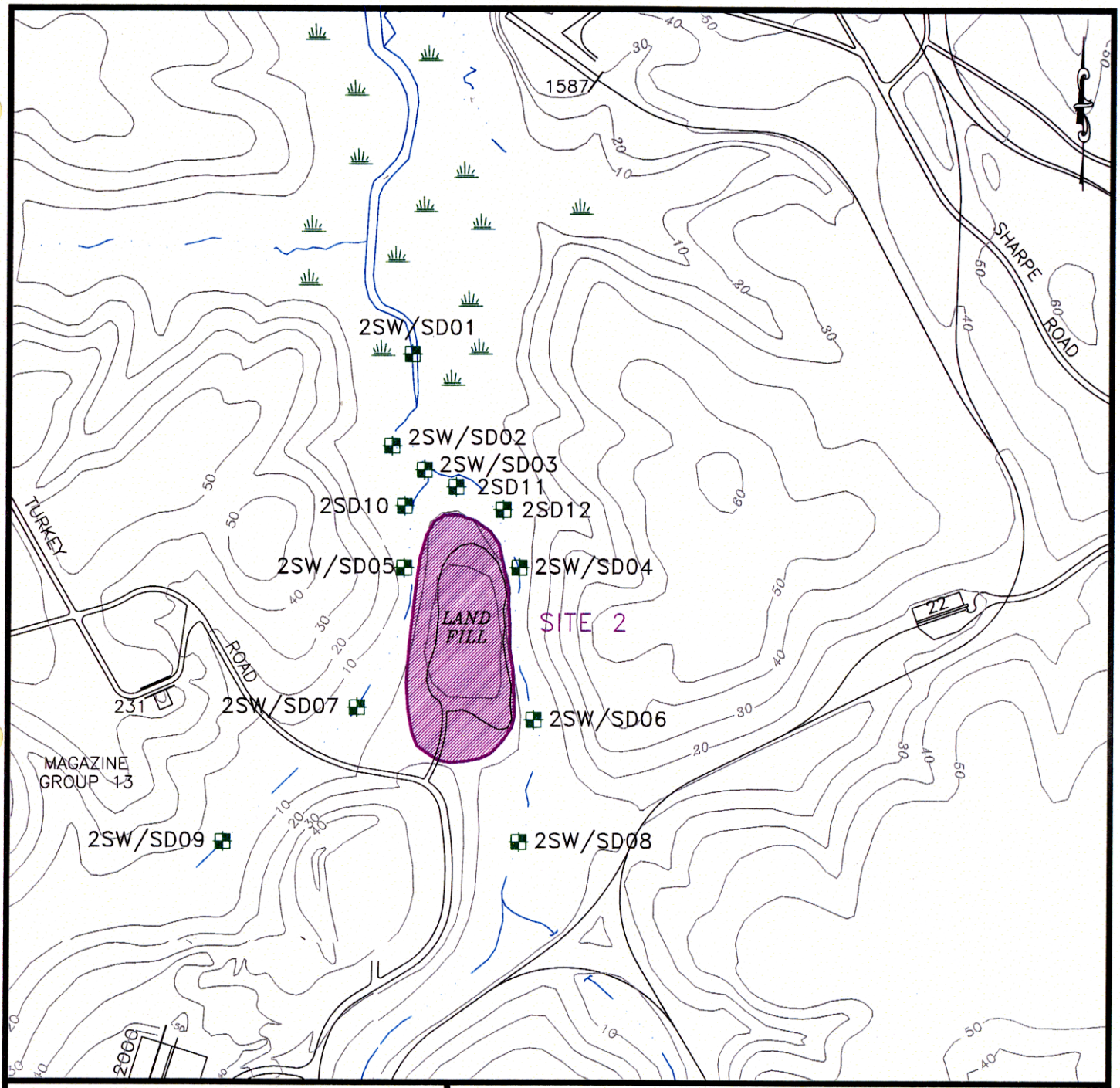
PROPOSED SOIL BORING LOCATION

PROPOSED STAFF GAUGE LOCATION

383514WP

FIGURE 4-1
PROPOSED SOIL BORING AND MONITORING WELL LOCATIONS
SITE 2

NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA



400 0 200 400

1 inch = 400 ft.

BOUNDARY
DRAINAGE
EDGE OF PAVEMENT
MARSH
RAILROAD
FENCE
STRUCTURE
REMEDIAL INVESTIGATION SITE

2SW/SD08 PROPOSED SURFACE WATER/SEDIMENT/ BIOTA SAMPLE LOCATIONS

363515WP

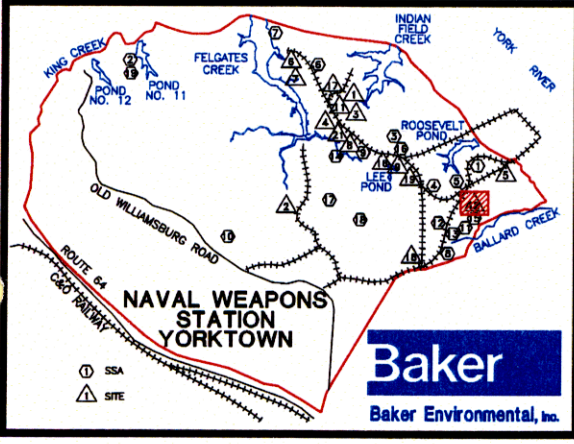
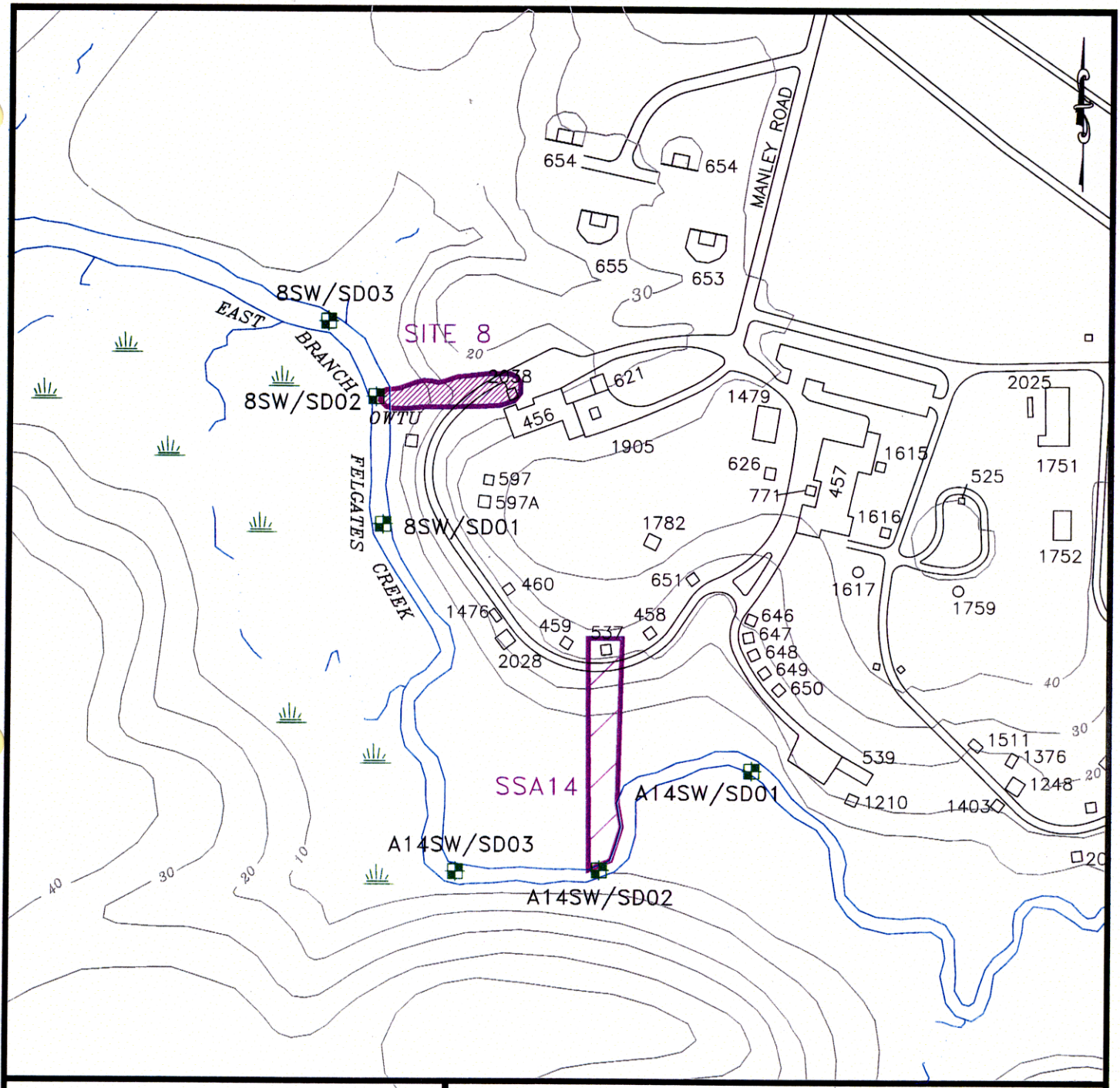


FIGURE 4-2
PROPOSED SURFACE WATER/SEDIMENT/ BIOTA SAMPLE LOCATIONS SITE 2

NAVAL WEAPONS STATION YORKTOWN — YORKTOWN, VIRGINIA

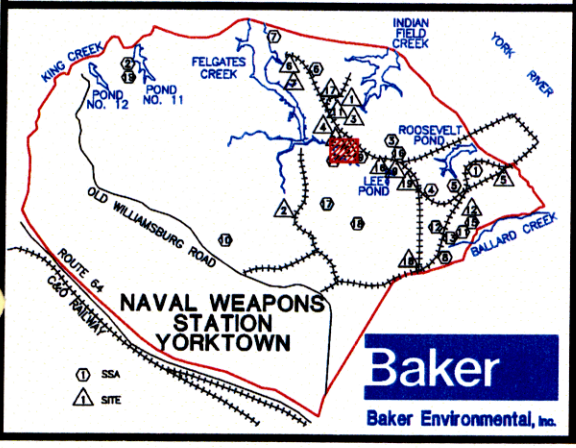


250 0 125 250

1 inch = 250 ft.

BOUNDARY
DRAINAGE
EDGE OF PAVEMENT
MARSH
RAILROAD
FENCE
STRUCTURE
REMEDIAL INVESTIGATION SITE

8SW/SD02 PROPOSED SURFACE WATER/SEDIMENT/ BIOTA SAMPLE LOCATION



Baker

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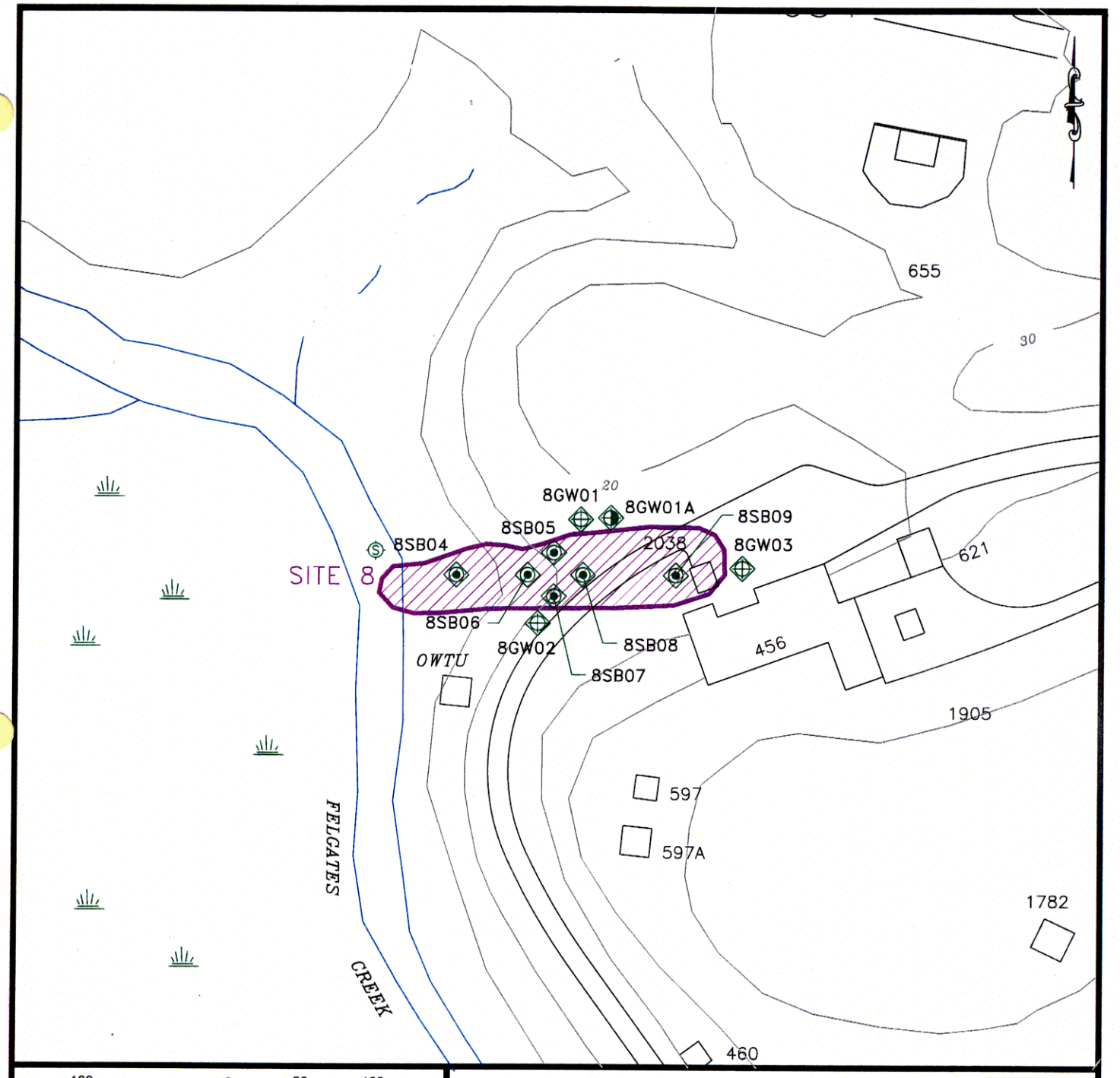
363516WP

FIGURE 4-3
PROPOSED SURFACE WATER/SEDIMENT/ BIOTA SAMPLE LOCATIONS EAST BRANCH FELGATES CREEK

NAVAL WEAPONS STATION YORKTOWN

YORKTOWN, VIRGINIA



100 0 50 100

1 inch = 100 ft.

BOUNDARY
DRAINAGE
EDGE OF PAVEMENT
MARSH
RAILROAD
FENCE
STRUCTURE
REMEDIAL INVESTIGATION SITE

PROPOSED SOIL BORING LOCATION (INCLUDES SURFACE SOIL SAMPLE)

PROPOSED SOIL BORING/ SHALLOW MONITORING WELL LOCATION

PROPOSED DEEP MONITORING WELL LOCATION

PROPOSED STAFF GAUGE LOCATION

383517WP

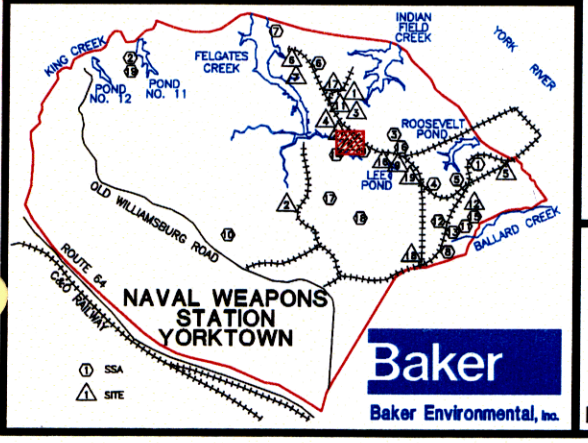


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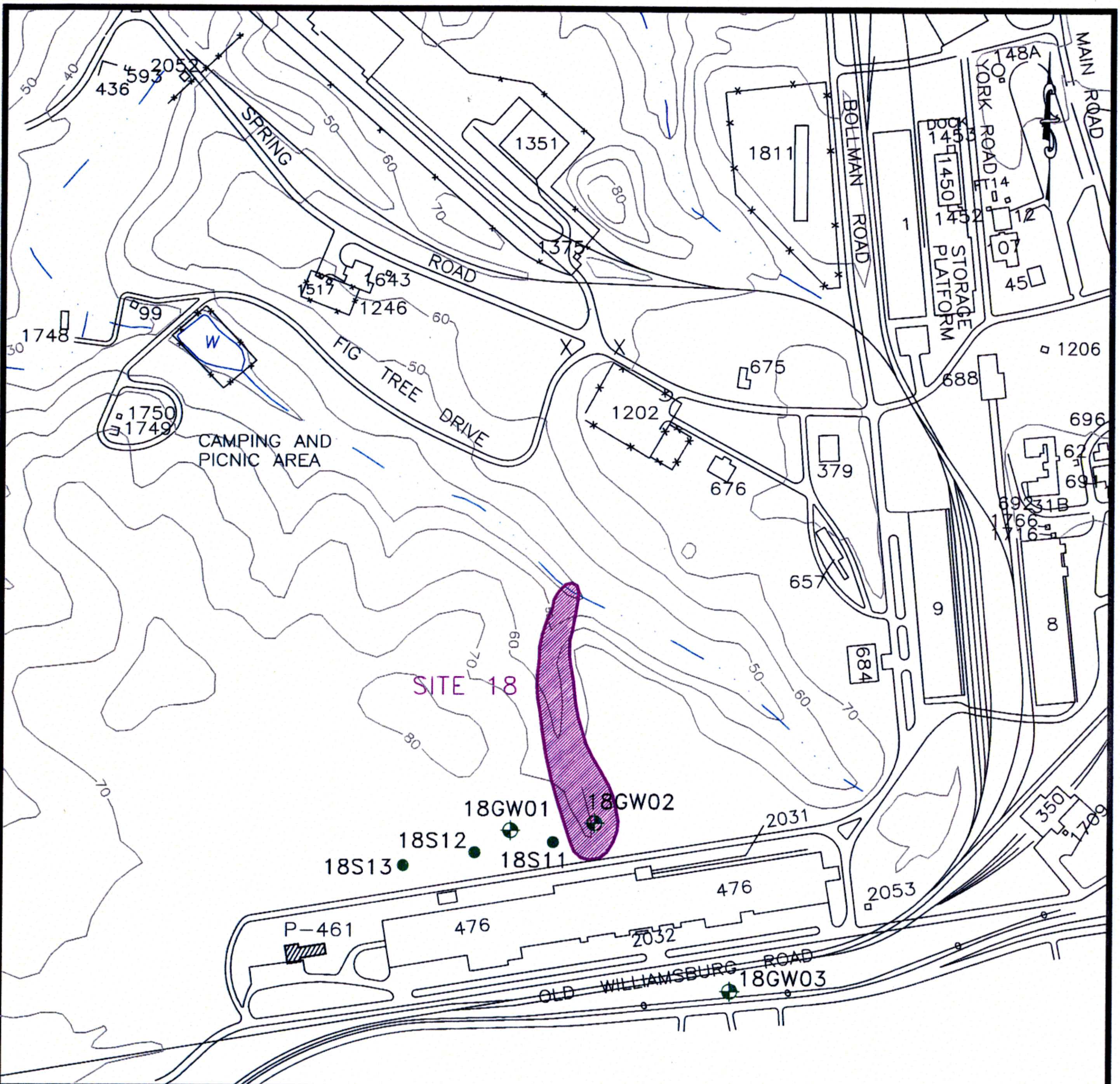
FIGURE 4-4
PROPOSED SOIL BORING AND MONITORING WELL LOCATIONS
SITE 8

NAVAL WEAPONS STATION YORKTOWN

YORKTOWN, VIRGINIA



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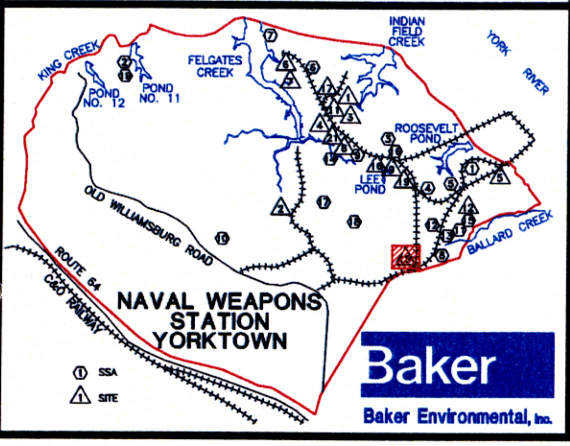

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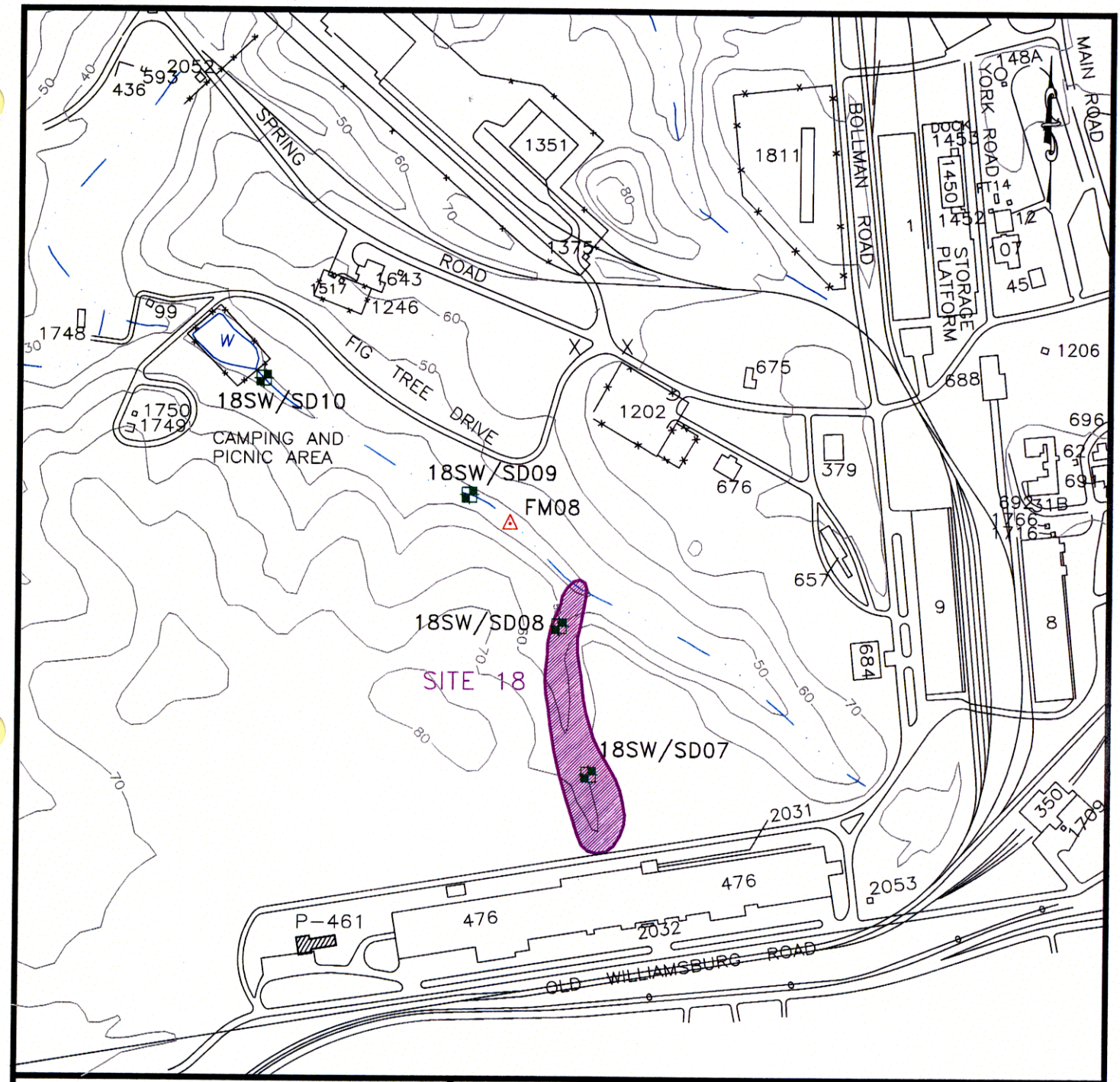
(red line)	BOUNDARY
(blue line)	DRAINAGE
(black line)	EDGE OF PAVEMENT
(symbol)	MARSH
(symbol)	RAILROAD
(symbol)	FENCE
(symbol)	STRUCTURE
(purple shape)	REMEDIAL INVESTIGATION SITE
18S09 ●	PROPOSED SURFACE SOIL SAMPLE LOCATION
18GW01 ⊕	PROPOSED MONITORING WELL LOCATION

383519WP

FIGURE 4-5
PROPOSED SOIL AND GROUNDWATER SAMPLING LOCATIONS
SITE 18

NAVAL WEAPONS STATION YORKTOWN — YORKTOWN, VIRGINIA



400 0 200 400
1 inch = 400 ft.

BOUNDARY
DRAINAGE
EDGE OF PAVEMENT
MARSH
RAILROAD
FENCE
STRUCTURE
REMEDIAL INVESTIGATION SITE

18SW/SD02 PROPOSED SURFACE WATER/ SEDIMENT SAMPLING LOCATION
FM08 STREAM FLOW MEASUREMENT STATION

363520WP

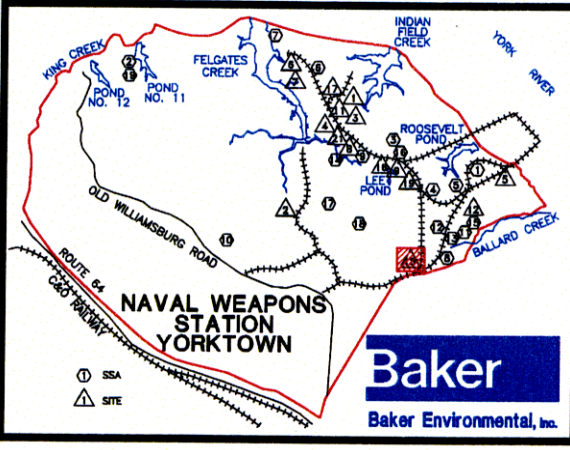


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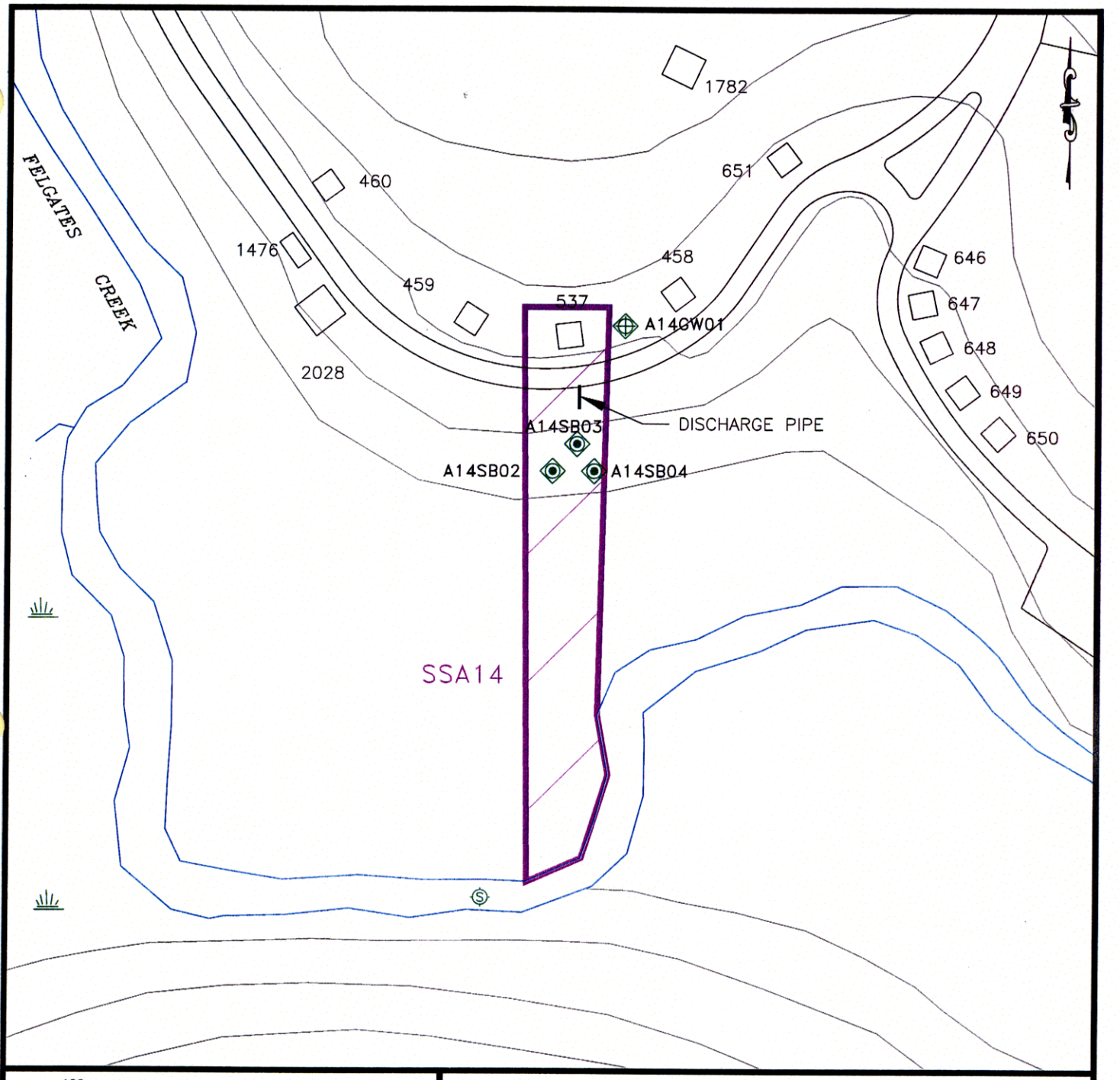
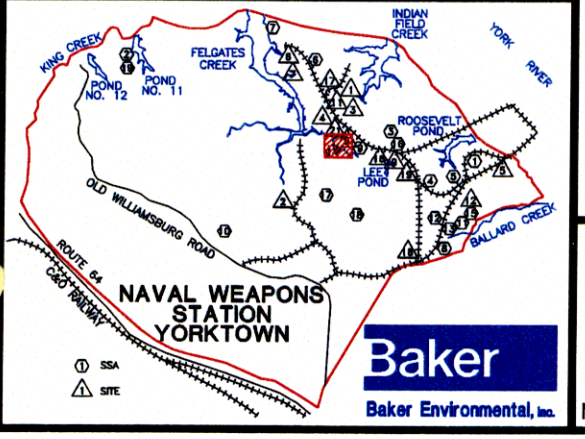
FIGURE 4-6
PROPOSED SURFACE WATER AND SEDIMENT SAMPLING LOCATIONS
SITE 18

NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA



100 0 50 100
1 inch = 100 ft.



Baker
Baker Environmental, Inc.

BOUNDARY
DRAINAGE
EDGE OF PAVEMENT
MARSH
RAILROAD
FENCE
STRUCTURE
REMEDIAL INVESTIGATION SITE

PROPOSED SOIL BORING LOCATION (INCLUDES SURFACE SOIL SAMPLE)
PROPOSED SHALLOW MONITORING WELL LOCATION
PROPOSED STAFF GAUGE LOCATION

363518WP

FIGURE 4-7
PROPOSED SOIL BORING AND MONITORING WELL LOCATIONS
SSA 14

NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

5.0 PROJECT MANAGEMENT AND STAFFING

Project management tasks for the work to be completed at Sites 2, 8, 18, and SSA 14 will consist of activities such as daily technical support and oversight, budget and schedule review and tracking, preparation and review of invoices, personnel resources planning and allocation, and project-specific coordination with LANTDIV, the Station, and subcontractors. The Project Manager will be the primary point of contact for personnel performing field activities. In addition, the Project Manager will keep in close contact with the WPNSTA Environmental Engineer to help ensure that project-specific information is disseminated among the WPNSTA project team.

The Project Manager will keep the Baker WPNSTA Yorktown Activity Coordinator informed as to project progress, issues raised/resolved, and other matters pertinent to completion of the project. The Activity Coordinator, in turn, will maintain close contact with the LANTDIV Navy Technical Representative (NTR) and the WPNSTA Yorktown Environmental Engineer. The NTR also will keep the USEPA Remedial Project Manager and VDEQ Federal Facilities Project Officer informed of project progress and discuss with them any issues which need to be resolved with respect to the RI/FS activities at WPNSTA Yorktown.

The proposed management and staffing is depicted in Figure 5-1. The primary participants for the project include:

WPNSTA Yorktown

- Mr. Jeffrey Harlow, Environmental Engineer

LANTDIV

- Mr. Richard N. Stryker, Navy Technical Representative

USEPA Region III

- Mr. Robert Thomson, P.E., Remedial Project Manager

VDEQ

- Mr. Stephen Mihalko, Federal Facilities Project Officer

Baker Environmental, Inc.

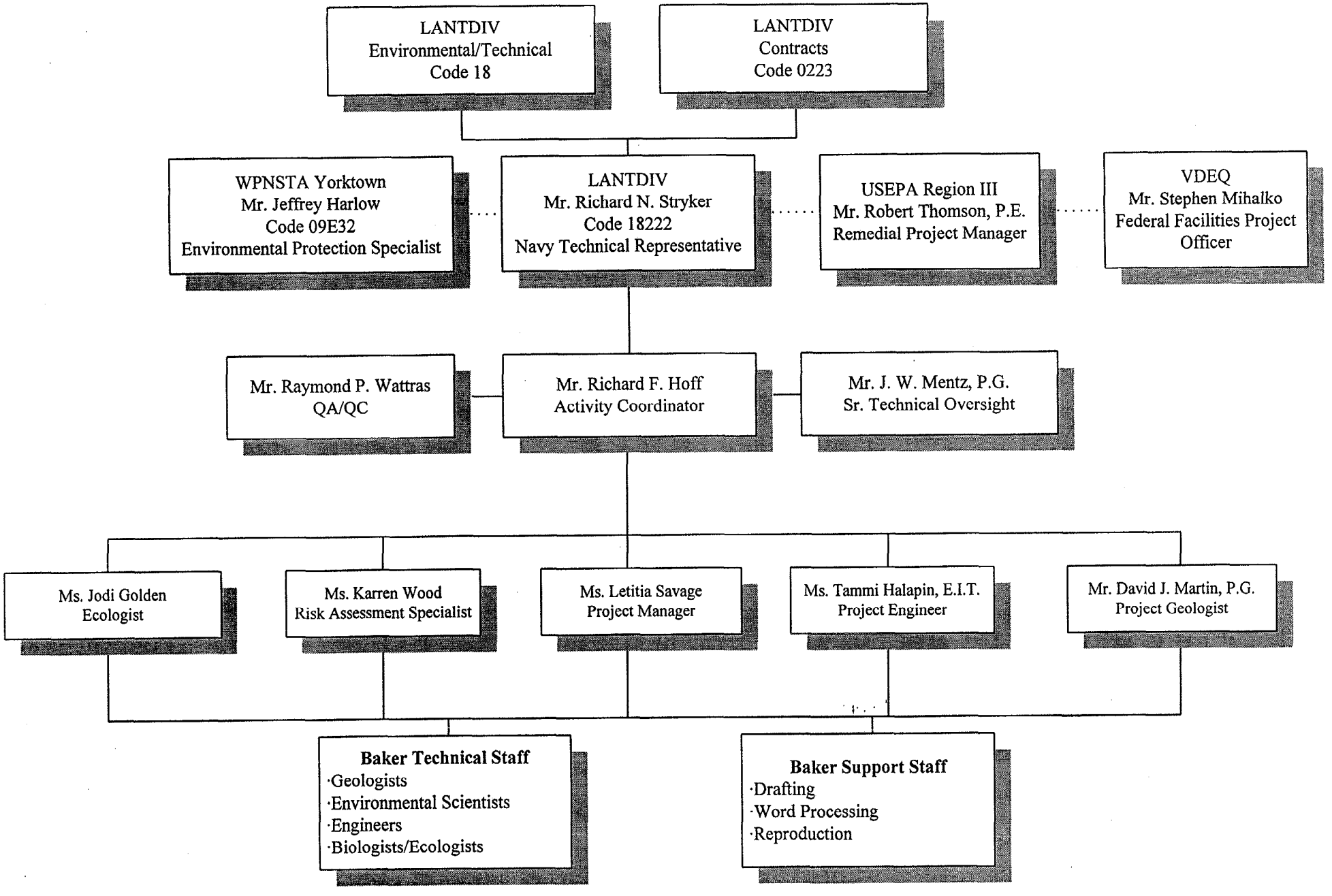
- Mr. Richard Hoff, Activity Coordinator
- Mr. Raymond Wattras, Quality Assurance Officer
- Mr. John Mentz, Senior Technical Advisor
- Ms. Letitia Savage, Project Manager
- Ms. Jodi Golden, Ecologist
- Ms. Karren Wood, Risk Assessment Specialist
- Ms. Tammi Halapin, Project Engineer
- Mr. David Martin, Project Geologist
- Mr. Kenneth Tua, Site Manager

Other team members will be added for tasks such as field activities, data compilation and interpretation, risk assessment analysis, and evaluation of remedial alternatives. These other team members will report to the Project Manager.

SECTION 5.0 FIGURES

FIGURE 5-1

PROJECT ORGANIZATION



6.0 SCHEDULE

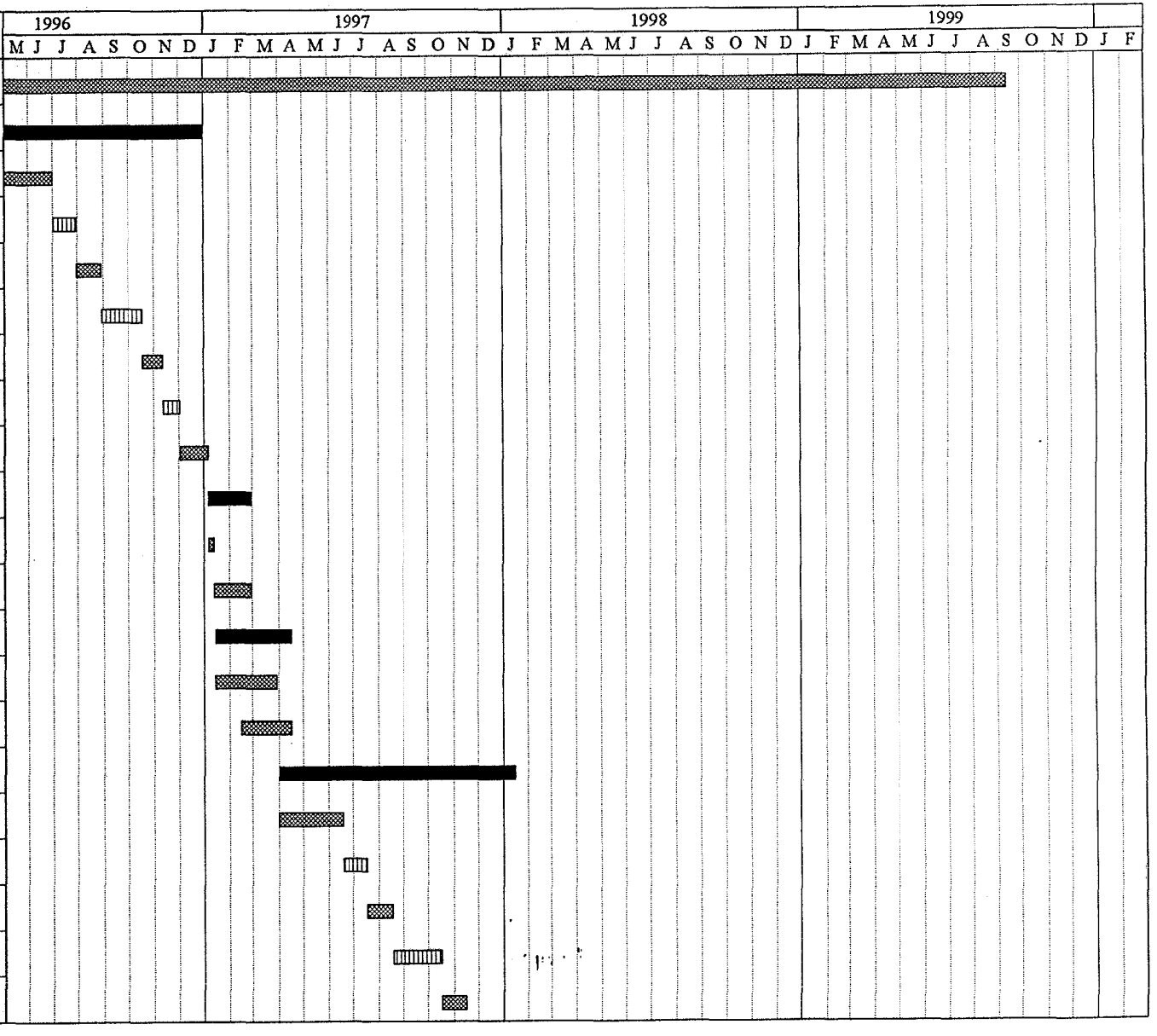
The schedule for completion of the planned activities at Sites 2, 8, 18, and SSA 14 is shown in Figure 6-1. This schedule provides dates and durations for finalization of the Site-Specific Work Plan, of field activities, and data analysis and validation. Figure 6-1 also provides a schedule for completion of the Remedial Investigation Report, Feasibility Study, Proposed Plan, and Record of Decision at Sites 2, 8, 18, and SSA 14.

SECTION 6.0 FIGURES

Figure 6 - 1

FY 1996: Sites 2, 8, 18 and SSA 14 Work Plan/Field Investigation/RI Report/FS Report/PRAP/ROD
Naval Weapons Station Yorktown, Yorktown, Virginia

Task	Days	Start	Finish
SITES 2, 8, 18 and SSA 14	1231ed	5/1/96	9/14/99
WORK PLAN	**244ed**	**5/1/96**	**12/31/96**
Preliminary Draft	61ed	5/1/96	7/1/96
Review (Navy)	30ed	7/1/96	7/31/96
Draft	30ed	7/31/96	8/30/96
Review (EPA/State)	49ed	8/30/96	10/18/96
Draft Final	25ed	10/18/96	11/12/96
Review (EPA/State)	20ed	11/12/96	12/2/96
Final	35ed	12/2/96	1/6/97
RI FIELD INVESTIGATION	**53ed**	**1/6/97**	**2/28/97**
Mobilization	7ed	1/6/97	1/13/97
Field Investigation	46ed	1/13/97	2/28/97
SAMPLE ANALYSIS/VALIDATION	**92ed**	**1/14/97**	**4/16/97**
Sample Analysis	75ed	1/14/97	3/30/97
Data Validation	60ed	2/15/97	4/16/97
REMEDIAL INVESTIGATION REPORT	**290ed**	**4/1/97**	**1/16/98**
Preliminary Draft	78ed	4/1/97	6/18/97
Review (Navy)	30ed	6/18/97	7/18/97
Draft	31ed	7/18/97	8/18/97
Review (EPA/State)	60ed	8/18/97	10/17/97
Draft Final	31ed	10/17/97	11/17/97

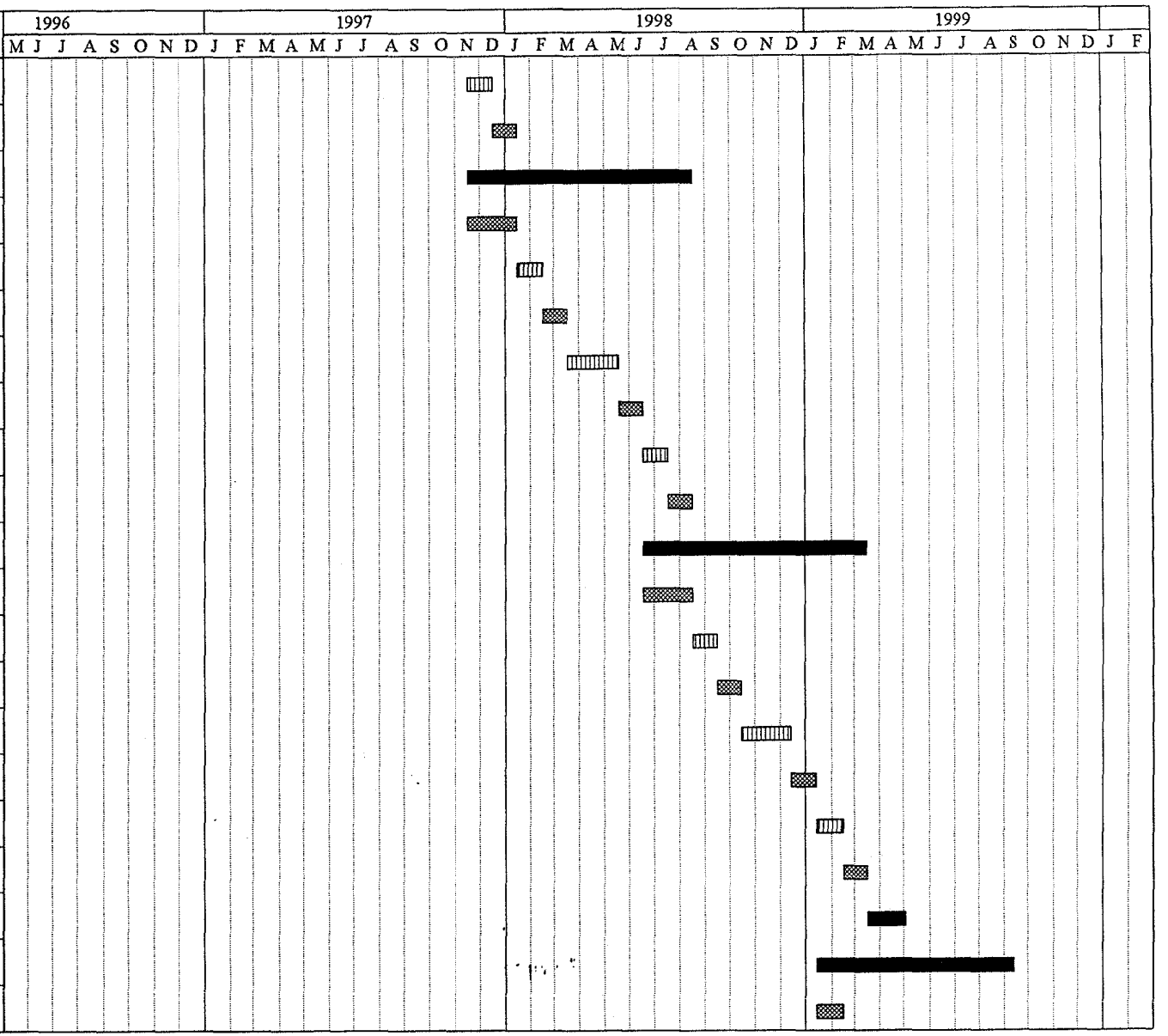


Note: Public Comment Period will close prior to finalization of the Record of Decision.

Figure 6 - 1

FY 1996: Sites 2, 8, 18 and SSA 14 Work Plan/Field Investigation/RI Report/FS Report/PRAP/ROD
Naval Weapons Station Yorktown, Yorktown, Virginia

Task	Days	Start	Finish
Review (EPA/State)	30ed	11/17/97	12/17/97
Final	30ed	12/17/97	1/16/98
FEASIBILITY STUDY	**273ed**	**11/17/97**	**8/17/98**
Preliminary Draft	60ed	11/17/97	1/16/98
Review (Navy)	31ed	1/16/98	2/16/98
Draft	30ed	2/16/98	3/18/98
Review (EPA/State)	61ed	3/18/98	5/18/98
Draft Final	30ed	5/18/98	6/17/98
Review (EPA/State)	30ed	6/17/98	7/17/98
Final	31ed	7/17/98	8/17/98
PROPOSED PLAN	**273ed**	**6/17/98**	**3/17/99**
Preliminary Draft	61ed	6/17/98	8/17/98
Review (Navy)	30ed	8/17/98	9/16/98
Draft	30ed	9/16/98	10/16/98
Review (EPA/State)	60ed	10/16/98	12/15/98
Draft Final	30ed	12/15/98	1/14/99
Review (EPA/State)	32ed	1/14/99	2/15/99
Final	30ed	2/15/99	3/17/99
PUBLIC COMMENT PERIOD	**47ed**	**3/17/99**	**5/3/99**
RECORD OF DECISION	**243ed**	**1/14/99**	**9/14/99**
Preliminary Draft	32ed	1/14/99	2/15/99

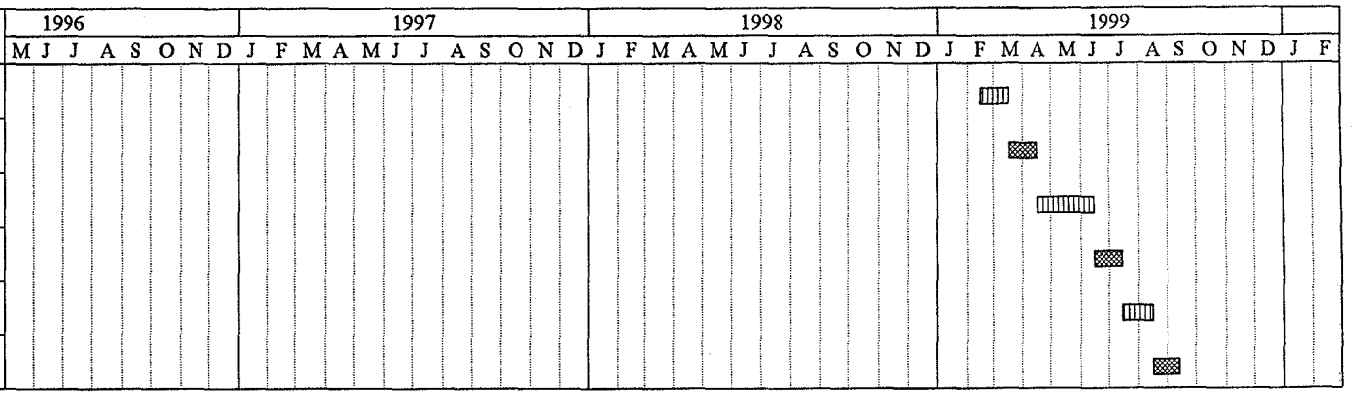


Note: Public Comment Period will close prior to finalization of the Record of Decision.

Figure 6 - 1

FY 1996: Sites 2, 8, 18 and SSA 14 Work Plan/Field Investigation/RI Report/FS Report/PRAP/ROD
Naval Weapons Station Yorktown, Yorktown, Virginia

Task	Days	Start	Finish
Review (Navy)	30ed	2/15/99	3/17/99
Draft	30ed	3/17/99	4/16/99
Review (EPA/State)	60ed	4/16/99	6/15/99
Draft Final	30ed	6/15/99	7/15/99
Review (EPA/State)	32ed	7/15/99	8/16/99
Final	29ed	8/16/99	9/14/99



Note: Public Comment Period will close prior to finalization of the Record of Decision.

APPENDIX A
USEPA GUIDE TO MANAGEMENT OF INVESTIGATION-DERIVED WASTES

United States Environmental Protection Agency

Office of Solid Waste and Emergency Response

Publication: 9345.3-03FS
April 1992

EPA

Guide to Management of Investigation-Derived Wastes

Office of Emergency and Remedial Response
Hazardous Site Control Division OS-220W

Quick Reference Fact Sheet

CERCLA field investigation activities (e.g., remedial investigation/feasibility studies and remedial designs) may result in the generation of waste materials that may pose a risk to human health and the environment. These investigation-derived wastes (IDW) may include drilling muds, cuttings, and purge water from test pit and well installation; purge water, soil, and other materials from collection of samples; residues (e.g., ash, spent carbon, well development purge water) from testing of treatment technologies and pump and treat systems; contaminated personal protective equipment (PPE); and solutions (aqueous or otherwise) used to decontaminate non-disposable protective clothing and equipment. The management of IDW must ensure protection of human health and the environment and comply with (or waive) regulatory requirements that are applicable or relevant and appropriate requirements (ARAR). **This fact sheet presents an overview of possible IDW management options, discusses the protectiveness requirements and ARARs associated with these options, and outlines general objectives established for IDW management under Superfund.[1]**

The general options for managing IDW (see Highlight 1) are collection and either (1) immediate disposal or (2) some type of interim management. Interim management may include storage or other temporary measures. As discussed below, the specific option selected will depend on the type of waste produced, its relative threat to human health and the environment, and other site-specific conditions.

IDW MANAGEMENT REQUIREMENTS

When managing IDW, site managers are required to choose an option that: (1) is protective of human health and the environment and (2) complies with (or waives) ARARs, as described below.

Protectiveness

In determining if a particular management/disposal option is protective, site managers should consider the following:

- The contaminants, their concentrations, and total volume of IDW;
- Media potentially affected (e.g., ground water, soil) under management options;
- Location of the nearest population(s) and the likelihood and/or degree of site access;
- Potential exposures to workers; and
- Potential for environmental impacts.

As a general rule, it will be necessary to use best professional judgment, in light of the site-specific conditions, to determine whether an option is protective of human health and the environment. For example, a site manager may determine that storing IDW temporarily until the final action or returning IDW to its source is protective, based on knowledge that the material poses low risk and/or that the final action will address any risks posed by the wastes and there will be no unacceptable risks in the interim.

Alternatively, if the site includes or is near residential areas, the site is unsecured, and/or contaminants appear to be present at unacceptable levels, it may not be protective to return excavated soil to the source. Storing IDW in containers in an on-site, secure location, or sending it off site immediately may be more appropriate.

Site managers also need to consider the potential effects of IDW management-related activities on environmental media. For example, pouring contaminated purge water on the ground around a well may not be prudent, because such an action could mobilize any hazardous constituents present in the soil or introduce contaminants into clean soil.

Compliance with ARARs

Remedial Investigation/Feasibility Study (RI/FS) and Remedial Design (RD) actions must comply with ARARs "to the extent practicable, considering the exigencies of the situation" (NCP, 55 FR 8756, emphasis added); therefore, it generally will not be necessary to obtain a waiver if an ARAR cannot be attained during these actions. If a site manager determines that, based on site-

[1] Management of treatability study and treatment pilot wastes is discussed in Guide for Conducting Treatability Studies Under CERCLA, Interim Final, December 1989, EPA/540/2-89/058. Information on management of IDW generated during Preliminary Assessments and Site Investigations is provided in Management of Investigation-Derived Waste During Site Investigations, May 1990, EPA/540/G-91/009.

Highlight 1: IDW MANAGEMENT OPTIONS

Type of IDW	Generation Processes*	Management Options
Soil	• Well/test pit installation • Borehole drilling • Soil sampling	• Return to boring, pit, or source immediately after generation • Spread around boring, pit, or source within the AOC+ • Consolidate in a pit (within the AOC) • Send to on-site TDU+ • Send to TDU off site immediately • Store for future treatment and/or disposal
Sludges/sediment	• Sludge pit/sediment sampling	• Return to boring, pit, or source immediately after generation • Send to on-site TDU • Send to TDU off site immediately • Store for future treatment and/or disposal
Aqueous liquids (ground water, surface water, drilling fluids, other wastewaters)	• Well installation/development • Well purging during sampling • Ground water discharge during pump tests • Surface water sampling	• Discharge to surface water • Pour onto ground close to well (non-hazardous waste) • Send to on-site TDU • Send to off-site commercial treatment unit • Send to POTW+ • Store for future treatment and/or disposal
Decontamination fluids	• Decontamination of PPE+ and equipment	• Send to on-site TDU • Evaporate (for small amounts of low contamination organic fluids) • Send to TDU off site immediately • Store for future treatment and/or disposal
Disposable PPE	• Sampling procedures or other on-site activities	• Send to on-site TDU • Place in on-site industrial dumpster • Send to TDU off site immediately • Store for future treatment and/or disposal

* The generation processes listed here are provided as examples. IDW may also be produced as a result of activities not listed here.

\+ AOC: Area of Contamination (AOCs at a site may not yet have been identified at the time of the RI/FS); TDU: Treatment/disposal Unit; POTW: Publicly Owned Treatment Works; PPE: Personal Protective Equipment

specific factors, compliance with an ARAR is practicable but an ARAR waiver is warranted for an RI/FS or RD action, an interim action waiver may be available if the final remedy will attain the ARAR. An action memorandum should be prepared for the waiver, the state given an opportunity to comment, and the decision document placed in the administrative record.

Potential ARARs for IDW at CERCLA sites include regulations under the Resource Conservation and Recovery Act (RCRA) (including both Federal and State underground injection control (UIC) regulations), the Clean Water Act (CWA), the Clean Air Act (CAA), the Toxic Substances Control Act (TSCA), and other State environmental laws. How these various requirements may direct or influence IDW management decisions is described below.

Resource Conservation and Recovery Act (RCRA). Certain sections of the RCRA Subtitle C hazardous waste regulations (e.g., land disposal restrictions and storage restrictions) may be ARARs for IDW should RCRA hazardous waste be identified at a site. (Note that RCRA may be relevant and appropriate even if the IDW is not a RCRA hazardous waste.) A waste is hazardous under RCRA if it is listed as such in 40 CFR 261.31 - 261.33 or if it exhibits one of four characteristics: ignitability, corrosivity, reactivity, or toxicity.

Site managers should not assume that a waste considered to pose a potential risk at a CERCLA site is a listed or characteristic RCRA hazardous waste. **Until there is positive evidence (records, test results, other knowledge of waste properties) that the IDW is a RCRA hazardous waste, site managers should manage it in a protective manner (but not necessarily in accordance with Subtitle C requirements).** Business records or facility processes should be examined to determine whether RCRA listed wastes were generated and are present in the IDW. For characteristic wastes, site managers should rely on testing results or on knowledge of the material's properties. If best professional judgment and available information indicate that, for protectiveness reasons (or because RCRA requirements are relevant and appropriate), IDW is best managed as a "hazardous waste," management in accordance with Subtitle C requirements is prudent, regardless of whether it is known to be a RCRA waste.

If aqueous liquid IDW is considered a RCRA hazardous waste, the site manager should determine whether the Domestic Sewage Exclusion (DSE) applies to the discharge of that IDW to a POTW. The RCRA DSE exempts domestic sewage and any mixture of domestic sewage and other wastes that passes through a sewer system to a POTW for treatment from classification as a solid waste and, therefore, as a RCRA hazardous waste (40 CFR 261.4).

- Land Disposal Restrictions

If IDW is determined to be a RCRA hazardous waste and subject to the land disposal restrictions (LDRs), "land disposal" of the IDW will be prohibited unless specified treatment standards are met (see Superfund LDR Guides #5 and #7, Determining When LDRs Are Applicable to CERCLA Response Actions and Determining When LDRs Are Relevant and Appropriate to CERCLA Response Actions, OSWER Directive 9347.3-05FS and 9347.3-08FS, June 1989 and December 1989 and the NCP, 55 FR 8759, March 8, 1990). "Land disposal" occurs when wastes from different AOCs are consolidated into one AOC; when wastes are moved outside an AOC (for treatment or storage) and returned to the same or a different AOC; or when wastes are excavated, placed in a separate hazardous waste management unit such as an incinerator or tank within the AOC, and then redeposited into the AOC.

Storing IDW in a container ("a portable device in which a material is stored, transported, treated, disposed of, or otherwise handled" (40 CFR 260.10)) within the AOC and then returning it to its source, however, is allowable without meeting the specified LDR treatment standards. Under the definition of "hazardous waste management unit" (40 CFR 260.10), EPA states that "a container alone does not constitute a unit; the unit includes the containers and the land or pad upon which they are placed." Therefore, returning IDW that has been stored in containers (not tanks or other RCRA-regulated units) within the AOC to its source does not constitute land disposal, as long as containers are not managed in such a manner as to constitute a RCRA storage unit as defined in 40 CFR 260.10. In addition, sampling and direct replacement of wastes within an AOC do not constitute land disposal.

- Storage

Subtitle C outlines the storage requirements for RCRA hazardous wastes. Under RCRA, "storage" is defined as "the holding of hazardous waste for a temporary period, at the end of which the hazardous waste is treated, disposed of, or stored elsewhere" (40 CFR 260.10).

On-site Superfund actions are only required to comply with the substantive standards of other laws (see 40 CFR 300.5, definitions of applicable or relevant and appropriate requirements). Superfund sites are also exempt from permit requirements under CERCLA §121(e). Therefore, site managers are not required to comply with administrative requirements triggered by RCRA storage deadlines (e.g., contingency planning, inspections, recordkeeping). Generally equivalent administrative activities are undertaken at Superfund sites, however, under existing Superfund management practices.

Site managers storing known RCRA hazardous waste must comply with the substantive, technical requirements of 40 CFR Parts 264 and 265 Subparts I (containers), J (tanks), and L (waste piles), to the extent practicable. (See Highlight 2 for a summary of these technical requirements for each type of unit). In addition, the ground-water monitoring requirements of 40 CFR Parts 264 and 265 Subpart F are potential ARARs, and to the extent they are determined to be ARARs at a site, they should be attained to the extent practicable (or waived). (In many cases, ground-water monitoring conducted during the RI/FS will provide protection equivalent to the Subpart F requirements.)

[NOTE: Under the LDRs, restricted RCRA hazardous waste may not be stored at a site unless the storage is solely for the purpose of accumulating sufficient quantities of the waste to facilitate proper disposal, treatment, or recovery (see 40 CFR 268.50). Generally, storing IDW until a final disposal option is

Highlight 2:
EXAMPLES OF RCRA TECHNICAL STORAGE REQUIREMENTS*

RCRA storage requirements, applicable to both less-than-90-days generators and permitted or interim status storage facilities, may include the following substantive requirements:

Containers 40 CFR 264 Subpart I and 265 Subpart I

- Containers must be in good condition
- Wastes must be compatible with container
- Container must be closed during storage
- Container storage areas must have a containment system that can contain 10 percent of the volume of containers or of the largest container
- Spilled or leaked waste must be removed from the collection area as necessary to prevent overflow

Tanks 40 CFR 264 Subpart J and 265 Subpart J

- Tanks must have a secondary containment system that includes a liner, a vault, a double-walled tank, or an equivalent device (applies only to certain tanks)

Waste Piles 40 CFR 264 Subpart L and 265 Subpart L

- Waste piles must have a liner and a leachate collection and removal system
- Owners/operators must have a run-on control system to prevent flow onto the active portion of the pile during peak discharge from at least a 25-year storm
- Owners/operators must have a run-off management system to collect and control at least the water volume resulting from a 24-hour, 25-year storm

* This is a partial list of substantive requirements. For more detail, see 40 CFR Part 264 and 265.

selected in a Record of Decision (ROD) and implemented during the remedial action is allowable storage under the RCRA LDR storage prohibition.]

- Recordkeeping and Manifesting

If hazardous wastes are sent off site, the site manager must comply with both administrative and substantive elements of the RCRA generator requirements of 40 CFR Part 262 and LDR notification and certification requirements of Part 268. (For example, a site manager must prepare an LDR notification and certification when restricted wastes are sent off site to a land disposal facility.) These standards include requirements such as manifests for shipping waste that list all hazardous waste listings and characteristics applicable to the waste (see 40 CFR 262.11), packaging and transport requirements, and recordkeeping requirements.

If the LDRs are applicable, the following information should be collected and available before the removal of wastes to an off-site disposal facility: EPA hazardous waste number, LDR treatment standards, manifest number for the waste shipment, and waste analysis data.

- Underground Injection Control (UIC) Program

Under the UIC regulations, RCRA hazardous wastes may be injected into Class I permitted wells. In some cases, hazardous liquids, such as extracted ground water from pump and treat operations, may be injected into a Class IV UIC well. For example, ground water contaminated with RCRA hazardous wastes may be injected into Class IV permitted wells if it is part of a CERCLA response action or a RCRA corrective action and if it has been treated to "substantially reduce hazardous constituents prior to such injection..." (RCRA § 3020(b)). (See Applicability of Land Disposal Restrictions to RCRA and CERCLA Ground Water Treatment Reinjection, OSWER Directive #9234.1-06, December 1989.)

- Non-RCRA Hazardous Wastes.

Some non-RCRA hazardous waste may be subject to management requirements under Subtitle D of RCRA as solid wastes. Subtitle D regulates disposal of solid waste in facilities such as municipal landfills. Therefore, non-RCRA hazardous IDW, such as decontaminated PPE or equipment, may need to be disposed of in a Subtitle D facility (depending on State requirements).

Clean Water Act (CWA). Discharges of aqueous IDW to surface water and publicly owned treatment works (POTWs) may be required to comply with CWA Federal, State, and local requirements. Requirements to be met may include water quality criteria, pre-treatment standards, State water quality standards, and NPDES permit conditions. Direct discharges to on-site waters are subject only to substantive requirements, while discharges to POTWs and other off-site discharges must comply with both substantive and administrative CWA requirements (including permitting requirements). (See Guide to Discharging CERCLA Aqueous Wastes to POTWs, June 1991 and CERCLA Compliance with the CWA and SDWA, #9234.2-06FS, January 1991.)

Toxic Substances Control Act (TSCA). If IDW contains PCBs, TSCA treatment and/or disposal requirements may apply during its management. TSCA requirements regulate the disposal of material contaminated with PCBs at concentrations of 50 ppm or greater as found on site (i.e., based on sample analysis and not the PCB concentration of the source material {e.g., transformer fluid}). (See PCB Guidance Manual, EPA/540/G-90/007, August 1990.) In addition, TSCA storage requirements may apply that limit the time that PCBs may be stored to one year. Furthermore, if PCB materials are mixed with a RCRA hazardous waste, they may be regulated by the LDR California list prohibitions. (See RCRA sections 3004(d)(2)(D) and (E).)

Department of Transportation (DOT) requirements. Where IDW will be disposed of off site or transported on public roads to a site,

DOT requirements for containerizing, labeling, and transporting hazardous materials and substances may apply.

State requirements. Promulgated State regulations that are legally enforceable, timely identified, and more stringent than Federal regulations may be potential ARARs for IDW managed on site. Substantive requirements of State law that may be ARARs for IDW management include State water quality standards, direct discharge limits, and RCRA requirements (including underground injection control regulations) promulgated in a State with an authorized RCRA hazardous waste management program (as well as programs authorized by State laws). Off-site, substantive and administrative requirements of State law may apply.

Off-Site Policy. In addition to complying with requirements of Federal and State laws, all off-site disposal of wastes must comply with CERCLA section 121(d)(3) and the CERCLA Off-Site Policy (OSWER Directive No. 9834.11 (November 13, 1987)). The Off-Site Policy establishes criteria for selecting an appropriate treatment, storage, or disposal facility (TSDF), including release criteria for all facilities that receive wastes from CERCLA-authorized or funded response actions. In addition, receiving facilities must be in compliance with all "applicable laws."

Before shipping wastes off site, approval should be obtained for the proposed disposal facility from EPA's Regional Off-Site Policy Coordinator. In addition, EPA has adopted a policy for Superfund wastes shipped out of State that written notification should be provided to receiving States (OSWER Directive 9330.2-07, September 14, 1989).

GENERAL OBJECTIVES FOR IDW MANAGEMENT

In addition to the two requirements of protectiveness and compliance with ARARs to the extent practicable (on site) or compliance with applicable law (off site), EPA has identified two general objectives that Superfund site managers should consider when managing IDW: (1) minimization of IDW generation; and (2) management of IDW consistent with the final remedy for the site. The extent to which these objectives can be achieved is highly dependent on site-specific circumstances.

IDW Minimization

Site managers should strive to minimize the generation of IDW to reduce the need for special storage or disposal requirements that may result in substantial additional costs yet provide little or no reduction in site risks relative to the final remedial action. Generation of IDW can be minimized through proper planning of all remedial activities that may generate IDW, as well as through use of screening information from the site inspection. The potential problems of managing IDW should be a factor in choosing an investigative method. Site managers may wish to consider techniques such as replacing solvent-based cleaners with aqueous-based cleaners for decontamination of equipment, reuse of equipment (where it can be decontaminated), limitation of traffic between clean and hot zones, and drilling methods and sampling techniques that generate little waste. Examples of such techniques include using gridding techniques to minimize the number of test pits or using soil borings instead of test pits. Alternative drilling and subsurface sampling methods may include the use of small diameter boreholes, as well as borehole testing methods such as a core penetrometer instead of coring. Site managers should also be careful to keep hazardous wastes separate from nonhazardous wastes.

Management Consistent with Final Remedy

Most IDW (with the exception of non-indigenous IDW) generated during the course of an investigation are intrinsic elements of the site. If possible, IDW should be considered part of the site and should be managed with other wastes from the site, consistent with the final remedy. This will avoid the need for separate treatment and/or disposal arrangements.

Because early planning for IDW management can prevent unnecessary costs and the use of treatment or disposal capacity, IDW management should be considered as early as possible during the remedial process. A key decision to be made is whether the waste will best be treated/disposed of immediately or addressed with the final remedy. If addressed with the final remedy, IDW volumes should be considered in the FS. In addition, when IDW is stored on site, it should be managed as part of the first remedial action/operable unit that addresses the affected media.

SELECTION OF IDW DISPOSAL OPTIONS

The following sections present the Agency's presumptions for IDW management that have been established based on the above considerations. The actual option selected should be based upon best professional judgment and should take into account the following factors:

- The type and quantity of IDW generated (sludge/soil, aqueous liquid, non-indigenous IDW);
- Risk posed by managing the IDW on site (e.g., based on site access controls, contaminant concentrations);
- Compliance with ARARs, to the extent practicable (on site);
- IDW minimization; and
- Whether the final remedy is anticipated to be an off-site or on-site remedy (or this information is unknown) and whether IDW can be managed consistent with the final remedy.

Off-site Final Remedies

If a site manager believes that the final remedy will involve off-site disposal of wastes, EPA's presumption is to manage the IDW as part of the remedial action addressing the waste/medium. Thus, until the final action, the IDW may be stored (e.g., drummed, covered waste pile) or returned to its source. However, the management option selected should also take into account any protectiveness concerns, ARARs, and other relevant site-specific factors (e.g., weather, storage space, and public concern/perceptions).

There are several potential reasons why it may be advisable to store IDW until the final action. First, because wastes at the site will be shipped off site eventually, returning IDW (especially sludges and soil) to its source would require that it be excavated again. Thus, site managers may consider it practical to containerize IDW as soon as it is generated. Second, storing IDW in containers may be more protective than returning it to its source. Third, because off-site actions may trigger such requirements as the LDRs, temporary storage will eliminate the need to meet these additional requirements until the final remedy.

In some cases, circumstances may lead site managers to choose to return the IDW to its source. This may be appropriate if it is determined that returning IDW to the source is protective and that storage at the site is not possible or practicable (i.e., given State or community concerns). In other cases, long-term storage may not be protective, and immediate off-site disposal may be a better option.

Off-site Remedy

Example: A site involves volatile organic RCRA hazardous wastes that will likely be sent off site for final treatment and disposal. Site conditions are such that temporary storage of IDW is considered protective until the remedial action begins. Because off-site disposal will trigger RCRA disposal requirements such as the LDRs and immediate containerization would be more protective than redepositing into the source area at the time of sampling, the site manager decides to containerize the IDW (and comply with RCRA substantive technical tank and container standards) until the final action is initiated.

On-site Final Remedies (or Final Management in an Unknown Location)

When final management of wastes is likely to occur on site, the management presumptions vary depending on the type of IDW produced.

Sludge/soil

Generally, the Agency expects sludge or soil IDW will be returned to its source if short-term protectiveness is not an issue. The reason behind this presumption is that IDW that may pose a risk to human health and the environment in the long term will be addressed by the final action. **Storage of RCRA hazardous IDW in containers within the AOC prior to returning it to the source will not trigger the LDRs, as long as the containers are not managed in such a way as to constitute a RCRA storage unit as defined in 40 CFR 260.10.** Therefore, it may be possible to store IDW temporarily before redisposing of it. However, EPA believes that, in many cases, returning sludges and soils to their source immediately will be protective and will avoid potentially increased costs and requirements associated with storage. Site-specific decisions on how to manage sludge and soil IDW may ultimately vary from the presumption based on protectiveness, ARARs, and/or community concerns.

Sludge/Soil

Example 1: The soil at a site contains wastes that are expected to be stabilized on site during the final remedial action. The site manager determines that sending soil IDW off site is not cost-effective, because off-site disposal would involve testing and transport costs for a relatively small amount of waste. Instead, knowing that the site is secure and that redisposing the waste at the source will not increase site risk or violate ARARs, the site manager decides to return soil IDW to the source area from which it originated.

Example 2: A site manager determines that returning highly contaminated PCB wastes to the ground at a site is not protective because of the potential risks associated with the material; instead, the site manager chooses to drum the waste and send it off site (in compliance with TSCA). (Off-site disposal may occur immediately or at a later date.)

Example 3: Soil IDW contaminated with a RCRA hazardous waste is generated from a soil boring. The site manager decides to put the IDW back into the borehole immediately after generation, but ensures that site risks will not be increased (e.g., the contaminated soil will not be replaced at a greater depth than where it was originally so that it will not contaminate "clean" areas) and that the contamination will be addressed in the final remedy.

Aqueous liquids

EPA has not established a presumption for the management of aqueous liquid IDW (e.g., ground water). Site managers should determine the most appropriate disposal option for aqueous liquids on a site-specific basis. Parameters to consider, especially in making the protectiveness decision, include the volume of IDW, the contaminants present in the ground water, the presence of contaminants in the soil at the site, whether the ground or surface water is a drinking water supply, and whether the ground-water plume is contained or moving. Special disposal/handling may be needed for drilling fluids because they may contain significant solid components. Examples of aqueous liquid management decisions considering these factors are presented in the box on the next page.

Non-indigenous IDW

Non-indigenous IDW (e.g., sampling materials, disposable PPE decontamination fluids) should be stored until the final remedy or disposed of immediately. If contaminated, such waste may not be disposed of onto the ground because such an action would add contamination that was not present when activities began at the site (e.g., solvents used for decontamination). If non-indigenous IDW is contaminated with RCRA hazardous waste, it must be managed in accordance with RCRA Subtitle C requirements. Otherwise, sit

Aqueous Liquids

Example 1: A site manager has large volumes of ground water IDW and does not know if it is contaminated. Pouring this IDW on the ground would not be protective, because it may contaminate previously uncontaminated soil or may mobilize contaminants that are present in the soil. Therefore, the site manager stores the water in a mobile tank until a determination is made as to whether the water and soil are contaminated or until the final action.

Example 2: IDW is generated from the sampling of background, upgradient wells. Because there are no community concerns or evidence of any soil contamination from other sources, the site manager decides to pour this presumably uncontaminated IDW on the ground around the well.

Example 3: Purge water from a deep aquifer is known to be contaminated with a RCRA hazardous waste. At this site, if this water were poured on the ground, it could contaminate a previously uncontaminated shallow aquifer that is a potential drinking water source and would have to comply with the LDRs. The site manager decides to containerize the water within the AOC and store it until the final remedy.

managers may generally dispose of it in an on-site dumpster (for PPE).

Non-indigenous IDW

Example 1: Disposable PPE (e.g., gloves, shoe covers) becomes contaminated with RCRA hazardous waste during the field investigation. The site manager containerizes and disposes of this IDW in compliance with RCRA Subtitle C requirements.

Example 2: Disposable equipment becomes contaminated during a field investigation. The site manager decontaminates them and sends them to a Subtitle D facility.

COMMUNITY CONCERNS

Residents of communities near a CERCLA site, local governments, or States may have concerns about certain disposal methods or long-term storage of IDW at the site. As with all CERCLA activities, site managers should evaluate community concerns regarding disposal of IDW in deciding what action to take. For example, if a community is concerned about the direct discharge of IDW water to surface water on site, site managers may want to consider sending the water to a POTW, if one is located nearby. In some instances, it may be appropriate to prepare fact sheets, include options in other community relations documents, or explain IDW management decisions at public meetings prior to actions.

EPA

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HEALTH AND SAFETY PLAN ADDENDUM

FINAL

HEALTH AND SAFETY PLAN ADDENDUM REMEDIAL INVESTIGATION FOR SITES 2, 8, 18, AND SITE SCREENING AREA (SSA) 14

NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

CONTRACT TASK ORDER 0363

JANUARY 3, 1997

Prepared for:

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES
ENGINEERING COMMAND
Norfolk, Virginia

Under:

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Prepared by:

BAKER ENVIRONMENTAL, INC.
Coraopolis, Pennsylvania

EXECUTIVE SUMMARY

This Health and Safety Plan (HASP) Addendum will provide information pertaining to the activities to be performed at Sites 2, 8, 18, and (SSA) 14. The types of activities include: surface water and sediment sampling, land survey, surface and subsurface soil sampling, monitoring well installation, and groundwater sampling from monitoring wells. The chemical hazards associated with the tasks at this site(s) are expected to include potential exposure to varying levels of volatile organic compounds, semivolatile organic compounds, pesticides/PCBs, nitramine compounds, and inorganics (metals).

The physical hazards include working around heavy equipment during drilling and backhoe operations, underground/overhead utilities, and uneven/steeply-sloped terrain. The environmental hazards may include limited potentially hazardous flora and fauna. Each of these hazards is described in Section 3.0.

Section 4.0 describes the site control measures that will be in place during the field investigation activities. Section 5.0 describes the environmental monitoring requirements which consist of using a photoionization detector (PID) and oxygen/combustible gas meter.

The level of personal protection assigned for work tasks and other operations will be Levels D through D+ with protection upgrades/downgrades dependent on monitoring results and the Site Health and Safety Officer's discretion. Section 6.0 describes the personal protective equipment (PPE) to be used.

Section 8.0 describes emergency procedures, which includes Figures 8-1 and 8-2 (showing the route to the nearest public hospitals), and Figure 8-3 (providing directions to the nearest public hospitals), in addition to first aid procedures, communication procedures, and other site concerns.

PREFACE

The purpose of this Health and Safety Plan (HASP) Addendum is to provide specific health and safety information for Sites 2, 8, 18, and Site Screening Area (SSA) 14 at the Naval Weapons Station Yorktown, Yorktown, Virginia (WPNSTA Yorktown). This HASP Addendum is designed to be used in conjunction with the Master Site HASP for WPNSTA Yorktown.

Both the Master HASP and HASP Addendum will be maintained together on-site at a centralized location. General information that is required for this HASP Addendum is presented in the Master Site HASP and identified in the Table of Contents with italicized print; this information will not be repeated here. Specific information is presented in bold print according to the same section numbers as the Master Site HASP. Site personnel are required to review the information presented in both the Master Site HASP and this HASP Addendum prior to conducting field activities.

TABLE OF CONTENTS*

*Italicized print indicates that information in that section is presented in the Master Site HASP.

TABLE OF CONTENTS*
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TABLE OF CONTENTS*
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*Italicized print indicates that information in that section is presented in the Master Site HASP.

LIST OF TABLES

LIST OF FIGURES

LIST OF ATTACHMENTS

*Italicized print indicates that information in that section is presented in the Master Site HASP.

LIST OF ACRONYMS AND ABBREVIATIONS

Baker	Baker Environmental, Inc.
BZ	Breathing Zone
CPR	Cardiopulmonary Resuscitation
HASP	Health and Safety Plan
HEPA	High Efficiency Particulate Air
HRSD	Hampton Roads Sanitation District
IDW	Investigative-Derived Waste
LANTDIV	Atlantic Division, Naval Facilities Engineering Command
LEL	Lower Explosive Limit
MSDS	Material Safety Data Sheet
mu	meter unit
NEDED	Naval Explosives Development Engineering Department
NPDES	National Pollutant Discharge Elimination System
PCB	Polychlorinated Biphenyl
PHSO	Project Health and Safety Officer
PID	Photoionization Detector
PPE	Personal Protective Equipment
SSA	Site Screening Area
SHSO	Site Health and Safety Officer
SVOC	Semivolaitle Organic Compounds
VOC	Volatile Organic Compound
WPNSTA Yorktown	Naval Weapons Station Yorktown, Yorktown, Virginia

EXECUTIVE SUMMARY

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Section 8.0 describes emergency procedures, which includes Figures 8-1 and 8-2 (showing the route to the nearest public hospitals), and Figure 8-3 (providing directions to the nearest public hospitals), in addition to first aid procedures, communication procedures, and other site concerns.

2.2 Site-Specific Personnel

The following personnel will be responsible for the activities to be performed at Sites 2, 8, 18, and SSA 14 (the responsibilities for these personnel are described in Section 2.2 of the Master Site HASP):

Site Manager:	Mr. Kenneth A. Tua
Site Health and Safety Officer:	Mr. Kenneth A. Tua
Field Team Members:	Small Disadvantaged Business Employees

Subcontractor Companies:

Drilling Operations:	Parratt-Wolff, Inc.
Surveying Operations:	Miller-Stephenson and Associates, P.C.
Analytical Operations:	Quanterra Environmental Services
Field Support:	Engineering and Environment, Inc.
Laboratory Validation:	Heartland Environmental Services, Inc.

3.2 Description of Areas Under Investigation

Descriptions for Sites 2, 8, 18, and SSA 14 are provided in the following sections. Table 3-1, located in the "Tables" section at the end of this HASP Addendum, lists the field activities to be performed at each area under investigation.

3.2.1 Site 2 - Turkey Road Landfill

Site 2 is a 5-acre landfill located east of Turkey Road in a wetland area adjacent to the southern branch of Felgates Creek. Operations at the landfill reportedly began in the 1940s and ceased in 1981. Wastes disposed in this landfill reportedly included mercury and carbon-zinc batteries, tree stumps and limbs, construction rubble, missile hardware (e.g., wings, fins and power packs), electrical devices, and unidentified drums and/or tanks. Waste quantities have been estimated at 240 tons during the period of use. Hard waste material (mine casings) is primarily located along the tributaries to the southern branch of Felgates Creek. A removal of hard waste material was conducted during the summer of 1994 at Site 2.

3.2.2 Site 8 - NEDED Explosives-Contaminated Wastewater Discharge Area

Site 8 is a 300-foot drainage way located along the eastern branch of Felgates Creek, approximately 1.5 miles from the confluence of the creek and the York River. This area received wastewater from the Naval Explosives Development Engineering Department (NEDED) complex (Building 456) from 1940 to 1975. The wastewater reportedly contained unspecified solvents, spent/neutralized acids, and nitramine compounds. In 1975, a carbon adsorption tower was installed to treat the contaminated wastewater prior to discharge into the drainage area. A National Pollutant Discharge Elimination System (NPDES) permit was granted by USEPA Region III to allow this discharge. In 1986, the effluent from the tower was diverted to the sanitary sewer and ultimately to Hampton Roads Sanitation District (HRSD). Currently, the site has reverted to a natural drainage area.

3.2.3 Site 18 - Building 476 Discharge Area

Site 18 is a one-quarter mile long, drainage ditch located north of Building 476 in the southeastern area of the installation along a small tributary leading to Lee Pond. This area was in use for approximately 20 years from the 1940s to the 1960s. The discharge into the area reportedly contained battery acid waste, consisting of hydrochloric acid or calcium hydroxide and dissolved metals such as lead, cadmium, nickel, and antimony. An estimated 100 to 200 pounds of metals may have been discharged. Battery acid waste no longer discharges from Building 476 into this drainage way.

3.2.4 Site Screening Area 14 - Building 537 Discharge to Felgates Creek

SSA 14 occupies an area of approximately 0.4 acres, and is located outside of Building 537 upstream of Site 8 (NEDED Explosives-Contaminated Wastewater Discharge Area) in the north central portion of the facility. This SSA consists of a pipe leading from the building, through which nitramine-contaminated wastewater was reportedly discharged to Felgates Creek.

3.3 Hazard Evaluation

The pre-entry briefing and subsequent (i.e., weekly) safety meetings will serve to address the hazards particular to each area under investigation. If additional hazards are identified by the Site Health and Safety Officer (SHSO) or other site personnel, they will be added to this HASP Addendum, and the Project Health and Safety Officer (PHSO), Project Manager, and all field staff will be informed.

3.3.1 Chemical Hazards

The chemical hazard potential for personnel performing investigative activities at Sites 2, 8, 18, and SSA 14 relates directly to the potential for exposure to chemicals or hazardous materials that were disposed at the sites. Table 3-2, located in the "Tables" section at the end of this HASP Addendum, provides the results of previous sampling at Sites 2, 8, 18, and SSA 14 for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated binphenyls (PCBs), and nitramine compounds.

The risk of exposure to site personnel from inorganics (metals) found with each respective media is considered low; therefore, detected metals exceeding applicable criteria are listed with the exposure limit and primary routes of entry in Table 3-3 (located in the "Tables" section at the end of this HASP Addendum).

Material Safety Data Sheets (MSDSs) for the constituents that were previously identified at WPNSTA Yorktown have been included as Appendix B to the Master Project Plans (Baker, 1994). However, it is important to note that the data presented in an MSDS reflects the chemical/toxicological properties of the specific compound in a pure, non-diluted state. As such, when these compounds are detected in environmental media (i.e., soil, groundwater, surface water, and sediment), the hazards are anticipated to be substantially less than those associated with exposure to "pure" compound. The data presented in the MSDS will, therefore, be utilized as reference information when questions arise as to a constituent's chemical, physical, and toxicological properties, or measures to be used in an emergency situation.

3.3.3 Radiation Hazards

Radiation hazards are not anticipated at these sites; therefore, a radiation survey meter will not be used during the intrusive activities at Sites 2, 8, 18, and SSA 14.

3.3.5 Task-Specific Hazards

Table 3-1, located in the "Tables" section at the end of this HASP Addendum, lists the field activities to be performed at each area under investigation. Section 3.3.5 in the Master HASP describes the hazards that coincide with each field operation. Specific potential hazards at each site are discussed in the following subsections.

3.3.5.1 Hot Works Permit

Any hot work activity such as using an oxygen/acetylene torch to cut well casing or operating equipment generating temperatures in excess of 280°F (e.g., a generator) at WPNSTA Yorktown requires a Hot Works Permit. This permit can be acquired on the morning that the hot work is scheduled. The permit can be obtained by contacting the Fire Inspector at (804) 887-4950 (off-Station) or ext. 4950 (on-Station) during the week and ext. 4343 on the weekends. The WPNSTA Yorktown hot work requirements will be reviewed prior to the activity. Requirements include such items as maintaining a fire extinguisher near the activity and maintaining a fire watch during the activity and for an hour after the activity is completed.

3.3.5.2 Utilities

Utility clearances are to be obtained from a Station representative at least 48 hours prior to soil intrusive activities. The following are the three contacts for utility clearance:

Electric Shop	804-887-4353	Mike South* Jack Smith*
Pipe Shop	804-887-4325	Hank Robertson*
Telephone Shop	804-887-7297	Bill Spencer*

*Must call Jeffrey Hardlow, WPNSTA Yorktown 804-887-4775 first.

Additional information on utility clearance can be obtained in Section 3.3.5.2 of Master HASP.

4.2 Site Conditions

Site conditions include information on the prevailing wind and weather conditions during the time of field activities and topographical information particular to each site. Since the field activities are planned for January 1977, the weather conditions are anticipated to be cold with occasional rain showers. Winds generally will be from the west, southwest. The topography for each site is presented below:

- Site 2 - The site is relatively open, with scrub grass and small trees.
- Site 8 - The site is a small drainageway leading to Felgates Creek. Terrain is uneven.
- Site 18 - The site is a wooded area with a drainage ditch leading to a tributary of Lee Pond.
- SSA 14 - The site is located along a steep stream bank of Felgates Creek.

5.0 ENVIRONMENTAL MONITORING

The specific monitoring requirements and the action levels for Sites 2, 8, 18, and SSA 14 are discussed below. Monitoring equipment and frequency of use for each field activity, as it applies to each site under investigation, are outlined in Table 5-1 (located in the "Tables" section at the end of this HASP Addendum.)

5.1 Personal Monitoring

Personal monitoring, at a minimum, will include a PID directed at the breathing zone (BZ) of work party personnel. It will be used to determine if work can proceed, upgrade in protection is needed, or if specific personal monitoring is needed. The BZ includes the area bordered by the outside of the shoulders from the mid-chest to the top of the head. BZ monitoring will be performed each time a meter reading above background is detected at the point source. The guidelines below identify the protection levels required according to the concentrations measured using the PID (HNu PI-101 or DL-101 with a 10.2 eV lamp):

PID (HNu PI-101 or DL-101 with a 10.2 eV lamp)

- Level D/D+ = Background[1] to >1 mu[2] above background for 1 continuous minute in the BZ
- Level C = >1 mu above background for up to 5 continuous minutes in the BZ
- Stop Work and contact the PHSO = >1 mu above background for >5 continuous minutes in the BZ

[1] Background is typically 1 to 2 meter units
[2] mu = meter unit on the 1X scale

5.2 Point Source Monitoring

Point source monitoring, which is monitoring performed directly at the source of sampling or investigative activity (i.e., borehole, monitoring well, etc.), will comply with the action levels outlined below. The monitoring equipment assigned for these site activities and corresponding action levels are as follows:

PID (HNu PI-101 or DL-101 with 10.2 eV lamp)

- If detecting levels greater than background, immediately measure the BZ levels, following the action levels set forth in Section 5.1, Personal Monitoring.
- For levels greater than 10 times the background level, retreat upwind, monitor BZ, and return after allowing the source to dissipate.
- For elevated levels that are sustained, leave the area and contact the SHSO for guidance.

Oxygen/Combustible Gas Meter[1][2] [Bacharach 503A]

Oxygen Meter

- 19.5% to <23.5% = Continue working
- <19.5% to >23.5% = Stop work immediately and consult SHSO

Combustible Gas Meter

- <10% of the Lower Explosive Limit (LEL) = Continue working
- >10% of the LEL = Stop work immediately and consult the SHSO

[1] Used to evaluate physical safety in conjunction with PID
[2] Assigned action levels are for non-confined space entry operations.

MINIRAM Model PDM-3

Dust generation during the types of activities conducted for this project is not anticipated. If dust is generated from work activities, the MINIRAM will be used in conjunction with dust suppression techniques.

6.0 PERSONAL PROTECTIVE EQUIPMENT

The assigned levels of protection for the field activities to be conducted are listed in Section 6.1. The PPE item numbers are outlined below. Protection upgrades or downgrades will be based on environmental (i.e., real time) monitoring, working conditions, and the discretion of the SHSO.

Item No.	Personal Protective Equipment
1	Chemical-Resistant Clothing (Polyethylene-coated Tyvek®)
2	Chemical-Resistant Clothing (Saranex®)
3	Uncoated Tyvek®/Kleenguard® Coveralls
4	Normal Work Clothes
5	Air-Line Respirator (ALR) with 5-minute escape pack
6	Self-Contained Breathing Apparatus (SCBA) for rescue
7	NIOSH 5-minute Escape Pack (on standby)
8	Full-face Cartridge Respirator
9	Half-face Cartridge Respirator
10	Full-face Cartridge Respirator (on standby)
11	Half-face Cartridge Respirator (on standby)
12	Chemical-Resistant Gloves (Nitrile inner - double layer)
13	Chemical-Resistant Gloves (Nitrile inner - single layer)
14	Chemical-Resistant Gloves (Rubber/Neoprene outer)
15	Chemical-Resistant Gloves (Nitrile outer)
16	Work Gloves (outer) (as necessary)
17	Chemical-Resistant Overboots (with steel toe and shank)
18	Chemical-Resistant Overboots (w/o steel toe)
19	Steel Toe Boots
20	Safety Glasses
21	Safety Goggles
22	Face Shield
23	Hard Hat
24	Hearing Protection (as necessary)
25	Chest/Hip Waders (as necessary)
26	Safety Vests (as necessary)
27	Snake Chaps (as necessary)

6.1 Specific Levels of Protection

Based on an evaluation of potential hazards at each area under investigation, the levels of protection and corresponding PPE for work activities conducted at Sites 2, 8, 18, and SSA 14 are designated in the table below.

Note: No single combination of PPE is capable of protecting against all hazards. PPE should be used in conjunction with safe work practices, effective decontamination, and good personal hygiene.

Field Activity (Sites 2, 8, and SSA 14)	Level of Protection					PPE Item No.
	B	C[1]	D+	D	Other	
Surface Water and Sediment Sampling				X		4, 12, 16, 18, 19, 20, 25, 27
Land Surveying				X		4, 16, 19
Surface Soil Sampling			X			4, 10, 12, 16, 19, 20
Subsurface Soil Sampling			X			4, 10, 12, 16, 19, 20, 23, 24
Groundwater Sampling via Monitoring Well			X			4, 10, 12, 19, 20
Monitoring Well Installation			X			4, 10, 12, 16, 19, 20, 23, 24
Well Development			X			4, 10, 12, 19, 20
IDW Sampling			X[2]			3, 4, 10, 12, 16, 19, 20

EXCEPT IN EMERGENCY SITUATIONS, CHANGES TO THE SPECIFIED LEVELS OF PROTECTION SHALL ONLY BE MADE WITH THE APPROVAL OF THE SHSO AND THE SITE MANAGER, IN CONSULTATION WITH THE PHSO AND ACTIVITY COORDINATOR.

(1) Respiratory protection protocols will comply with the Master Site HASP. If Level C is required, an organic vapor/acid gas/high efficiency particulate air (HEPA) cartridge will be used.

(2) Level of protection may be upgraded or downgraded based upon monitoring levels observed during sampling activities.

8.0 EMERGENCY PROCEDURES

Much of the information regarding emergency procedures is presented in the Master HASP; however, this information is of such importance that some sections are repeated here with some additional information.

8.5 Emergency Medical Treatment and Telephone Numbers

The emergency medical treatment facility information and emergency telephone numbers, as identified below, will be posted in the Baker field trailer and maintained in each Baker field vehicle. A mobile telephone will most likely be used for external communications. The telephone number will be provided to site personnel along with operating instructions as soon as it is available. If possible, two-way radios will be utilized for internal communications between the field personnel. This method of communication will be used only when WPNSTA Yorktown provides the proper clearance and authorization for use of the two-way radios.

Emergency Medical Services

For non-chemical exposure incidents (i.e., cuts, bruises, sprains, heat or cold stress), the nearest public hospital is:

Mary Immaculate Hospital
800 Denbigh Boulevard
Newport News, VA 23602
(804) 886-6000 (General Information)
(804) 886-6437 (Emergency Room)

Note: In emergencies, personnel may be transported to Building 1806, which is the WPNSTA Yorktown Branch Medical Clinic, for initial treatment.

For chemical exposure incidents (i.e., skin rash due to contact with contaminated media, inhalation of organic vapors, eye irritation due to accidental splashing), the nearest public hospital is:

Riverside Regional Medical Center
500 J. Clyde Morris Boulevard
Newport News, Virginia 23601
(804) 594-2000 (General Information)
(804) 594-2050 (Emergency Room)

Local ambulance service is available from: Branch Medical Clinic

On-Station Emergency Telephone No.	x 4911
On-Station Non-Emergency Telephone No.	x 7404
Off-Station Emergency Telephone No.	(804) 887-4911
Off-Station Non-Emergency Telephone No.	(804) 887-7404

Contact will be made with emergency personnel at the pre-construction meeting.

Emergency Telephone Numbers

Table 8-1, located in the "Tables" section at the end of this HASP Addendum, presents the necessary emergency telephone numbers for both on-Station and off-Station telephones.

8.6 Emergency Hospital Route

Emergency hospital routes for the off-site public hospitals (e.g., Figures 8-1 and 8-2 located in the Figures section at the end of this HASP Addendum) and a building identification map for the Branch Medical Clinic (Building 1806) (located adjacent to the Baker field trailer), will be posted in the Baker field trailer and maintained in each Baker field vehicle. Personnel will be informed of the location of each of the maps and the directions to the hospital at the pre-entry briefing. The directions to each of the public hospitals are presented in Figure 8-3 (located in the "Figures" section at the end of this HASP Addendum.)

8.7 Injuries

If injuries are not serious or life threatening, affected personnel may be transported by other site personnel to the local medical facility, if necessary. Emergency medical response personnel will be contacted in the event of serious or multiple injuries. Medical personnel will be provided with all available information regarding the nature of the incident, chemicals involved, etc. Instances requiring treatment beyond First Aid will be handled at appropriate facilities and reported to the Project Manager and PHSO within 24 hours.

There will be a minimum of two people during each phase of field activities who will be trained in standard first aid and adult cardiopulmonary resuscitation (CPR). These people will also be familiar with Baker's program for potential exposure to bloodborne pathogens. Subcontractors will be responsible for securing proper medical attention for their employees. Baker may assist the subcontractor as necessary.

8.7.1 Physical Injury

If an employee working in a contaminated area is physically injured, first aid procedures will be followed. Depending on the severity of the injury, emergency medical response from WPNSTA Yorktown Branch Medical Clinic personnel may be sought to stabilize the victim for transport to a public hospital. If the employee can be moved, the individual will be taken to the edge of the work area and decontaminated, if necessary (refer to Section 8.8 of the Master HASP). If circumstances permit, emergency first aid will be administered, and the victim will be transported to an awaiting ambulance or to a local emergency medical facility.

8.7.2 Chemical Injury

If the injury to a worker is chemical in nature (e.g., direct contact or exposure), the following first aid procedures will be instituted immediately:

- Eye Exposure - If contaminated solid or liquid gets into the eyes, wash the eyes immediately at the 15-minute emergency eyewash station or with the emergency eye wash bottle when an eye wash station is not available. Obtain medical attention immediately.

NOTE: Contact lenses will not be worn while working at any site.

- Skin Exposure - If contaminated solid or liquid gets on the skin, promptly wash the contaminated skin using soap or mild detergent and water. If solids or liquids penetrate through the clothing, remove the clothing immediately and wash the skin using soap or mild detergent and water. Obtain medical attention immediately.

- Swallowing - If contaminated solid or liquid has been swallowed immediately contact the Central Virginia Poison Information Services at (804) 786-9123. Do not induce vomiting in an unconscious person. Obtain medical attention as directed by the Poison Control Center.

- Breathing - If a person has difficulty breathing, move the exposed person to fresh air at once. If breathing is not evident, check for pulse and perform appropriate first aid, either rescue breathing or CPR, depending on the condition. Obtain medical attention immediately.

Procedures to follow in the event of an exposure to hazardous chemicals/wastes are located in Attachment A of this HASP Addendum.

8.7.3 Snakebite Injury

In the event of a snakebite injury, the following procedures will be followed.

Look for signs and symptoms such as the characteristic appearance of two small holes, usually about a half inch apart, with surrounding discoloration, swelling, and pain. Systemic signs, which may or may not occur, include weakness, sweating, faintness, and signs of shock.

Provide treatment as follows:

1. Calm the victim and keep affected area still.
2. Contact ambulance if victim needs transportation to the nearest hospital.

3. Wash the wound.

4. Keep the affected area below the level of the heart if bite is on the arm or leg.

5. Treat for shock (maintain body temperature).

6. Monitor airway, breathing, and circulation.

7. Obtain physical description of snake, if possible.

8. Transport victim to the nearest medical facility.

9. Provide the emergency medical responder, either the ambulance attendant or the emergency room at the hospital, with all pertinent information such as: how long ago the bite occurred, the type of snake (if known), any known allergic conditions (if known), etc.

10. Inform the SHSO as soon as possible.

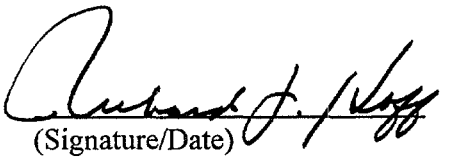
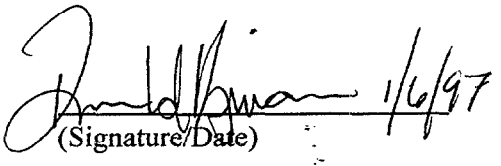
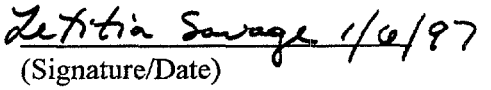
8.7.4 Spider Bite Injury

The emergency treatment for the black widow spider bite is basic life support. Sometimes the individual is not even aware of having been bitten, or where. Apply cold to the site of the bite if it can be identified. There is a specific antivenom for this spider bite that must be administered by a physician. It is particularly important to identify the spider, and bring it in, if you can.

The emergency treatment for the brown recluse spider is similar to that for the black widow spider except that these bites need local surgical treatment, and these patients should be brought to the hospital. Again, if possible, identification of the spider should be carried out.

11.0 HEALTH AND SAFETY PLAN APPROVAL

This Final HASP Addendum for Sites 2, 8, 18, and SSA 14 has been reviewed by the following personnel prior to submission to Atlantic Division, Naval Facilities Engineering Command (LANTDIV).

Richard Hoff (Name)	QA/QC Reviewer (Role)	 (Signature/Date)
Ronald Krivan (Name)	Project Health and Safety Officer (Role)	 (Signature/Date)
Letitia Savage (Name)	Project Manager (Role)	 (Signature/Date)

12.0 DECLARATION OF HASP REVIEW*

All site personnel indicated below have reviewed and are familiar with the Master Site HASP and this HASP Addendum for Sites 2, 8, 18, and SSA 14 at WPNSTA Yorktown.

(Name - Print)	(Company)
(Name - Sign)	(Date/Time)
(Name - Print)	(Company)
(Name - Sign)	(Date/Time)
(Name - Print)	(Company)
(Name - Sign)	(Date/Time)
(Name - Print)	(Company)
(Name - Sign)	(Date/Time)
(Name - Print)	(Company)
(Name - Sign)	(Date/Time)
(Name - Print)	(Company)
(Name - Sign)	(Date/Time)

* This page is to be reproduced to accommodate the numbers of personnel who receive training prior to performing activities, and is to remain in the Baker Field Trailer until demobilization.

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TABLE 3-1

FIELD ACTIVITIES
SITES 2, 8, 18, AND SSA 14
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Field Activity	Sites			
	2	8	18	SSA 14
Surface Water and Sediment Sampling	X	X	X	X
Benthic Macroinvertebrate Sampling	X	X		X
Land Surveying	X	X	X	X
Surface Soil Sampling		X	X	X
Subsurface Soil Sampling	X	X	X	X
Groundwater Sampling via Monitoring Well	X	X	X	X
Monitoring Well Installation	X	X	X	X
Monitoring Well Development	X	X	X	X
IDW Sampling	X	X	X	X

Note: * Section 3.4.5 in the Master HASP describes the chemical, physical, and environmental hazards that are commonly associated with each field activity.

TABLE 3-2

CHEMICAL/PHYSICAL PROPERTIES FOR PREVIOUSLY DETECTED ORGANIC CONSTITUENTS
SITES 2, 8, AND SSA 14
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Chemical	Site	Highest Concentration Detected (ppb)	Source				Carcionogen?	Exposure Limit (EL)[1]	Vapor Pressure[2]	Ionization Potential (eV)
			SL	SD	GW	SW				
Volatiles:										
Toluene	2	1200			*X*		No	5o ppm (skin)	21	8.82
1,2 Dichloroethene	8	9026			*X*		No	50 ppm	58	9.45
Trichloroethene	8	32			*X*		Yes	50 ppm	58	9.45
Semivolatiles:										
Coal Tar Pitch Volatiles	2	90,000	*X*				Yes	0.2 mg/m^3	Properties vary by compound	<10.20
Pesticides/PCBs:										
Chlordane	2	9.8	*X*				Yes	0.5 mg/m^3 (skin)	1 x 10^{-5}	NA
DDT series	2	6.4	*X*				Yes	1 mg/m^3 (skin)	2 x 10^{-07}	NA
Dieldrin	2	40	*X*				Yes	0.25 mg/m^3 (skin)	8 x 10^{-07}	NA
Endrin (Aldehyde)	2	34	*X*				No	0.1 mg/m^3 (skin)	Low	NA
Aroclor-1254/1260	2	6200	*X*				Yes	0.5 mg/m^3 (skin)	6 x 10^{-05}	NA
Nitramines:	SSA 14	510,000	*X*							
HMX	8	2,800			*X*		No	NA	3.3 x 10^{-14}	NA
RDX	SSA 14	4,900	*X*		X	X	No	1.5 mg/m^3 (skin)	4 x 10^{-04}	NA
2,4,6-Trinitrotoluene	2	1.7	*X*			X	No	1.5 mg/m^3 (skin)	2 x 10^{-04}	10.59

TABLE 3-2 (Continued)

CHEMICAL/PHYSICAL PROPERTIES FOR PREVIOUSLY DETECTED ORGANIC CONSTITUENTS
SITES 2, 8, AND SSA 14
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

(1) EL - Exposure Limit = A time-weighted average concentration for a normal eight-hour work day and 40-hour work week to which nearly all workers may be repeatedly exposed day after day without expected adverse effect. The EL represents published Exposure Levels according to the following hierarchical order: (1) OSHA PELs; (2) NIOSH RELs; (3) ACGIH TLVs; and, (4) other recognized sources.

(2) Vapor Pressure = Expressed as mm/Hg at 68°F (unless noted otherwise).

NA - Not Available
SL - Soil sample (ppb as µg/kg)
SD - Sediment sample (ppb as µg/kg)
GW - Groundwater sample (ppb as µg/L)
SW - Surface water sample (ppb as µg/kg)
ppm - one part per million parts of air

X - Medium with highest detected concentration
eV - Electron volt
Skin - Potential contribution to exposure through skin or mucous membranes
mg/m^3 - milligrams per cubic meter (in air)

TABLE 3-3

ROUTES OF ENTRY FOR PREVIOUSLY DETECTED INORGANIC CONSTITUENTS
SITES 2, 8, 18, AND SSA 14
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Substance	Exposure Limit (EL)[a] (mg/m^3)	Routes of Entry
Aluminum	15(total)/5(resp.)	Inhalation, Ingestion, Skin/Eye Contact
Antimony	0.5	Inhalation, Ingestion, Skin/Eye Contact
Arsenic	0.01	Inhalation, Ingestion, Absorption, Skin/Eye Contact
Barium	0.5	Inhalation, Ingestion, Skin/Eye Contact
Beryllium	0.025	Inhalation, Skin/Eye Contact
Cadmium	0.005	Inhalation, Ingestion
Chromium	0.5	Inhalation, Ingestion, Skin/Eye Contact
Copper	1	Inhalation, Ingestion, Skin/Eye Contact
Lead	0.05	Inhalation, Ingestion, Skin/Eye Contact
Manganese	5	Inhalation, Ingestion
Mercury	0.05	Inhalation, Ingestion, Absorption, Skin/Eye Contact
Nickel	1	Inhalation, Ingestion, Skin/Eye Contact
Vanadium	0.5 (resp.)	Inhalation, Ingestion, Skin/Eye Contact
Zinc	5	Inhalation

[a] EL - Exposure Limit = A time-weighted average concentration for a normal eight-hour work day and 40-hour work week to which nearly all workers may be repeatedly exposed day after day without expected adverse effect. The EL represents published Exposure Levels according to the following hierarchical order: (1) OSHA PELs; (2) NIOSH RELs; (3) ACGIH TLVs; and, (4) other recognized sources.

TABLE 5-1

MONITORING EQUIPMENT AND FREQUENCY FOR EACH FIELD ACTIVITY CONDUCTED AT SITES 2, 8, 18, AND SSA 14
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Field Activity	PID	Oxygen/Combustible Gas Meter
Surface Water and Sediment Sampling	I & D	
Land Surveying		
Surface Soil Sampling	I & D	
Subsurface Soil Sampling	C	D
Groundwater Sampling via Monitoring Well	I & P	
Monitoring Well Installation	C	C
Monitoring Well Development	I & P	
IDW Sampling	I & D	

I = Initially - At start of field activity to confirm designated protection level.
P = Periodically - When site condition or set-up changes, or when a new area is entered.
C = Continuously - Monitor levels continuously as site operations allow.
D = At the discretion of the SHSO.
PID = Photoionization Detector

Note: As air concentrations are measured, they should be documented in the individual's field logbook. In the case of continuous monitoring, every 15 minutes.

TABLE 8-1

EMERGENCY TELEPHONE NUMBERS
SITES 2, 8, 18, AND SSA 14
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Facility	Phone Number On-Station Phone[1]	Phone Number Off-Station Phone[2]	Contact[3]
Emergency (One Call)	**ext. 4911**	**(757) 887-4911**	**Dispatch**
Spill Response	ext. 4676	(757) 887-4676	Dispatch
Hot Work Permits	ext. 4950	(757) 887-4950	Fire Inspector
Fire	ext. 4333	(757) 887-4676	Dispatch
Security	ext. 4676	(757) 887-4676	Response Operator
Ambulance (Branch Medical Clinic)	ext. 4911	(757) 887-4911	Dispatch
Ambulance (Public)	(9) 911	911	Response Operator
Branch Medical Clinic (Non-Emergency)	ext. 7404	(757) 887-7404	Tommy Stainback, RN
Branch Medical Clinic (Emergency)	ext. 4911	(757) 887-4911	Tommy Stainback, RN
Riverside Medical Center Public Hospital (Chemical Exposure)	(9) 594-2050	(757) 594-2050 (757) 594-2692	Bill Fielig EMS Trauma Coordinator
Mary Immaculate Public Hospital (Non-Chemical Exposure)	(9) 886-6437	(757) 886-6437	David Ferris Emergency Room Dept. Head
On-Scene Coordinator	ext. 4911	(757) 887-4911	Dispatch
Central Virginia Poison Information Services	(9) 786-9123	(757) 828-9123 VA only: 800-552-6337	Response Operator
National Response Center	1-800-424-8802	1-800-424-8802	Response Operator
CHEMTREC (Chemical Transport Emergency Center)	1-800-424-9300	1-800-424-9300	Response Operator
Electric Shop (Utility Clearance)	ext. 4353	(757) 887-4353	Mike South Jack Smith
Pipe Shop (Utility Clearance)	ext. 4325	(757) 887-4325	Hank Robertson
WPNSTA Environmental Coordinator	ext. 4775	(757) 887-4775	Jeff Harlow[4]

Notes:

(1) When using the trailer phone, use the "887" prefix when calling on-Station.
(2) When using a mobile phone at WPNSTA Yorktown, dial the complete telephone number, including area code.
(3) Points of Contact will be reconfirmed during site mobilization.
(4) Contact for chemical spills; if greater than 25 gallons also contact the spill response dispatch.