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FINAL

WORK PLAN

SITES 9 AND 19
ROUND TWO REMEDIAL INVESTIGATION

NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

CONTRACT TASK ORDER 0292

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LIST OF ACRONYMS AND ABBREVIATIONS

AET	Apparent Effects Threshold
ATV	All Terrain Vehicle
Baker	Baker Environmental, Inc.
bgs	Below Ground Surface
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP	Contract Laboratory Program
COPC	Chemical of Potential Concern
CTO	Contract Task Order
CWA	Clean Water Act
DoN	Department of the Navy
2,4-DNT	2,4-Dinitrotoluene
Eh	Oxidation-Reduction Potential
ER-L	Effects Range-Low
ER-M	Effects Range-Median
FFA	Federal Facilities Agreement
FSP	Field Sampling Plan
gpm	Gallons Per Minute
HASP	Health and Safety Plan
HMX	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
HRSD	Hampton Roads Sanitation District
IDW	Investigation Derived Waste
LANTDIV	Atlantic Division, Naval Facilities Engineering Command
MCL	Maximum Contaminant Level
µg/kg	Microgram per Kilogram
µg/L	Microgram per Liter
mg/kg	Miligram per Kilogram
msl	Mean Sea Level
NEESA	Naval Energy and Environmental Support Activity
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NTR	Navy Technical Representative
OD	Outside Diameter

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued)

PID	Photoionization Detector
PCB	Polychlorinated Biphenyl
PPE	Personal Protective Equipment
ppm	Part Per Million
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
QAPP	Quality Assurance Project Plan
RA	Risk Assessment
RCRA	Resource Conservation and Recovery Act
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
RI	Remedial Investigation
RAB	Restoration Advisory Board
RI/FS	Remedial Investigation/Feasibility Study
SSA	Site Screening Area
SVOC	Semivolatile Organic Compound
SOP	Standard Operating Procedure
TAL	Target Analyte List
1,1,1-TCA	1,1,1-Trichloroethane
TCE	Trichloroethene
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
1,3,5-TNB	1,3,5-Trinitrobenzene
2,4,6-TNT	2,4,6-Trinitrotoluene
TSS	Total Suspended Solids
USEPA	United States Environmental Protection Agency
VDEQ	Virginia Department of Environmental Quality
VGS	Virginia Groundwater Standards
VOC	Volatile Organic Compound
VWQS	Virginia Water Quality Standards
WPNSTA Yorktown	Naval Weapons Station Yorktown, Yorktown, Virginia

1.0 INTRODUCTION

This Work Plan presents the scope of activities to be accomplished during the Round Two Remedial Investigation (RI) for Sites 9 and 19 at Naval Weapons Station Yorktown, Yorktown, Virginia (WPNSTA Yorktown). The location of WPNSTA Yorktown is presented on Figure 1-1. This document has been prepared by Baker Environmental, Inc. (Baker) under Contract Task Order (CTO)-0292 of the Department of the Navy's (DoN) Comprehensive Long-Term Environmental Action Navy (CLEAN) Program. During previous investigations, Sites 9 and 19 had been identified as potentially affecting the environment and, therefore, required further evaluation and possible remediation. The study and evaluation of these sites are being performed under a Federal Facilities Agreement (FFA) among the United States DoN, the United States Environmental Protection Agency (USEPA) Region III, and the Virginia Department of Environmental Quality (VDEQ).

These Site-Specific Work Plans are to be used in conjunction with the Master Project Plans for WPNSTA Yorktown, submitted under separate cover (Baker, 1994a). 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/interpretation methodologies; and other overall project activities. As such, methodology information contained in the Master Project Plans is incorporated by reference in the Site-Specific Work Plan, as applicable.

This Site-Specific Work Plan, which incorporates a HASP Addendum, provides a detailed description of site conditions and the findings of previous investigative work at the sites. In addition, the number and types of samples to be collected, the analytical methods to be used on those samples, specific sample locations, and the rationale for selecting these environmental media, locations, and analyses also are addressed. The plans also will establish the schedule for completion of field activities and project management and staffing plans.

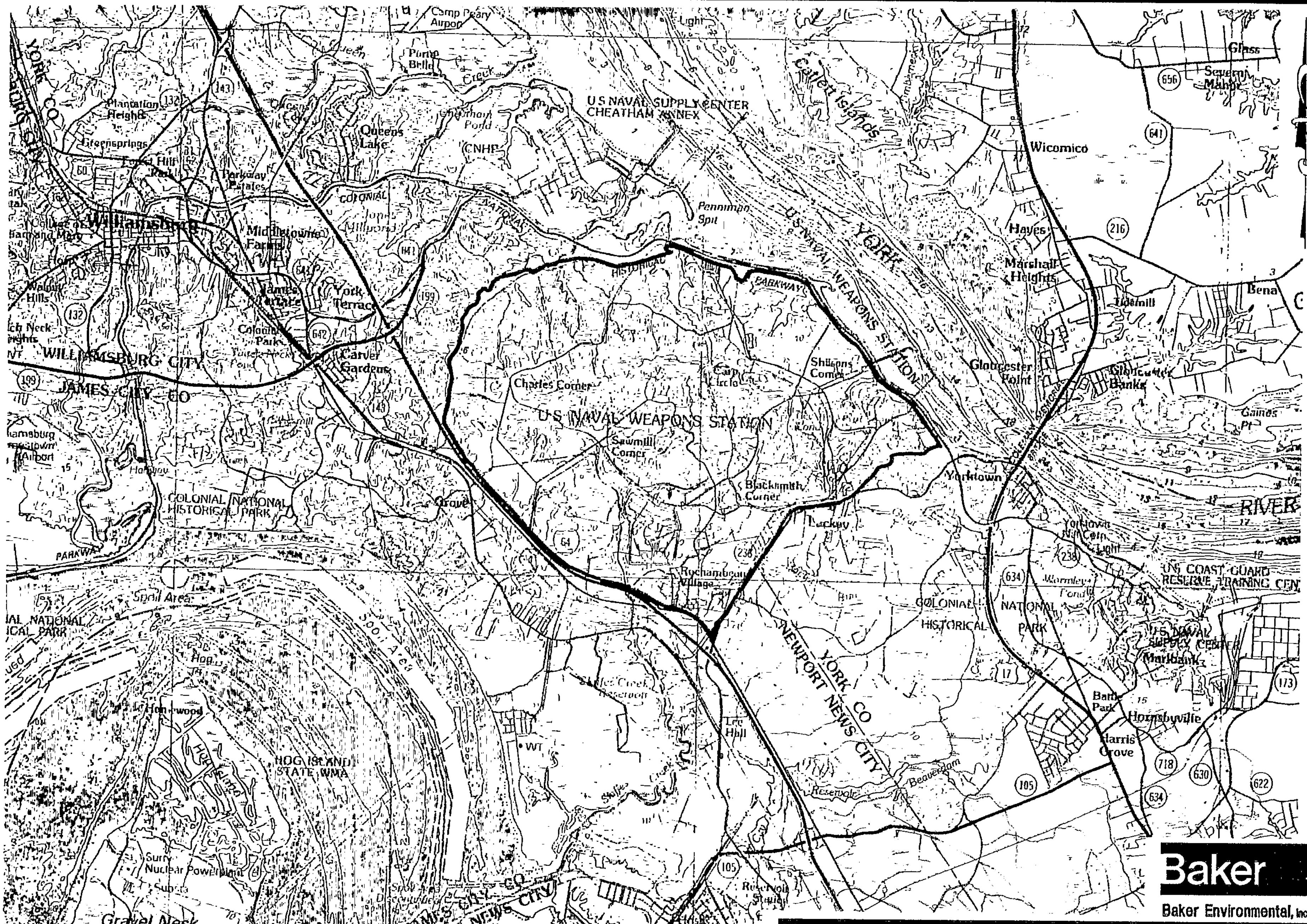
1.1 Purpose

The Round One RI investigated the extent of contamination at various sites and addressed data needs for additional investigations. The sampling and analyses presented in this plan for Sites 9 and 19 are designed to fill data gaps identified during the Round One RI conducted in 1992-1993 (Baker/Weston, 1993). This work plan also is designed to provide analytical data for use in human health and ecological risk assessments.

1.2 Document Organization and Presentation

This document is organized into six additional sections. Section 2.0 summarizes background information and the past site investigation results for Sites 9 and 19. 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 Risk Assessment and FS tasks. 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 also are presented in this section. Section 5.0 contains project management and staffing. Section 6.0 contains the schedule for field activities, while Section 7.0 lists the references used to develop this Work Plan.

FIGURES



8333 0 4166 8333 16666

1 inch = 8333 ft.

209108

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

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

2.0 SITE HISTORY AND RESULTS OF PREVIOUS INVESTIGATIONS

Most of the information provided has been gathered from the Site Management Plan (Baker, 1995a) and the Round One RI Report (Baker/Weston, 1993). Additional analytical information has been gathered from the treatability study for explosives-contaminated soil that Baker is conducting under a separate CTO and from confirmation data collected following a removal action at Site 9 conducted by IT Corporation (IT, 1995). (Note that the comparisons to background concentrations discussed below are comparisons to the limited background data collected during the Round One RI.) Additional background samples were collected during the summer 1994 field work and summarized in a background report (Baker, 1995b). All Round One RI data, additional data, and the data collected during this study will be used, as appropriate, 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 an overall description of the Station and site-specific information for Sites 9 and 19.

2.1.1 Facility Description

WPNSTA Yorktown is a 10,624 acre installation located on the Virginia Peninsula in York and James City Counties and the City of Newport News (Figure 1-1). The facility is bounded on the northwest by the Naval Supply Center Cheatham Annex, the Virginia Emergency Fuel Farm, and the future community 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.

2.1.2 Site 9 - Plant 1 Explosives-Contaminated Wastewater Discharge Area

Site 9 is a discharge area which had been used as a drainage way for Plant 1 (Building 10) nitramines/nitroaromatics (explosives)-contaminated wastewater and possibly for substantial quantities of organic solvents. The drainage area was reportedly used from the late 1930s to 1975. In 1975, a carbon adsorption tower was installed to treat the contaminated wastewater prior to discharge to the drainage way. A National Pollutant Discharge Elimination System (NPDES) permit was granted by the USEPA Region III to allow this discharge. In 1986, the discharge from the treatment tower was diverted to the sanitary sewer and ultimately to the Hampton Roads Sanitation District (HRSD).

Site 9 is topographically downgradient from Site 19, Conveyer Belt Soil at Building 10. Based on estimated discharges of 100 parts per million (ppm) of TNT and RDX and 30 ppm of HMX at 5 gallons per minute (gpm) for 2 hours per workday for 40 years, an estimated 5,200 pounds of TNT and RDX and 1,600 pounds of HMX may have been discharged to the site (C.C. Johnson & Associates, Inc. and CH_2M Hill, 1984). Solvents such as trichloroethene (TCE) may have been discharged from Plant 1 with the explosives wastewater. Contaminants from Plant 1 may have migrated via surface water into Lee Pond or across the upper soil via overland flow in the area of the pond near Building 10. Lee Pond drains into the eastern branch of Felgates Creek, which in turn flows northward to the York River, approximately 1.5 miles from Site 9. The location of Site 9 is presented on Figure 2-1.

2.1.3 Site 19 - Conveyor Belt Soil at Building 10

The conveyor belt at Site 19 (between Buildings 10 and 98) carried TNT powder packaged in containers across a depression into the loading building. The conveyer belt is completely enclosed with corrugated metal, but holes are visible along the floors and walls. TNT dust may have been released to the soil below when boxes fell from the conveyor. The conveyor and walls/floors were sprayed with water to control dust; this rinse water may have dripped onto the ground surface below.

TNT-contaminated soil has been reported in the vicinity of the conveyor belt. Soil beneath the belt was removed in 1973-1974, but later tests indicated the presence of RDX and TNT. It is possible that contamination from Site 19 has migrated via runoff toward Lee Pond. Analyses have confirmed TNT contamination in Lee Pond. Lee Pond will be investigated in the future as a separate Site Screening Area (SSA 20). The location of Site 9 is presented on Figure 2-1.

2.2 Results of Previous Investigations

The following section summarizes the analytical results of the Round One RI (Baker/Weston, 1993a). In addition, the soil results from the treatability study sampling (Baker, 1995c) at Sites 9 and 19 are presented.

2.2.1 Soil Results

Soil samples were collected at Sites 9 and 19 during the Round One RI and analyzed for the full suite of Contract Laboratory Program (CLP) parameters. Soil was collected from the 0- to 2- foot below ground surface (bgs) interval. Results of the sample analyses are presented on Figure 2-2 and summarized in the following section.

2.2.1.1 Site 9 Soil Results

Six surface soil samples collected from Site 9 for the Round One RI indicate that several semivolatile organic compounds (SVOCs) were detected across the site. The highest SVOC concentrations were detected in the sample collected from location 9S16, ranging from 39J micrograms per kilogram (µg/kg) fluorene to 1,100 µg/kg fluoranthene. The "J" qualifier indicates that the reported sample

concentration value has been estimated. No volatile organic compounds (VOCs) were detected in any of the surface soil samples. The explosive analyses showed the presence of 2,4,6-TNT in four of the soil samples (9S15, 9S16, 9S17, and 9S19) at levels above the criteria ranging from 2,900 µg/kg to 2,100,000 µg/kg. Explosive compounds 2,4-dinitrotoluene (2,4-DNT) and 1,3,5-trinitrobenzene (1,3,5-TNB) also were detected in the sample collected from location 9S19, at concentrations below the criteria of 3,200 and 3,000 µg/kg, respectively. Inorganic concentrations and pH levels were within the ranges found in the background surface soil samples.

One soil sample was collected from the soil boring advanced at the location of HydroPunch™ 9HP03 and analyzed for VOCs because odors observed in the field indicated the possible presence of volatile compounds. Ethylbenzene, at an estimated concentration of 8J µg/kg, was the only VOC detected. This compound was not detected in the groundwater sample collected from the same location.

2.2.1.2 Site 19 Soil Results

Six surface soil samples were collected during the Round One RI at Site 19. Acetone (a common laboratory contaminant) was the only VOC detected in the surface soil samples. Several SVOCs were detected in the surface soil samples, with the highest concentrations (24 to 480 µg/kg) and the largest number of analytes present in sample 19S19, the sample collected from beneath the conveyor belt connecting Buildings 10 and 528. Explosives were detected in sample 19S17, which was collected from a drainage swale along the road west of Site 19, and in sample 19S20, which was collected midway between the two conveyor belts in this area. Soil samples collected from beneath and adjacent to the conveyor belt did not contain any explosive compounds. Inorganic concentrations in the surface soil were generally close to Round One RI surface soil levels in the site control samples, with occasional variations.

The explosives analysis of the surface soil collected from beneath the conveyor belt showed lower concentrations than in investigations conducted before the Round One RI. The partial removal of the soil in the 1970s would account for this difference. Concentrations of other compounds were similar to previous results.

Six soil samples were collected from the soil borings advanced prior to installation of the groundwater monitoring wells at Site 19. Analysis of these samples indicated the following:

- No VOCs or SVOCs were detected in the shallow sample from soil boring 19SB01, the boring advanced prior to installation of monitoring well 19GW01. The deep sample, collected from just above the water table, contained 61J µg/kg of di-n-butylphthalate. This compound was not detected in the duplicate sample.

- Results of soil sample 19SB02-001, collected from 0- to 2- ft bgs, showed 2J µg/kg of toluene, 57J µg/kg of di-n-butylphthalate, and 210J µg/kg of bis(2-ethylhexyl)phthalate. The deep soil sample from soil boring 19SB02 showed 45J µg/kg of di-n-butylphthalate and 2,120J µg/kg of bis(2-ethylhexyl)phthalate.

- Several SVOCs were detected in the shallow soil sample collected from soil boring 19SB03 including fluoranthene (74J µg/kg), pyrene (95J µg/kg), benzo(b)fluoranthene (140J µg/kg), benzo(k)fluoranthene (130J µg/kg), benzo(a)-pyrene (86J µg/kg), and indeno(1,2,3-cd)pyrene (74J µg/kg). The only SVOC detected in the deep soil sample was phenol (280J µg/kg). No VOCs were detected.

- The only soil boring sample containing explosives was the deep soil sample from soil boring 19SB03, which contained 8,200 µg/kg of 2,4,6-TNT (below criteria). All inorganic concentrations in the soil boring samples were within background soil boring concentration ranges.

2.2.2 Surface Water and Sediment Results

Surface water and sediment samples were collected at Site 9. Sediment samples only were collected at Site 19 during the Round One RI. These samples were analyzed for the full suite of CLP parameters. Results of the surface water and sediment samples are presented on Figures 2-3 and 2-4.

2.2.2.1 Site 9 Surface Water and Sediment Results

A total of seven surface water and sediment samples were collected at Site 9 during the Round One RI. The surface water sample collected from station 9SW06 showed the presence of 6J micrograms per liter (µg/L) of 1,1 dichloroethane and 18 µg/L of 1,1,1-trichloroethane (1,1,1-TCA); 1,1,1-TCA also was detected in surface water sample 9SW01 (1J µg/L). Trace amounts (<20 µg/L) of acetone were detected in surface water samples 9SW04, 9SW05, and 9SW07. Explosives were detected in all surface water samples collected at Site 9 except for 9SW02 and 9SW03 which were obtained at points furthest away from the suspected source. Samples 9SW01 and 9SW06 showed the highest levels of explosives contamination along with the widest range of contaminants. 2,4,6-TNT was present in high concentrations (190 to 370 µg/L) in samples 9SW01, 9SW04, and 9SW06, located along the main drainage channel. Explosives concentrations were higher than those detected in previous investigations.

The inorganic analysis results for the surface water samples at Site 9 are summarized below. Complete results are presented on Table 2-1.

- Total and dissolved inorganic concentrations in sample 9SW01-001 were below Virginia Water Quality Standards (VWQS) and Clean Water Act (CWA) freshwater chronic criteria.

- The lead concentration in the total inorganic sample 9SW02-001 (19.8 µg/L) exceeded the CWA freshwater chronic level of 3.2 µg/L. The zinc concentration also was above both the CWA and VWQS criteria in the total inorganic samples. The dissolved inorganic sample did not contain detectable concentrations of lead or zinc concentrations above the criteria.

- Total and dissolved inorganic concentrations in samples 9SW03-001, 9SW03-101 (duplicate), 9SW04-001, and 9SW05-001 were below the VWQS and CWA freshwater chronic criteria.

- Copper exceeded the CWA freshwater chronic criteria in sample 9SW06-001.

- The total and dissolved inorganic concentrations in surface water sample 9SW07-001 were below the VWQS and CWA criteria.

- The total and dissolved inorganic concentrations were generally similar to those detected in background samples.

The sediment samples collected in association with Site 9 showed the presence of several SVOCs; previous results showed similar concentrations. Sediment samples collected from locations 9SD01 and 9SD04 contained concentrations of SVOCs that exceeded the National Oceanic and Atmospheric Administration (NOAA) effects range-low (ER-L) criteria and the Apparent Effects Threshold (AET). Sediment samples from stations 9SD05 and 9SD06 contained levels of SVOCs above the NOAA effects range-median (ER-M) and AET concentrations. Acetone and 2-butanone were the only VOCs detected in any of the sediment samples (samples 9SD07-001 and 9SD07-002); however, these compounds are common laboratory contaminants and are not considered to be site related. No explosives were detected in any of the sediment samples collected from Site 9, consistent with previous investigation results. Inorganic concentrations were generally similar to those found in the background sediment samples. Arsenic, lead, mercury, copper, and zinc were detected in at least one sediment sample collected from Site 9 at a concentration above the NOAA ER-L criteria.

2.2.2.2 Site 19 Surface Water and Sediment Results

There was no surface water present at Site 19; however, two sediment samples were collected from a concrete drainage way located along the west side of Building 10. No VOCs or explosives were detected in these samples. Several SVOCs were detected in both samples at concentrations that exceeded the NOAA sediment screening criteria. All of the constituents detected in sample 19SD01-001 exceeded the ER-M and AET concentrations. The concentrations of inorganics detected in the sediment samples at Site 19 were comparable to those found in background sediment samples. The zinc concentration in sample 19SD01-001 was slightly higher than the NOAA ER-L concentration.

2.2.3 Groundwater Results

Groundwater samples were collected at Sites 9 and 19 during the Round One RI and analyzed for the full suite of CLP parameters. Results of groundwater sampling are presented on Figure 2-5 and Table 2-2.

2.2.3.1 Site 9 Groundwater Results

The three groundwater samples collected from Site 9, obtained using a HydroPunch™ sampler, showed no detectable concentrations of VOCs. The only SVOC detected in the groundwater samples was 1J µg/L diethylphthalate from sample location 9HP01. No explosives were detected in this sample. Explosives were found in the other two groundwater samples. Sample 9HP03 contained 0.89 µg/L of 2,4-DNT and 2,300 µg/L of 2,4,6-TNT. Sample 9HP02 was found to contain 6.3 µg/L of 1,3,5-TNB, 2.2 µg/L of 2,4,6-TNT, and 12J µg/L of 2,4-DNT.

The inorganic analysis results from the groundwater samples collected from Site 9 are summarized below and are presented in Table 2-2.

- The total inorganic analysis of sample 9HP01-001 showed concentrations of barium, chromium, mercury, and zinc above the Virginia Groundwater Standard (VGS). Barium, beryllium, chromium, and nickel concentrations were detected above the maximum contaminant level (MCLs). The lead concentration exceeded the Federal action level. All dissolved inorganic concentrations were below these criteria.

- Barium, chromium, lead, mercury, and zinc were present at concentrations above the VCS in the total inorganic sample 9HP02-001. Lead was detected above the Federal action level concentration. Beryllium, chromium, and nickel concentrations were detected above MCLs. The dissolved inorganic analysis showed concentrations below criteria.

- The total inorganic analysis of sample 9HP03-001 contained cadmium, lead, and zinc concentrations above the VGS. Beryllium and cadmium exceeded the Federal

MCL. Lead exceeded the Federal action level. In the dissolved inorganic samples, zinc remained above the VGS.

- The total inorganic concentrations in groundwater samples collected from Site 9 were typically higher than those in background groundwater samples. The dissolved inorganic samples were similar to background ranges.

2.2.3.2 Site 19 Groundwater Results

Three groundwater samples were collected from the monitoring wells at Site 19. No VOCs, SVOCs, nitrates, or explosives were detected in groundwater samples 19GW01 and 19GW02. Explosives were the only compounds detected in sample 19GW03 (1.3J µg/L 1,3,5-TNB and 5.1 µg/L 2,4,6-TNT). These results are consistent with the potentiometric surface evaluation that the groundwater flow is westerly towards Lee Pond.

The total and dissolved inorganic analyses performed on the groundwater samples did not indicate the presence of any inorganics above criteria (see Table 2-2). The concentrations of magnesium, calcium, and manganese were above background in the total and dissolved inorganic samples collected from 19GW03. Groundwater samples collected from the other two monitoring wells showed inorganic concentrations similar to background.

Site 19 appears to have been impacted by explosives contamination, as evidenced by the presence of these compounds in the soil and groundwater. Sediment does not appear to have been affected by previous site operations. SVOCs are present but appear to be widespread in this area and are not necessarily site related.

2.2.4 Confirmation Sampling

A Soil Characterization Study (Baker, 1995c) was conducted to support a treatability study for explosives-contaminated soil and included Sites 6, 7, 9, and 19. Representative, composite soil samples were collected and analyzed for nitramine compounds. The soil was collected from 0- to 12-inches bgs.

high as 2,100 milligrams per kilogram (mg/kg). TNT also was found in surface water samples, both in the ditch and in Lee Pond (near the point of discharge to the pond). The measured concentration in the pond surface water was 190 µg/L, indicating very little dilution by the pond at the point of sample collection. Other surface water samples in Lee Pond, more remote from the discharge, did not contain explosives. SVOCs were abundant in the soil and sediment. No monitoring wells were installed at Site 9; however, three HydroPunch™ samples were taken to investigate groundwater concentrations. The HydroPunch™ samples were relatively close together and the samples showed the presence of explosives. The results were generally very low (total compound concentrations less than 10 µg/L), except for the concentration of TNT in one sample at 2,300 µg/L.

Inorganic concentrations in soil were in the range of background samples, and the Lee Pond sample closest to the discharge of the ditch did not show any inorganic levels above criteria. In filtered groundwater samples, only beryllium and zinc were above criteria, and these two inorganics were not elevated above background in the soil samples.

At Site 19, TNT was the most significant detection present at concentrations of 120 mg/kg in soil at two locations near, but not directly under, the conveyor belt extending perpendicular from Building 10. No explosives were detected in soil under the conveyor belt; this may be attributable to the previous removal action. SVOCs also were detected in shallow soil and sediment at four locations, all of which are adjacent to or near the railroad tracks. Most of the SVOC detections were estimated values of less than 500 µg/kg, although at 19SD01 (adjacent to the railroad tracks and just north of the conveyor belt), five SVOCs were detected in the 2 mg/kg range. Inorganic concentrations in soil and sediment were comparable to background concentrations.

Very low levels of explosives (5.1 µg/L TNT) were found in the groundwater sample from one monitoring well that was located near one of the soil sampling locations where high concentrations of TNT were detected.

The rationale for the additional RI activities at Sites 9 and 19 is based upon data from the Round One RI and data gaps identified during the Round One RI. The Round One RI also recommended that specific activities be performed during Round Two. Specifically, the following data gaps were identified and recommendations made:

- Site 9
  - Collect additional surface water samples at location 9SW01.
  - Conduct additional soil sampling to define the extent of explosives contamination upgradient of location 9S15, which is located at the northeastern end of the drainage way adjacent to Building 10.
  - Collect additional soil boring samples near location 9HP03 to characterize the fill along Bollman Road.
  - Install shallow wells to further assess the extent of contamination.
  - Conduct a risk evaluation.
- Site 19
  - Sample soil in the area around the conveyor belt and analyze for explosives.
  - Perform a risk evaluation.

TABLES

TABLE 2-1

METALS CONCENTRATIONS (µg/L) FOR SURFACE WATER SAMPLES
ROUND ONE REMEDIAL INVESTIGATION
SITE 9
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

SITE ID	VWQS	CWA	9SW01-001	9SW02-001	9SW03-001
ANALYTE	Criteria	Criteria			
Aluminum			116	1,820	35.00 U
Aluminum (dissolved)			35.00 U	35.00 U	35.00 U
Antimony			44.00 U	44.00 U	44.00 U
Antimony (dissolved)			44.00 U	44.00 U	44.00 U
Arsenic		190/36	3.00	16.10	2.60
Arsenic (dissolved)			2.00	2.10	2.30
Barium			35.70	84.70	13.00
Barium (dissolved)			43.70	50.90	26.80
Beryllium			1.00 U	1.00 U	1.00 U
Beryllium (dissolved)			1.00 U	1.00 U	1.00 U
Cadmium	--/9.3	1.1/--	4.00 U	4.00 U	4.00 U
Cadmium (dissolved)			4.00 U	4.00 U	4.00 U
Calcium			86,600 J	54,900 J	33,400 J
Calcium (dissolved)			90,400 J	44,900 J	35,200 J
Chromium	11/50		8.00 U	8.00 U	8.00 U
Chromium (dissolved)			8.00 U	8.00 U	8.00 U
Cobalt			6.00 U	6.00 U	6.00 U
Cobalt (dissolved)			6.00 U	6.00 U	6.00 U
Copper	--/2.9	12/2.9	5.00 U	5.00 U	5.00 U
Copper (dissolved)			5.00 U	5.00 U	5.00 U
Iron			812 J	25,500 J	789 J
Iron (dissolved)			19.00 UJ	94.50 UJ	197 J
Lead		3.2/8.5	2.00 UJ	19.80 (d)	2.00 UJ
Lead (dissolved)			2.00 UJ	2.00 UJ	2.00 UJ
Magnesium			1,930	1,650	1,010
Magnesium (dissolved)			1,890	1,210	1,040
Manganese			51.00	645	36.40
Manganese (dissolved)			37.80	131	19.60
Mercury	.012/.025	.012/.025	0.10 U	0.10 U	0.10 U
Mercury (dissolved)			0.10 U	0.10 U	0.10 U
Nickel	--/8.3	160/8.3	18.00 U	18.00 U	18.00 U
Nickel (dissolved)			18.00 U	18.00 U	18.00 U
Potassium			1,450	1,710	970 U
Potassium (dissolved)			970 UJ	970 UJ	970 UJ
Selenium	5/71	5/71	2.00 R	2.00 R	2.00 R
Selenium (dissolved)			2.00 R	2.00 R	2.00 R
Silver			6.00 U	6.00 U	6.00 U
Silver (dissolved)			6.00 U	6.00 U	6.00 U
Sodium			7,160 J	4,140 J	3,900 J
Sodium (dissolved)			7,250 J	4,240 J	3,780 J
Thallium			2.00 UJ	2.00 U	2.00 U
Thallium (dissolved)			2.00 UJ	2.00 U	2.00 UJ
Vanadium			6.00 U	40.00	6.00 U
Vanadium (dissolved)			6.00 U	6.00 U	6.00 U
Zinc	--/86	110/86	45.20 U	92.80	20.10
Zinc (dissolved)			14.50	15.20	16.90

TABLE 2-1 (Continued)

METALS CONCENTRATIONS (µg/L) FOR SURFACE WATER SAMPLES
ROUND ONE REMEDIAL INVESTIGATION
SITE 9
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

SITE ID	VWQS	CWA	9SW03-101	9SW04-001	9SW05-001	9SW06-001	9SW07-001
ANALYTE	Criteria	Criteria					
Aluminum			76.10	106	66.30	613	159
Aluminum (dissolved)			35.00 U	35.00 U	35.00 U	35.00 U	35.00 U
Antimony			44.00 U	44.00 UJ	44.00 UJ	44.00 UJ	44.00 U
Antimony (dissolved)			44.00 U	44.00 UJ	44.00 UJ	44.00 UJ	44.00 U
Arsenic		190/36	2.70	2.40 J	2.70 J	46.10 J	4.10
Arsenic (dissolved)			2.00	2.00 R	2.00R	3.40 J	2.20
Barium			15.90	35.70	42.70	63.50	44.30
Barium (dissolved)			26.80	34.50	37.30	39.50	53.20
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			33,800 J	84,500	88,100	68,200	55,500 J
Calcium (dissolved)			35,100 J	82,500	81,900	64,800	55,200 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	6.00 U	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	5.00 U	7.70 J	5.00 U	15.40 J (d)	5.00 U
Copper (dissolved)			5.00 U	7.70 J	7.70 J	5.00 U	5.00 U
Iron			926 J	944	1,350	21,300	3,780 J
Iron (dissolved)			296 J	61.80	54.00	98.90	361 J
Lead		3.2/8.5	2.00 UJ	2.00 U	2.00 U	2.90 J	2.00 UJ
Lead (dissolved)			2.00 UJ	2.00 U	2.00 U	2.00 U	2.00 UJ
Magnesium			1,010	1,950	2,060	2,800	1,600
Magnesium (dissolved)			1,210	1,960	1,860	2,640	1,430
Manganese			40.70	40.50	81.00	145	207
Manganese (dissolved)			22.40	33.30	49.60	87.40	158
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			1,530	970 U	970 U	1,220	3,790
Potassium (dissolved)			970 U	976	1,470	970 U	1,100 J
Selenium	5/71	5/71	0.00 R	2.00 UJ	2.00 UJ	2.00 UJ	2.00 R
Selenium (dissolved)			2.00 R	2.00 UJ	2.00 UJ	2.00 UJ	2.00 R
Silver			6.00 U	6.00 U	7.90	6.00 U	6.00 U
Silver (dissolved)			6.00 U	6.00 U	6.00 U	6.00 U	6.00 U
Sodium			3,560 J	8,510 J	8,700 J	7,230 J	4,590 J
Sodium (dissolved)			3,790 J	8,280 J	8,440 J	6,780 J	4,930 J
Thallium			2.00 U	2.00 UJ	2.00 UJ	2.60 J	2.00 U
Thallium (dissolved)			2.00 U	2.00 UJ	2.00 UJ	2.00 UJ	2.00 UJ
Vanadium			6.00 U	6.00 U	6.00 U	6.00 U	6.00 U
Vanadium (dissolved)			6.00 U	6.00 U	6.00 U	6.00 U.	6.00 U
Zinc	--/86	110/86	24.00 U	30.00 J	27.00 J	43.80 J	29.90 U
Zinc (dissolved)			15.10	16.50 J	15.60 J	19.90 J	17.10

TABLE 2-2

METALS CONCENTRATIONS (µg/L) FOR GROUNDWATER SAMPLES
ROUND ONE REMEDIAL INVESTIGATION
SITES 9 AND 19
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

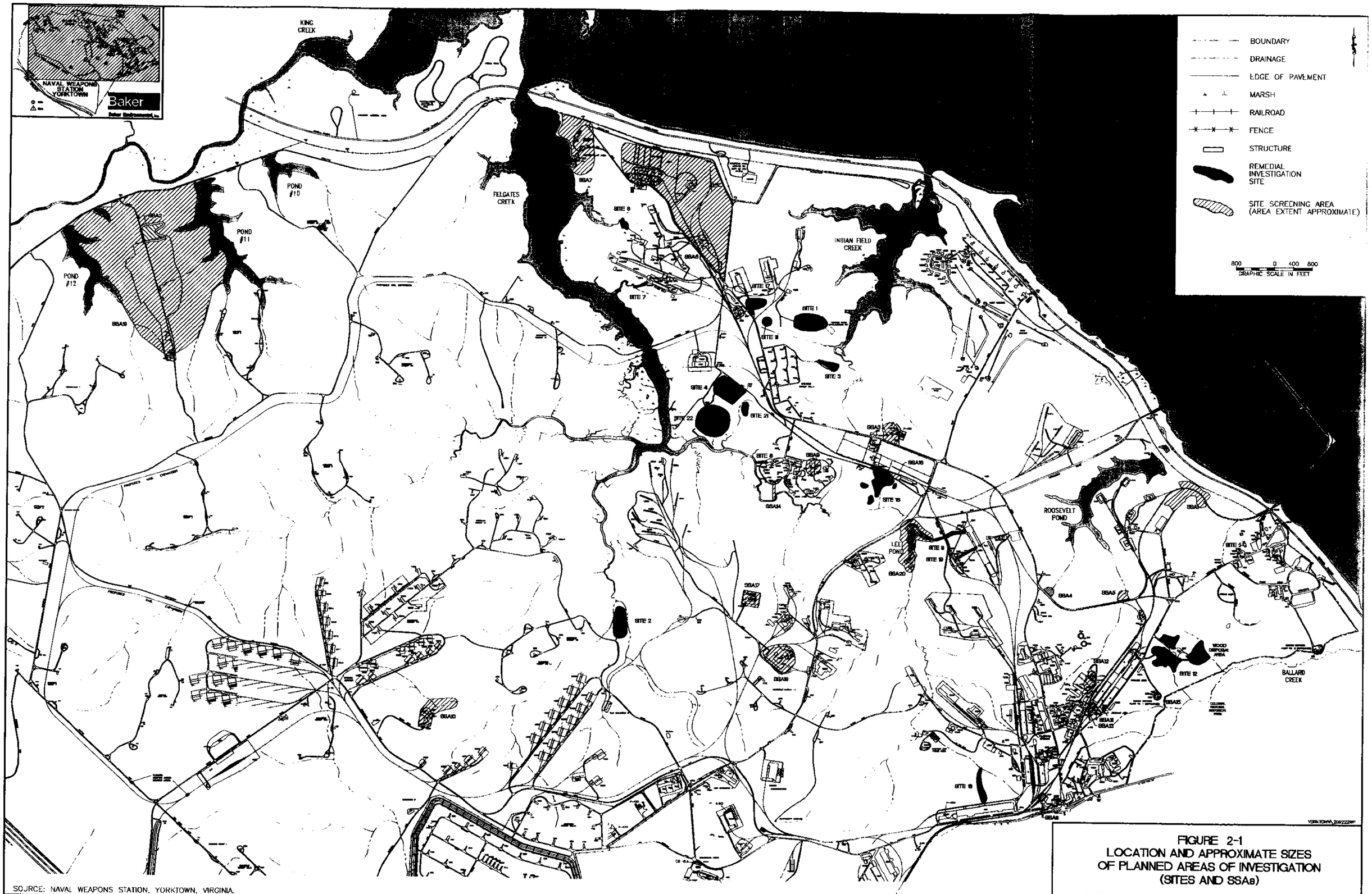
SITE ID	Federal	Federal	VGS	9HP01-001	9HP02-001	9HP03-001	19GW01-001
ANALYTE	MCL	SMCL					
Aluminum		200		85,300 J (c) *	62,800 J (c) *	31,100 J (c) *	819 J (c)
Aluminum (dissolved)				35.00 UJ	35.00 UJ	35.00 UJ	89.90 UJ
Antimony	6			44.00 R	44.00 R	44.00 R	44.00 U
Antimony (dissolved)				44.00 R	44.00 R	44.00 R	44.00 U
Arsenic	50		50	2.00 R	2.60 J	6.90 J	2.00 U
Arsenic (dissolved)				2.00 R	2.00 R	23.20 J	2.00 U
Barium	2,000		1,000	2,070 (d) *	1,010 J (a) *	728 J *	59.10
Barium (dissolved)				22.90	39.60 J	515 J *	63.20
Beryllium	4			25.30 (b) *	10.40 J (b) *	5.10 J (b) *	1.00 U
Beryllium (dissolved)				1.00 U	1.10 J	1.10 J	1.00 U
Cadmium	5		0.04	4.00 U	4.00 U	5.80 (d)	4.00 UJ
Cadmium (dissolved)				4.00 U	4.00 U	4.00 U	4.00 UJ
Calcium				125,000	2,030,000 J *	85,300 J	118,000
Calcium (dissolved)				41,500	126,000 J	83,700 J	130,000
Chromium	100		50	205 J (d)	299 J (d) *	32.40 J	8.00 U
Chromium (dissolved)				8.00 UJ	8.00 UJ	8.00 U	8.00 U
Cobalt				339 *	147 J *	34.30 J *	6.00 U
Cobalt (dissolved)				6.00 U	6.00 UJ	11.60 J	6.00 U
Copper	1,300**	1,000	1000	26.00 *	56.30 J *	16.00 J	5.00 UJ
Copper (dissolved)				5.00 U	5.00 UJ	5.00 UJ	5.00 UJ
Iron		300	300	256,000 J (e) *	254,000 J (e) *	107,000 J (e) *	2,090 J (e)
Iron (dissolved)				23.30 UJ	19.00 U	42,300 J (e)	792 J (e)
Lead	15**		50	39.20 J (b) *	119 (d) *	248 (d) *	2.00 U
Lead (dissolved)				2.00 UJ	2.00 UJ	20.00 UJ	2.00 U
Magnesium				12,400 *	23,500 J *	27,500 J *	1,910 J
Magnesium (dissolved)				2,100	3,360 J	26,500 J *	2,120 J
Manganese		50	50	9,130 (e) *	8,890 J (e) *	1,070 J (e) *	30.20
Manganese (dissolved)				21.90	587 J (e) *	251 J (e) *	23.90
Mercury	2		0.05	1.24 (a) *	1.82 J (a) *	0.10 UJ	0.10 U
Mercury (dissolved)				0.10 U	0.10 UJ	0.10 UJ	0.10 U
Nickel	100			118 (b)	164 J (b)	38.00 J	18.00 U
Nickel (dissolved)				18.00 U	18.00 UJ	18.00 UJ	18.00 U
Potassium				8,420 *	11,600 *	27,200 *	970 U
Potassium (dissolved)				970 U	1,400	26,900 *	970 U
Selenium	50		10	2.00 R	20.00 R	2.00 R	2.00 UJ
Selenium (dissolved)				2.00 R	2.00 R	2.00 R	2.00 UJ
Silver		100		20.90	13.60	9.40	6.00 UJ
Silver (dissolved)				6.00 U	6.00 U	6.00 U	6.00 UJ
Sodium			100,000	5,540 J	28,600 J *	22,900 J *	5,270
Sodium (dissolved)				5,110 J	12,200 J *	23,800 J *	6,010
Thallium	2			2.00 UJ	2.00 UJ	2.00 UJ	2.00 U
Thallium (dissolved)				2.00 UJ	2.00 UJ	2.00 UJ	2.00 U
Vanadium				203 J *	363 J *	40.60 J *	6.00 U
Vanadium (dissolved)				9.10 U	13.90 UJ	6.00 UJ	6.00 U
Zinc		5,000	50	347 J (a) *	438 J (a) *	3,940 J (a) *	16.50
Zinc (dissolved)				12.20 J	6.10 J	774 J (a)	6.00 U
Nitrates	10,000		5,000	NA	NA	NA	100 U

TABLE 2-2 (Continued)

METALS CONCENTRATIONS (µg/L) FOR GROUNDWATER SAMPLES
ROUND ONE REMEDIAL INVESTIGATION
SITES 9 AND 19
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

SITE ID	Federal	Federal	VGS	19GW02-001	19GW03-001
ANALYTE	MCL	SMCL			
Aluminum		200		2,590 J (c) *	4,510 J (c) *
Aluminum (dissolved)				76.80 UJ	35.00 UJ
Antimony	6			44.00 U	44.00 U
Antimony (dissolved)				44.00 U	44.00 U
Arsenic	50		50	2.00 U	8.60
Arsenic (dissolved)				2.00 U	2.00 U
Barium	2,000		1,000	95.30	64.40
Barium (dissolved)				86.20 *	52.70
Beryllium	4			1.00 U	1.00 U
Beryllium (dissolved)				1.00 U	1.00 U
Cadmium	5		0.04	4.50 J (a)	4.00 UJ
Cadmium (dissolved)				4.00 UJ	4.00 UJ
Calcium				157,000	175,000
Calcium (dissolved)				148,000	185,000
Chromium	100		50	11.70	14.00
Chromium (dissolved)				8.00 U	8.00 U
Cobalt				6.00 U	6.00 U
Cobalt (dissolved)				6.00 U	6.00 U
Copper	1,300**	1,000	1000	5.00 UJ	5.00 UJ
Copper (dissolved)				8.10 U	5.00 UJ
Iron		300	300	6,150 J (e)	15,800 J (e)
Iron (dissolved)				19.00 U	19.00 U
Lead	15**		50	5.00	6.70
Lead (dissolved)				2.00 U	2.00 U
Magnesium				2,940 J	5,900 J *
Magnesium (dissolved)				2,730 J	5,710 J *
Manganese		50	50	79.00 (e)	3,480 (e) *
Manganese (dissolved)				26.20	4,010 (e) *
Mercury	2		0.05	0.10 U	0.10 U
Mercury (dissolved)				0.10 U	0.10 U
Nickel	100			18.00 U	18.00 U
Nickel (dissolved)				18.00 U	18.00 U
Potassium				2,640 U	2,250 U
Potassium (dissolved)				970 U	970 U
Selenium	50		10	2.00 UJ	2.00 UJ
Selenium (dissolved)				2.00 UJ	2.00 UJ
Silver		100		6.00 UJ	6.00 U
Silver (dissolved)				6.00 UJ	6.00 UJ
Sodium			100,000	6,120	9,480
Sodium (dissolved)				5,500	8,650
Thallium	2			2.00 U	2.00 U
Thallium (dissolved)				2.00 U	2.00 U
Vanadium				7.50	19.10
Vanadium (dissolved)				6.00 U	6.00 U
Zinc		5,000	50	35.80	31.50
Zinc (dissolved)				13.90	7.60
Nitrates	10,000		5,000	100 U	100 U

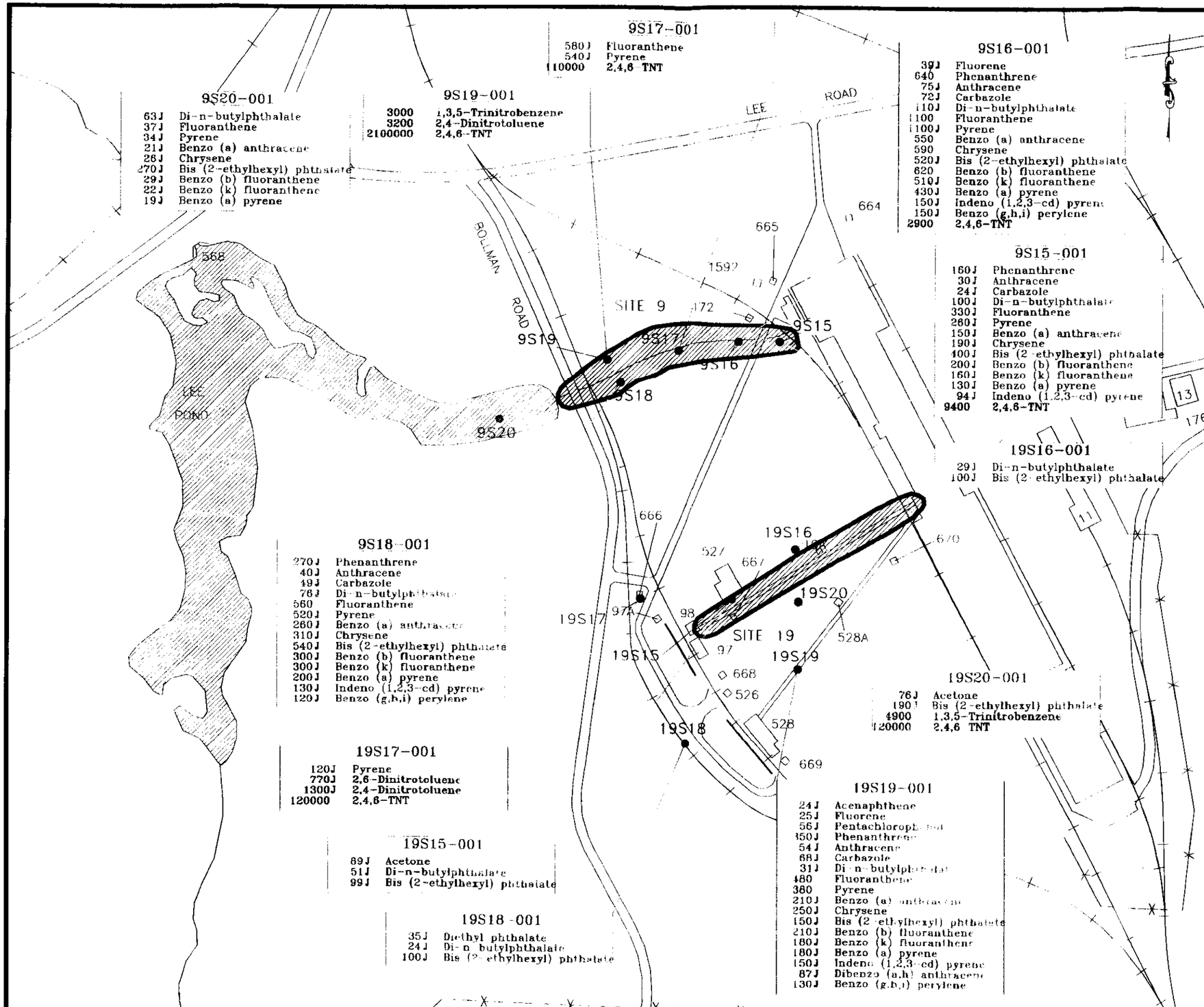
FIGURES

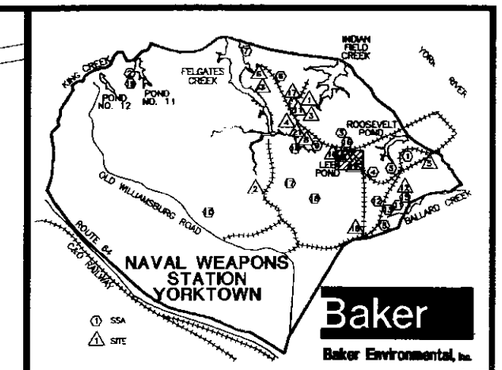


SOURCE: NAVAL WEAPONS STATION, YORKTOWN, VIRGINIA.

FIGURE 2-1
LOCATION AND APPROXIMATE SIZES
OF PLANNED AREAS OF INVESTIGATION
(SITES AND SSAs)

NAVAL WEAPONS STATION YORKTOWN — YORKTOWN, VIRGINIA





200 0 100 200
1 inch = 200 ft.

BOUNDARY
DRAINAGE
MARSH
RAILROAD
FENCE
EDGE OF PAVEMENT
STRUCTURE
REMEDIAL INVESTIGATION SITE OR SITE SCREENING AREA (SSA)
APPROXIMATE SITE DELINEATION

19S20 SOIL SAMPLE LOCATION

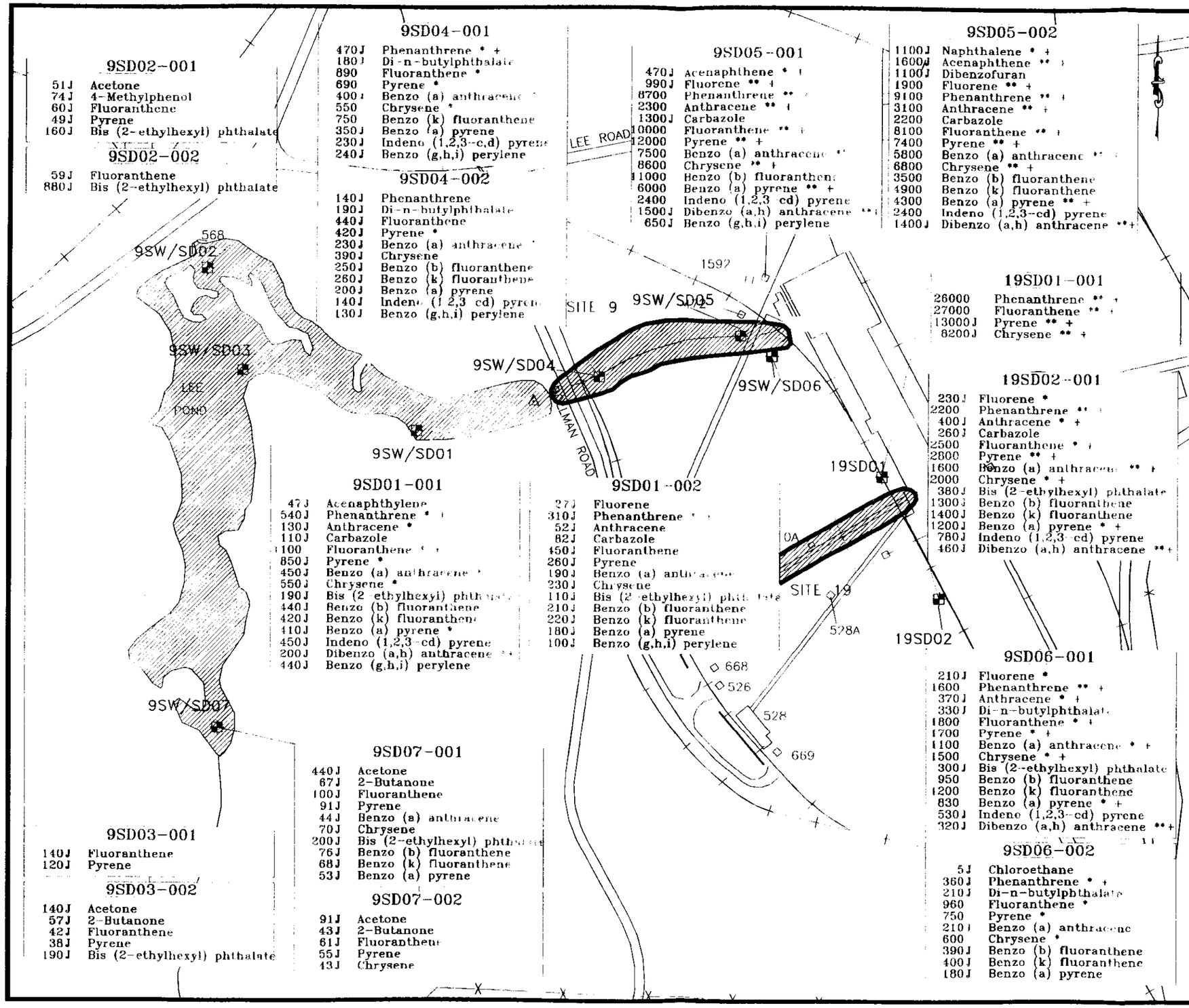
ANALYTICAL PARAMETER COLOR CODING	
55J	VOC (black)
91J	BNA (cyan)
43J	Explosive (red)
61J	Pesticide (green)
43J	PCB (orange)

NOTE ALL CONCENTRATIONS ARE IN ug/kg.

292517WP

FIGURE 2-2
SURFACE SOIL SAMPLES FROM SOU-III - LEE POND SITES 9 AND 19

NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA



9SD02-001

51J	Acetone
74J	4-Methylphenol
60J	Fluoranthene
49J	Pyrene
160J	Bis (2-ethylhexyl) phthalate

9SD02-002

59J	Fluoranthene
880J	Bis (2-ethylhexyl) phthalate

9SD04-001

470J	Phenanthrene * +
180J	Di-n-butylphthalate
890	Fluoranthene *
690	Pyrene *
400J	Benzo (a) anthracene *
550	Chrysene *
750	Benzo (k) fluoranthene
350J	Benzo (a) pyrene
230J	Indeno (1,2,3-c,d) pyrene
240J	Benzo (g,h,i) perylene

9SD04-002

140J	Phenanthrene
190J	Di-n-butylphthalate
440J	Fluoranthene
420J	Pyrene *
230J	Benzo (a) anthracene *
390J	Chrysene
250J	Benzo (b) fluoranthene
260J	Benzo (k) fluoranthene
200J	Benzo (a) pyrene
140J	Indeno (1,2,3-cd) pyrene
130J	Benzo (g,h,i) perylene

9SD05-001

470J	Acenaphthene * +
990J	Fluorene ** +
8700	Phenanthrene ** +
2300	Anthracene ** +
1300J	Carbazole
10000	Fluoranthene ** +
12000	Pyrene ** +
7500	Benzo (a) anthracene **
8600	Chrysene ** +
11000	Benzo (b) fluoranthene
6000	Benzo (a) pyrene ** +
2400	Indeno (1,2,3-cd) pyrene
1500J	Dibenzo (a,h) anthracene ** +
650J	Benzo (g,h,i) perylene

9SD05-002

1100J	Naphthalene * +
1600J	Acenaphthene ** +
1100J	Dibenzofuran
1900	Fluorene ** +
9100	Phenanthrene ** +
3100	Anthracene ** +
2200	Carbazole
8100	Fluoranthene ** +
7400	Pyrene ** +
5800	Benzo (a) anthracene ** +
6800	Chrysene ** +
3500	Benzo (b) fluoranthene
4900	Benzo (k) fluoranthene
4300	Benzo (a) pyrene ** +
2400	Indeno (1,2,3-cd) pyrene
1400J	Dibenzo (a,h) anthracene ** +

19SD01-001

26000	Phenanthrene ** +
27000	Fluoranthene ** +
13000J	Pyrene ** +
8200J	Chrysene ** +

19SD02-001

230J	Fluorene *
2200	Phenanthrene ** +
400J	Anthracene * +
260J	Carbazole
2500	Fluoranthene * +
2800	Pyrene ** +
1600	Benzo (a) anthracene ** +
2000	Chrysene * +
380J	Bis (2-ethylhexyl) phthalate
1300J	Benzo (b) fluoranthene
1400J	Benzo (k) fluoranthene
1200J	Benzo (a) pyrene * +
780J	Indeno (1,2,3-cd) pyrene
460J	Dibenzo (a,h) anthracene ** +

9SD01-001

47J	Acenaphthylene
540J	Phenanthrene * +
130J	Anthracene *
110J	Carbazole
1100	Fluoranthene * +
850J	Pyrene *
450J	Benzo (a) anthracene *
550J	Chrysene *
190J	Bis (2-ethylhexyl) phthalate
440J	Benzo (b) fluoranthene
420J	Benzo (k) fluoranthene
410J	Benzo (a) pyrene *
450J	Indeno (1,2,3-cd) pyrene
200J	Dibenzo (a,h) anthracene **
440J	Benzo (g,h,i) perylene

9SD01-002

27J	Fluorene
310J	Phenanthrene * +
52J	Anthracene
82J	Carbazole
450J	Fluoranthene
260J	Pyrene
190J	Benzo (a) anthracene
230J	Chrysene
110J	Bis (2-ethylhexyl) phthalate
210J	Benzo (b) fluoranthene
220J	Benzo (k) fluoranthene
180J	Benzo (a) pyrene
100J	Benzo (g,h,i) perylene

9SD06-001

210J	Fluorene *
1600	Phenanthrene ** +
370J	Anthracene * +
330J	Di-n-butylphthalate
1800	Fluoranthene * +
1700	Pyrene * +
1100	Benzo (a) anthracene * +
1500	Chrysene * +
300J	Bis (2-ethylhexyl) phthalate
950	Benzo (b) fluoranthene
1200	Benzo (k) fluoranthene
830	Benzo (a) pyrene * +
530J	Indeno (1,2,3-cd) pyrene
320J	Dibenzo (a,h) anthracene ** +

9SD06-002

5J	Chloroethane
360J	Phenanthrene * +
210J	Di-n-butylphthalate
960	Fluoranthene *
750	Pyrene *
210J	Benzo (a) anthracene
600	Chrysene *
390J	Benzo (b) fluoranthene
400J	Benzo (k) fluoranthene
180J	Benzo (a) pyrene

9SD03-001

140J	Fluoranthene
120J	Pyrene

9SD03-002

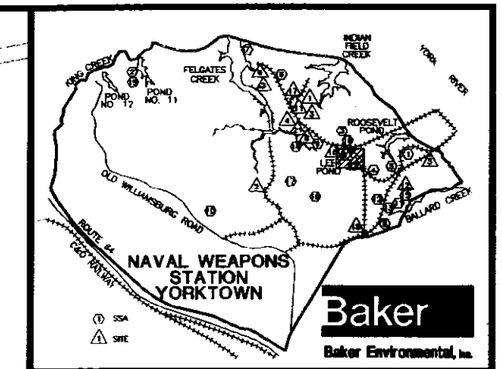
140J	Acetone
57J	2-Butanone
42J	Fluoranthene
38J	Pyrene
190J	Bis (2-ethylhexyl) phthalate

9SD07-001

440J	Acetone
67J	2-Butanone
100J	Fluoranthene
91J	Pyrene
44J	Benzo (a) anthracene
70J	Chrysene
200J	Bis (2-ethylhexyl) phthalate
76J	Benzo (b) fluoranthene
68J	Benzo (k) fluoranthene
53J	Benzo (a) pyrene

9SD07-002

91J	Acetone
43J	2-Butanone
61J	Fluoranthene
55J	Pyrene
43J	Chrysene



200 0 100 200
1 inch = 200 ft.

BOUNDARY
DRAINAGE
MARSH
RAILROAD
FENCE
EDGE OF PAVEMENT
STRUCTURE
REMEDIAL INVESTIGATION SITE OR SITE SCREENING AREA (SSA)
APPROXIMATE SITE DELINEATION

19SD01 SURFACE WATER/SEDIMENT/BIOTA SAMPLE LOCATION

ANALYTICAL PARAMETER COLOR CODING	
55J	VOC (black)
91J	BNA (cyan)
43J	PCB (orange)

\+ – Exceeds NOAA apparent effects threshold
* Meets or exceeds NOAA low effects range criteria
** Meets or exceeds NOAA median effects range criteria

NOTE: ALL CONCENTRATIONS ARE IN ug/kg.

292518WP

FIGURE 2-3
SEDIMENT SAMPLES
SOU-III - LEE POND
SITES 9 AND 19

NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

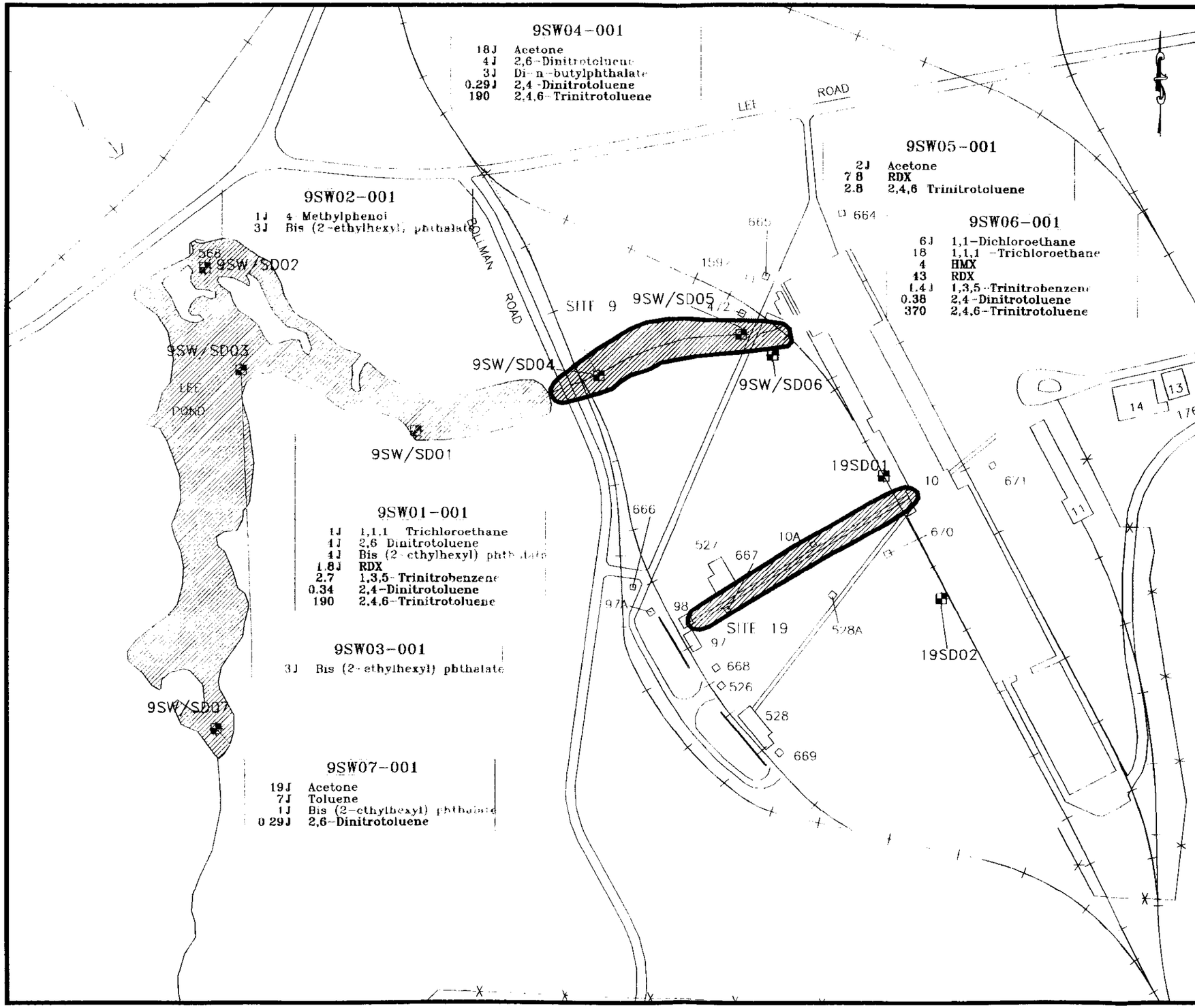
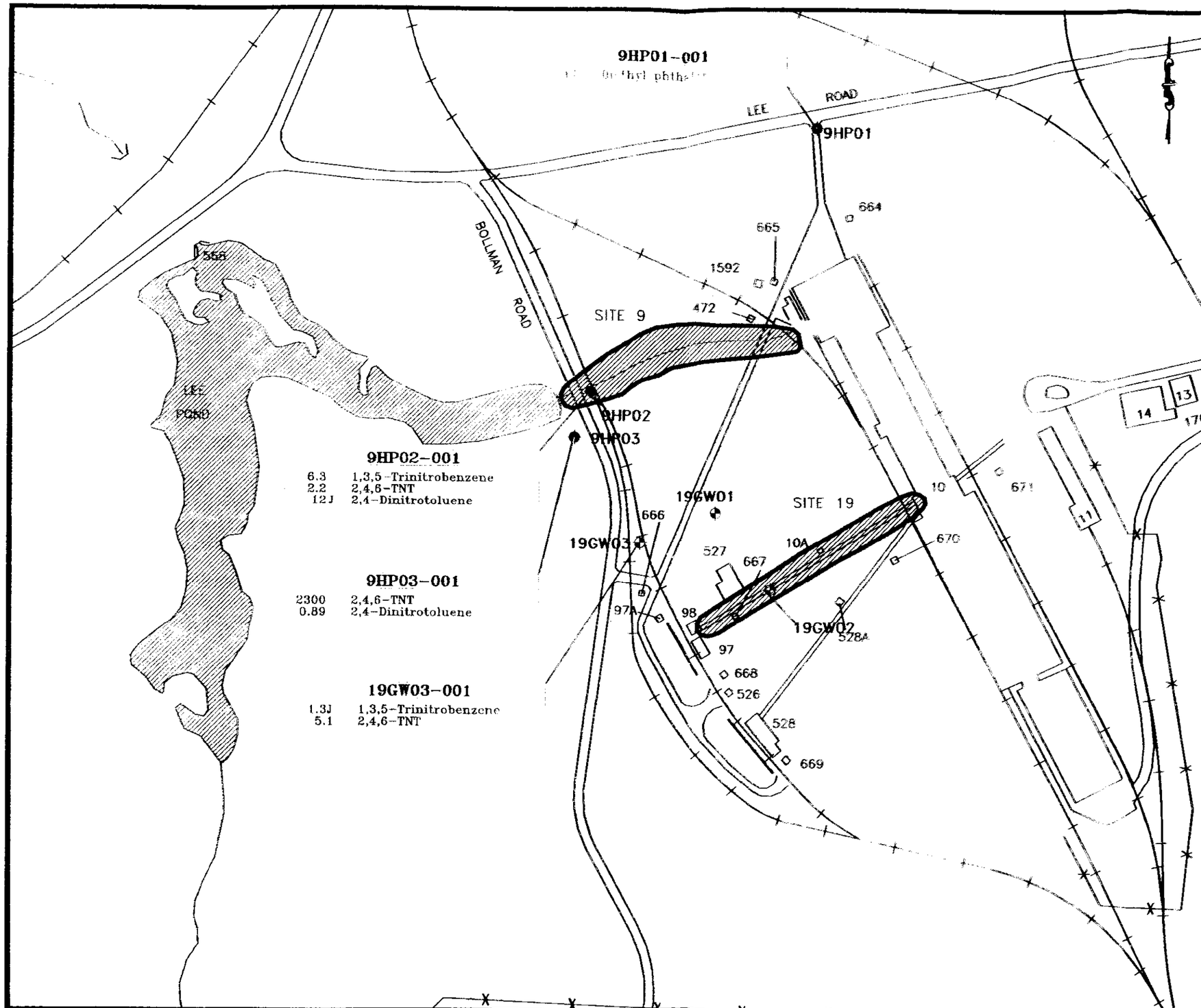
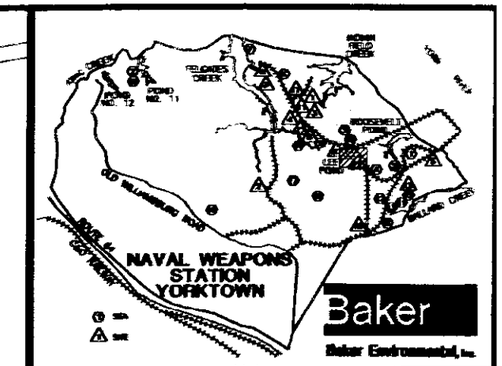


FIGURE 2-4
SURFACE WATER SAMPLES
SOU-III - LEE POND
SITES 9 AND 19

NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA





200 0 100 200
1 inch = 200 ft.

BOUNDARY
DRAINAGE
MARSH
RAILROAD
FENCE
EDGE OF PAVEMENT
STRUCTURE
REMEDIAL INVESTIGATION SITE OR SITE SCREENING AREA (SSA)
APPROXIMATE SITE DELINEATION

9HP01 HYDROPUNCH LOCATION

19GW02 MONITORING WELL LOCATION

ANALYTICAL PARAMETER COLOR CODING	
55J	VOC (black)
91J	BNA (cyan)
43J	Explosive (red)

NOTE: ALL CONCENTRATIONS ARE IN ug/L

FIGURE 2-5
GROUNDWATER SAMPLES
SOU-III - LEE POND
SITES 9 AND 19

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 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 each of the two sites to be studied in this investigation, Sites 9 and 19. Analytical results presented in Section 2.0 form the basis for the development of these preliminary models.

Under the current potential exposure scenario, access to Sites 9 and 19 at WPNSTA Yorktown is limited to Station employees (i.e., military and civilian), Station residents (i.e., adults and children [Site 9 only]), and ecological receptors (i.e., fish and deer). Station employees and residents could potentially engage in fishing, crabbing, or hunting and contact chemicals of potential concern (COPCs). 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 as required by USEPA Region III. The future residential development of Sites 9 and 19 will include exposure to residents, both adults and children.

3.1 Conceptual Site Model for Site 9 - Plant 1 Explosives-Contaminated Wastewater Discharge Area

The preliminary conceptual site model for Site 9 is presented in Figure 3-1. Potential source areas include the drainage ditch originating at the northern end of Building 10 and flowing to Lee Pond, surface drainage for stormwater, and Lee Pond sediment. COPCs include nitramine compounds, SVOCs, and selected inorganics. Potential release mechanisms include stormwater runoff, leaching to underlying groundwater, and advective transport in the direction of groundwater flow. Potentially affected media include surrounding soil, groundwater, surface water, and sediment. Plants, invertebrates, and fish in Lee Pond could potentially uptake contaminants emanating from Site 9

source areas. Terrestrial receptors also could be exposed to contaminants in soil, surface water, and sediment. Potential receptors of contamination also include Station employees and residents who fish in Lee Pond, future residents, and employees/workers.

3.2 Conceptual Site Model for Site 19 -Conveyor Belt Soil at Building 10

The source area at Site 19 is believed to be soil around and underneath the northern conveyor belt from the railroad tracks to Building 10. COPCs at Site 19 include nitramine compounds and SVOCs. Potential release mechanisms include stormwater runoff, leaching to underlying groundwater, and advective transport in the direction of groundwater flow. Potentially affected media are the surrounding soil and groundwater. Plants, invertebrates, and fish in Lee Pond also could potentially uptake contaminants emanating from Site 19 source areas. (Lee Pond will be evaluated in the future as SSA 20). Terrestrial receptors also could be exposed to contaminated soil. Potential receptors of contamination include future residents and employees/workers. The preliminary conceptual site model for Site 19 is presented in Figure 3-2.

FIGURES

FIGURE 3-1
PRELIMINARY CONCEPTUAL SITE MODEL
SITE 9 - PLANT 1 EXPLOSIVES-CONTAMINATED WASTEWATER DRAINAGE AREA
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

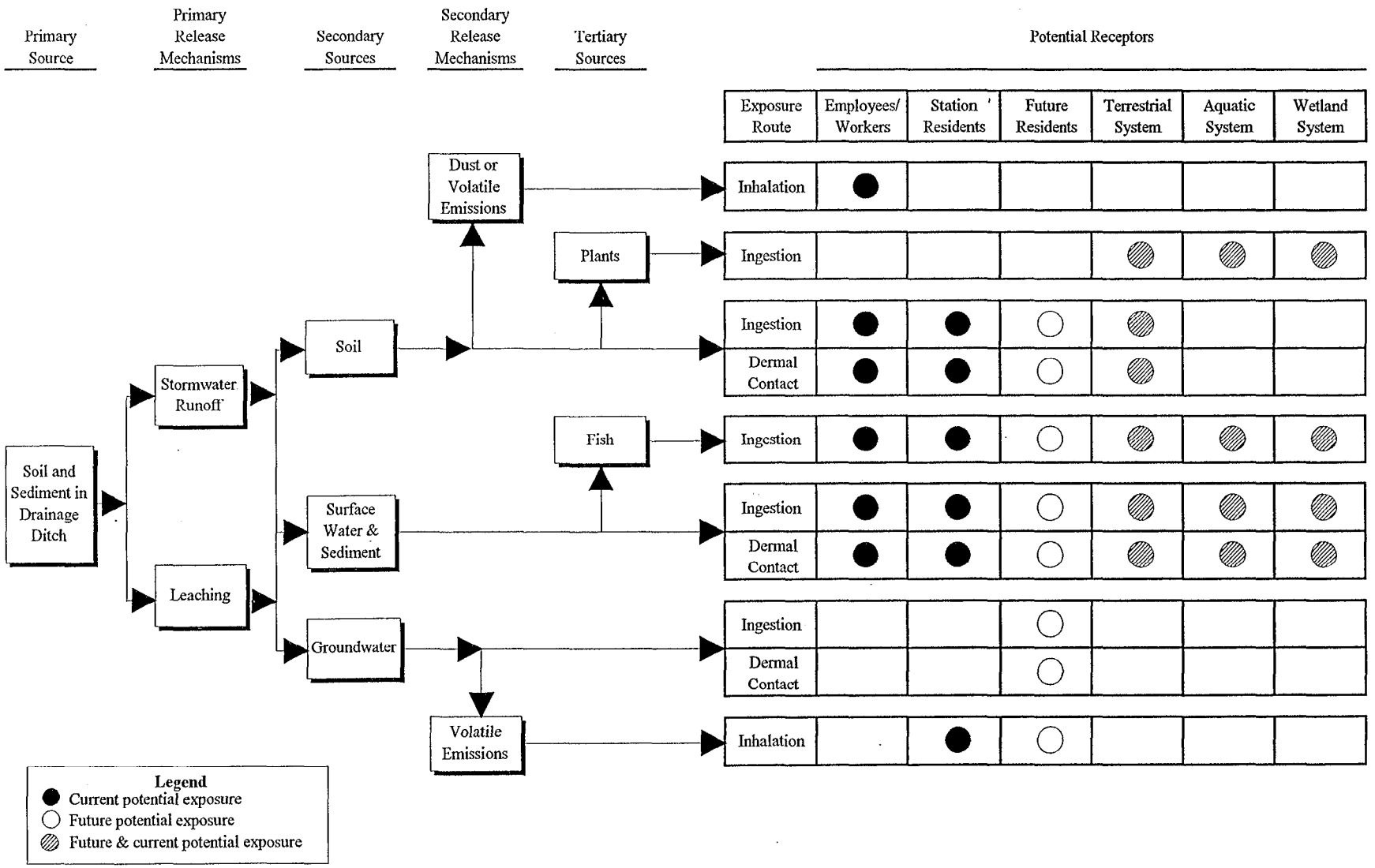
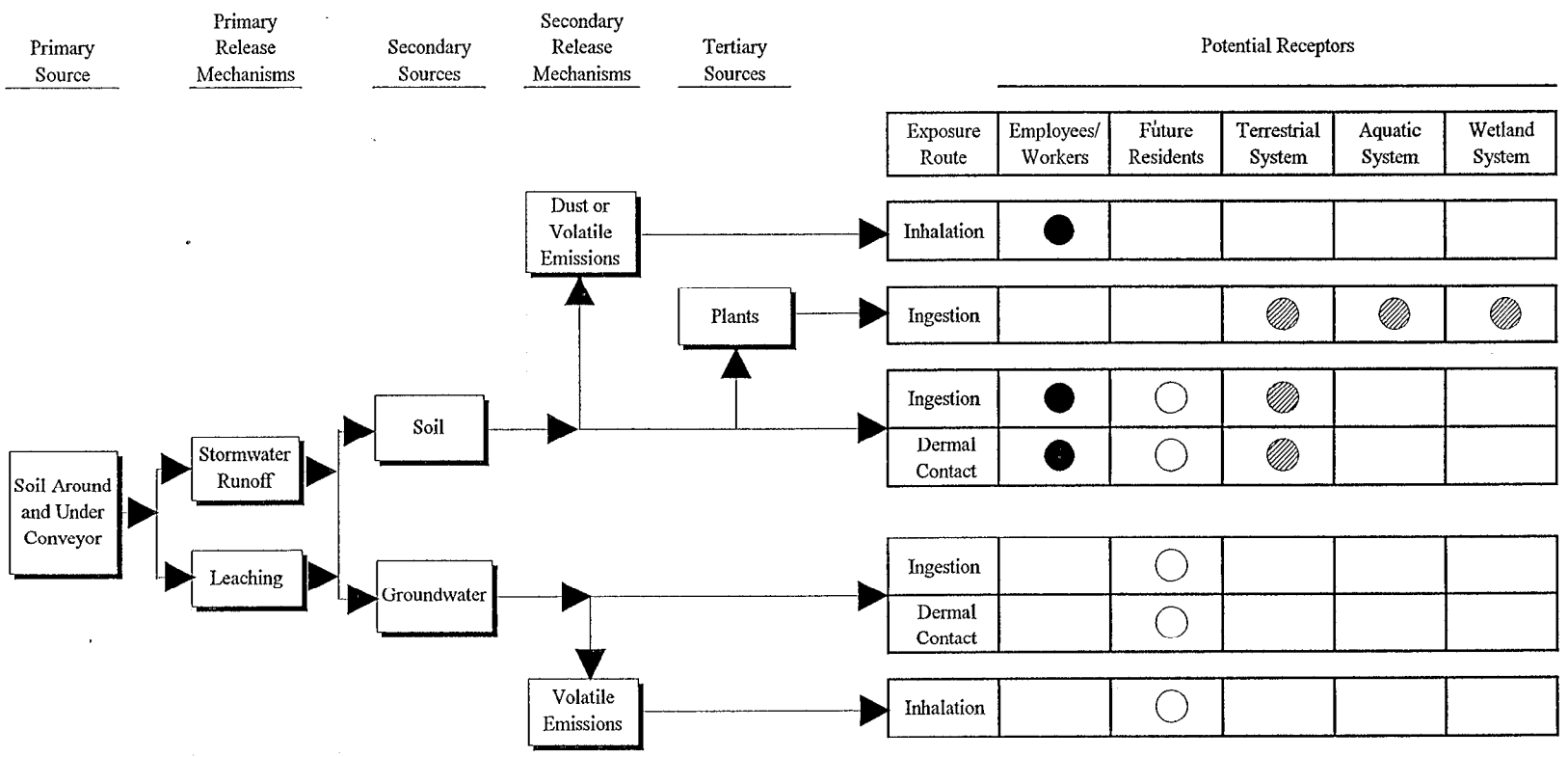


FIGURE 3-2
PRELIMINARY CONCEPTUAL SITE MODEL
SITE 19 - CONVEYOR BELT SOIL AT BUILDING 10
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA



Legend
- ● Current potential exposure
- ○ Future potential exposure
- ◍ Future & current potential exposure

4.0 TECHNICAL APPROACH

The types and numbers of environmental (i.e., both site-specific and site control) and associated QC samples to be collected, the locations of these samples, and the analytical parameters for which the samples will be tested are presented in this section. Interpretation of the site-specific data will allow the nature and extent of contamination at Sites 9 and 19 to be evaluated. Details pertaining to sample collection are included in the specific sections of the Master FSP; appropriate sections are referenced within this document. All sample analytical methods are found in Section 6.0 of the Master QAPP.

All sample locations discussed 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 Atlantic Division, Naval Facilities Engineering Command (LANTDIV), the Station, USEPA Region III, and VDEQ for approval before these changes are incorporated into the field program.

4.1 Site 9-Plant 1 - Explosives-Contaminated Wastewater Drainage Area

Data gathered during the Round One RI indicated potential contamination in all media sampled at Site 9. However, the extent of potential contamination could not be defined. In addition, soil samples were collected from the 0- to 2-foot interval, which is no longer deemed adequate for risk assessment purposes in USEPA Region III. As such, the following tasks are planned during the field program at Site 9 to determine the extent of contamination in surface soil, subsurface soil, groundwater, surface water, sediment, and biota and to provide data for human health and ecological risk assessments.

4.1.1 Soil Investigation

The soil investigation for Site 9 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. Some of the subsurface soil samples, particularly along the Site 9 drainage way, will be collected with a hand auger. Other subsurface samples will be collected during the installation of monitoring wells using a drill rig (refer to Section 4.1.1.3 of this report for a discussion of these samples).

4.1.1.1 Surface Soil Sampling

Seven surface soil samples will be collected at Site 9 from 0- to 6-inches bgs at the locations shown on Figure 4-1. The samples will be labeled 9SS21-01 through 9SS27-01. This numbering scheme was developed to follow the Round One RI samples, which were designated 9S15 through 9S20.

One of the surface soil sample locations, 9SS21, is located in the drainage way immediately downstream of the concrete culvert running parallel to Building 10. This location is upgradient of the Round One RI sampling point 9S15. Additional sampling was recommended here following the Round One RI. Six of the surface soil sample locations (9SS22 through 9SS27) are near locations sampled during the Round One RI (9S15 through 9S17) and the composite soil samples collected for the treatability study (C9SS01 through C9SS06). This covers the area surrounding the drainage way from Building 10 to the area immediately east of the recent removal action. No surface soil samples will be collected in the removal area, as confirmation data for this area are available. Nor will surface soil samples be collected within the portion of the site west of Bollman Road since Lee Pond extends up towards the road area.

The proposed surface soil samples will be collected for two primary reasons: to obtain surface soil information to be used in the risk assessments and to determine if surface soil contamination is present at the site. Some of the soil data obtained from the Round One RI and the recent treatability study soil collection event appear to contradict each other. The Round One RI soil data collected from Site 9 (collected from 0- to 2-feet bgs) indicated the presence of explosives and SVOCs. The detected 2,4,6-TNT concentrations ranged from 2,900 µg/kg to 2,100,000 µg/kg. The composite treatability samples (analyzed for explosives only) indicated significantly lower levels of explosives. The detected 2,4,6-TNT concentrations ranged from 189 µg/kg to 498 µg/kg. The recent removal action may account for the decrease in contaminant levels at the area of the site near Bollman Road. The difference in the treatability study samples also may be due to the fact that these samples were collected as composites over a transectional area and not from one single location.

In addition to the environmental samples, site control soil samples will be collected at the locations shown on Figure 4-1. Surface soil samples from the 0- to 6-inch bgs interval will be collected and analyzed for Target Compound List (TCL) VOCs, SVOCs, pesticides, PCBs, nitramine compounds, Target Analyte List (TAL) inorganics, and soil pH.

The Master FSP, Section 3.8, describes the surface soil sampling procedures which will be used to collect samples 9SS21-01 through 9SS27-01.

Based on the results of the Round One RI, the samples will be analyzed for TCL SVOCs, explosives (nitramine compounds), TAL inorganics, and soil pH. In addition to the above-mentioned parameters, the samples will be analyzed for TCL VOCs, pesticides, and PCBs for risk assessment (RA) purposes and to confirm Round One RI findings.

4.1.1.2 Hand Augered Subsurface Soil Sampling

Because the area within the Site 9 drainage way is inaccessible for an all terrain vehicle (ATV) drill rig, soil samples will be collected by hand augering. Hand augered subsurface soil samples will be collected at all surface soil sample locations, 9SS21 to 9SS27, as well as at site control locations 9BGSS01 and 9BGSS02. As shown on Figure 4-1, the subsurface soil sample locations are within the Site 9 drainage way east of Bollman Road.

One subsurface soil sample will be collected from each of the seven locations within the 2- to 4-foot bgs interval. If the water table is located within the 2- to 4-foot interval, the sample will not be collected from the sample location. Samples collected from the 2- to 4-foot interval will be labeled with -02 as part of the sample number.

The Master FSP, Section 3.8, describes the hand augered subsurface soil sampling procedures which will be used to collect the subsurface samples.

Based upon results of the Round One RI, the samples will be analyzed for TCL VOCs, SVOCs, pesticides, PCBs, nitramine compounds, TAL inorganics, and soil pH.

4.1.1.3 Subsurface Soil Borings and Sampling

Subsurface soil borings will be drilled at Site 9 for collection of subsurface soil samples and installation of monitoring wells for groundwater sampling. Throughout the following sections depths of soil borings or monitoring wells may be referenced. The basis for these assumptions is published documents (Brockman and Richardson, 1992) and firsthand knowledge of stratigraphy at WPNSTA Yorktown. These estimated depths of hydrogeological units is as follows: the top of the Cornwallis Cave aquifer should be intercepted at approximately 14- to 25-feet bgs and the subsequent monitoring well depth is estimated to be 25- to 35-feet bgs; in addition, the top of the Yorktown-Eastover aquifer should be intercepted at approximately 45- to 55-feet bgs and the subsequent monitoring well depth is estimated to be 65- to 75-feet bgs. All soil borings, whether or not they are sampled for chemical analysis, will be advanced using a continuous sampler and hollow-stem augers. There is no current standard operating procedure (SOP) listed in the Master FSP for the use of the continuous sampler. The following paragraph provides a brief description of this sampling procedure.

This continuous sampler is similar in construction to a split-spoon sampler in that the barrel splits vertically along its longitudinal axis. The sampler is approximately three inches in outside diameter (OD) and is approximately five feet in length. The sampler is inserted inside the augers and fixed to the drill head by a string of drill rods. The sample is collected in the sampler as the augers are advanced. At the end of a 5-foot run, the sampler is removed and opened in the same manner as the split-spoon. The sample can then be screened with a photoionization detector (PID) and logged by the on-site geologist. Discrete samples can be obtained by removing sections of the core. Using the continuous sampler, a continuous, 5-foot long sample is acquired; and thus lithologic changes are easier to depict, less time is required than conventional split-spoon sampling, and sample recovery is generally increased.

Five boreholes, shown in Figure 4-2, will be advanced at the site. The boreholes have been located around the site to further characterize the subsurface soil. Soil boring 9SB/GW01 will be advanced adjacent to the Plant 1 access road, south of the area of the Round One RI HydroPunch™ 9HP01. This borehole will be utilized as a shallow, upgradient boring to determine the subsurface lithology at the site and to further characterize the subsurface conditions upgradient of the wastewater drainage ditch.

Soil borings 9SB/GW02 will be advanced where Round One HydroPunch™ data (9HP02 and 9HP03) indicated groundwater contamination. The location of soil boring 9SB/GW03 will give additional data on the possibility of peripheral migration of contaminants as well as characterizing the subsurface soil.

Two additional soil borings will be advanced to facilitate deeper monitoring well installation Type III) and to characterize the deeper subsurface soil. Location 9SB/GW02A will be advanced adjacent to location 9SB/GW02 where shallow groundwater contamination was detected. Soil boring 9SB/GW04A will characterize the upgradient conditions of the deeper subsurface soil. During advancement of these soil borings, thin-walled open (shelby) tube samples will be collected in the low hydraulic conductivity zone (i.e., confining unit) where the surface casing will be set. Shelby tube samples will be collected according to American Society for Testing and Materials (ASTM) Method D1587-83(04.08) (ASTM, 1983) and analyzed for vertical hydraulic conductivity and grain size (sieve and hydrometer).

From each of these borings, three subsurface soil samples will be collected even if there is no visual evidence or HNu reading, indicating potential contamination. One sample will be collected from the upper one to two feet, one from just about the top of the water table, and one from the midpoint between these two locations. If evidence of contamination is apparent, samples will be collected as follows: one from the area with highest HNu readings/odor/visible evidence of contamination, one from the interval below the apparent contamination, and one from just above the top of the water table. The sampling protocols are described in Section 3.9 of the Master FSP.

No analytical data are currently available for subsurface soil; therefore, the subsurface soil samples will be analyzed for TCL VOCs, SVOCs, pesticides, PCBs, nitramine compounds, TAL inorganics, and soil pH. This data will be used in the RA. In addition, three samples of differing lithologies (e.g., sand, silt, and clay) will be collected and analyzed for grain size, bulk density, and total organic carbon. A summary of the number of samples to be collected and the analytical parameters is presented in Table 4-1.

4.1.2 Groundwater Investigation

4.1.2.1 Monitoring Well Installation

Five monitoring wells (Type II and Type III) will be installed for groundwater sampling to define the extent (vertical and horizontal) of groundwater contamination and to obtain data for site hydrogeology (i.e., groundwater flow direction). These monitoring well locations are shown on Figure 4-2. Monitoring well 9GW01 will be used to characterize the shallow upgradient conditions of the site. Monitoring well 9GW02 will be installed where Round One RI HydroPunches™ 9HP02 and 9HP03 were advanced to confirm the analytical results (elevated nitramine compounds). Monitoring well 9GW03 will be used to obtain data on the peripheral migration of the contaminants as well as to provide side-gradient groundwater flow information.

In addition, two deeper monitoring wells (Type II or Type III) will be installed at the site. The type of monitoring well installed will be determined after lithologic data from soil boring 19SB01 has been evaluated (see Section 4.2.1.3). If a low hydraulic conductivity lithology, at least 6 inches thick is encountered, a 10-inch steel surface casing will be installed into this lithology. The casing will be grouted in place. The 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 (shallow) monitoring wells will be installed to a maximum depth of 75 feet bgs to enable groundwater samples to be collected in a deeper portion of the surficial aquifer.

Location 9GW02A will identify any vertical migration of contaminants associated with the Round One HydroPunch™ data. Monitoring well 9GW04A will characterize the upgradient groundwater conditions at depth. Hydrogeologic data obtained from these two monitoring wells will be used with data from 19GW03A to evaluate the groundwater flow direction of the deeper aquifer.

It is anticipated that wells will be 2-inch diameter, Schedule 40 polyvinyl chloride (PVC) with 10-or 15-foot, 0.010 inch slot screens. An Insta-Pak® screen-within-a-screen unit, filled in the field with sand will be attached to each screen location. If two aquifers exist, the uppermost aquifer will be cased off to avoid aquifer cross-contamination. This will be accomplished by installing 10-inch

diameter steel casing at least 3 feet into the confining unit. 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. At one location, one subsurface soil sample will be collected of the aquifer material and sent to the laboratory for analysis of total organic carbon. This will allow for evaluation of the effect of organic carbon on the potential migration of constituents in the aquifer.

4.1.2.2 Well Development

Prior to groundwater sampling, the newly installed monitoring wells will be developed by removing water from each well into 55-gallon drums or other storage containers (e.g., tankers), using a disposable polyethylene bailer and clean rope, submersible pump, or bladder pump. Additional details for well development are found in Section 3.12 of the Master FSP. During development overpumping and surging methods will be utilized.

Development will consist of removing a minimum of three to five borehole volumes of water, plus the amount of any water added during the drilling or installation process. Development will continue until the water is relatively clear, or three successive measurements of specific conductance and temperature stabilize, or 3 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 present SOPs for "On-Site Water Quality Testing."

4.1.2.3 Groundwater Sampling

Prior to groundwater sampling, three to five well volumes will be purged from each well. Purging will be accomplished using low flow pumps. Field measurements of pH, temperature, 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. Groundwater sampling will take place from the newly installed monitoring wells. Wells will be sampled using a low flow pump. Well purging and groundwater sampling procedures also are detailed in Section 3.15 of the Master FSP. One round of groundwater sampling is anticipated.

Groundwater samples will be analyzed for TCL VOCs, SVOCs, pesticides, PCBs, nitramine compounds, TAL inorganics (both total and dissolved), total dissolved solids (TDS), total suspended solids (TSS), and nitrates. These data will be needed for RA purposes. Field measurements of pH, specific conductivity, temperature, and oxidation-reduction potential (Eh) also will be recorded. Table 4-1 summarizes the environmental samples to be collected and the analytical parameters for these samples.

4.1.2.4 Hydrologic Measurements

Hydrologic measurements consisting of water level and staff gauge measurements and in-situ hydraulic conductivity tests within the monitoring wells will be collected.

Water Level Measurements

Until the field program is complete, water level measurements will be collected on a weekly basis from newly-installed and developed monitoring wells. This will allow for a long-term evaluation of potential water level fluctuations in the area. The procedures for water level measurements are detailed in Section 3.17 of the Master FSP.

In-Situ Hydraulic Conductivity Tests

The hydraulic conductivity of the aquifer in the near vicinity of the well will be measured using in-situ hydraulic conductivity (slug) tests. The slug tests will be performed on the newly installed 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

Staff gauges will be installed within the wastewater drainage ditch, where it discharges into Lee Pond, and at the southern and northern portions of Lee Pond. The five staff gauge locations are shown on Figure 4-2. Water level measurements from the staff gauges along with 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 used in the future.

4.1.3 Surface Water and Sediment Investigation

Surface water and sediment investigations will be conducted in the drainage ditch located to the east of Lee Pond. Data from these studies will be used to assess potential impacts to the environment from Sites 9 and 19 and used in conjunction with the biota data in the ecological RA.

Four surface water and sediment sampling stations have been identified to characterize the drainage way to Lee Pond (Figure 4-3). These sample locations were chosen to coincide with the aquatic ecological sampling described in Section 4.1.4. Sample locations 9SW/SD08, 9SW/SD09, 9SW/SD10, and 9SW/SD11 will address the conditions of the drainage way from Site 9. Location 9SW/SD11 also coincides with Round One RI location 9SW01 where additional sampling was recommended.

One surface water sample will be collected from midstream at each sampling location if the depth of surface water is less than three feet. If the depth of the surface water is greater than three feet, a surface water sample will be collected from one-foot above the bottom of the stream with a Kemmerer sampler and an additional sample from the surface of the stream will be collected as described above. The samples will be collected as described in Section 3.7.1 of the Master FSP. Surface water samples will be collected at each station prior to obtaining the sediment samples to minimize possible turbidity effects from sampling. Downstream sample stations will be sampled first, with subsequent samples taken moving upstream.

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

All surface water and sediment samples will be analyzed for TCL VOCs, SVOCs, pesticides, PCBs, nitramine compounds, TAL inorganics, and pH, with sediment pH measured in the laboratory and water pH measured in the field. Surface water samples also will be analyzed for hardness, and dissolved TAL inorganics, with sediment samples analyzed for total organic carbon and grain size.

These analyses were selected to meet the needs of the ecological RA. In addition, analyses for temperature, dissolved oxygen, salinity, specific conductivity, and turbidity (by Secchi disk) will be performed on surface water samples in the field. The procedures for performing these measurements can be found in the Master FSP, Section 3.29. Table 4-1 summarizes the environmental samples to be collected and analytical parameters for these samples.

4.1.4 Aquatic Ecological Investigation

Aquatic ecological investigations will be conducted at the four 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, within the drainage way from Site 9. Site-specific considerations were incorporated into the overall sample station selection process. The information from the Draft Habitat Evaluation for Sites 2, 8, 9, 11, 17, 18, and 19 (Baker, 1994b) was used to qualitatively evaluate the variability of the media to be sampled.

At each location, 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. 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. Further details of the sample collection techniques are found in Section 3.18 of the Master FSP.

4.2 Site 19 - Conveyor Belt Soil at Building 10

Data obtained during the Round One RI indicated potential contamination in all media sampled at Site 19; however, the extent of potential contamination could not be defined. The following tasks are planned during the field program at Site 19 to evaluate the extent of contamination in surface soil, subsurface soil, and groundwater.

4.2.1 Soil Investigation

The soil investigation for Site 19 will include 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. Some of the subsurface soil samples will be collected with a hand auger, while others will be collected during installation of monitoring wells using a drill rig.

4.2.1.1 Surface Soil Sampling

Eight surface soil samples will be collected at Site 19 from 0- to 6-inches bgs at the locations shown on Figure 4-1. The samples will be labeled 19SS21-01 through 19SS28-01. This numbering scheme was developed to follow the Round One RI samples, which were designated 19S15 through 19S20.

Six of the surface soil sample locations (19SS21 through 19SS26) are located along the conveyor belt connecting Buildings 98 and 10. One of the sample locations (19SS27) will focus on the area around Buildings 98 and 527. The remaining sample location (19SS28) is located in the outer area surrounding the conveyor belt.

In addition to the environmental samples, a site-specific background soil sample will be collected at location 19BGSS02, shown on Figure 4-1. This sample will be collected and analyzed for TCL VOCs, SVOCs, pesticides, PCBs, nitramine compounds, TAL inorganics, and soil pH.

The proposed surface soil samples will be collected for two primary reasons: to obtain surface soil information to be used in the RAs and to confirm the results from the Round One RI and the treatability study sampling effort. The soil data from the Round One RI, which was collected between 0- to 2-feet bgs, indicated the presence of explosives near Building 98 and on the southern side of the conveyor belt (e.g., 2,4,6-TNT was detected at a concentration of 120,000 µg/kg at both of these locations). Some of the other samples collected along the conveyor belt did not contain detectable levels of explosives. The Round One RI soil sample collected near the overhead conveyor belt contained SVOCs, but no explosives. The treatability study samples (composites) indicated the presence of explosives along the conveyor belt area and near Building 98. The highest levels of explosives detected were found on the northern side of the conveyor belt between Buildings 10 and 10A and in the vicinity of Building 98.

The Master FSP, Section 3.8, describes the surface soil sampling procedures which will be used to collect samples 19SS21-01 through 19SS28-01.

The samples will be analyzed for TCL VOCs, SVOCs, pesticides, PCBs, nitramine compounds, TAL inorganics, and soil pH.

4.2.1.2 Hand Augered Subsurface Soil Sampling

Hand augered subsurface soil samples will be collected at Site 19 at all of the surface soil sample locations. As shown on Figure 4-1, the subsurface soil sample locations are along the conveyor belt and near Building 98.

One subsurface soil sample will be collected from each of the eight locations within the 2- to 4-foot bgs interval. If the water table is located within the 2- to 4-foot interval, the sample will not be collected from this sample location. Samples collected from the 2- to 4-foot interval will be labeled with -02 as part of the sample number.

The Master FSP, Section 3.8, describes the hand augered subsurface soil sampling procedures which will be used to collect the subsurface samples.

All samples will be analyzed for TCL VOCs, SVOCs, pesticides, PCBs, nitramine compounds, TAL inorganics, and soil pH.

4.2.1.3 Subsurface Soil Boring Sampling

Subsurface soil borings will be advanced at Site 19 for collection of subsurface soil samples and installation of monitoring wells for groundwater sampling. Throughout the following sections depths of soil borings or monitoring wells may be referenced. The basis for these assumptions is published documents (Brockman and Richardson, 1992) and firsthand knowledge of stratigraphy at WPNSTA Yorktown. These estimated depths of hydrogeological units are as follows: the top of the Cornwallis Cave aquifer should be intercepted at approximately 14- to 25-feet bgs, and the subsequent monitoring well depth is estimated to be 25- to 35-feet bgs. In addition, the top of the Yorktown-Eastover aquifer should be intercepted at approximately 45- to 55-feet bgs and the subsequent monitoring well depth is estimated to be 65- to 75-feet bgs. A cross section based on these assumptions is presented as Figure 4-4. All soil borings, whether or not they are sampled for

chemical analysis, will be advanced using a continuous sampler and hollow-stem augers. Use of a continuous sampler is described in Section 4.1.1.3.

Six boreholes will be advanced at Site 19. Soil boring 19SB01 located east of monitoring well 19GW02, to characterize the upgradient subsurface conditions through environmental sampling, and will be used as a pilot boring to determine the subsurface lithology for Sites 9 and 19. It is assumed that a confining unit will be present, separating a surficial (unconfined) aquifer and a deeper (confined) aquifer. This borehole will be advanced through the surficial aquifer and the underlying confining unit to at least 25 feet into the underlying confined aquifer. Information obtained from this soil boring will dictate the design of deeper monitoring wells. The deeper monitoring well (Type III) will be cased through the confining unit and screened below. If a confining unit is not encountered, the soil boring will be advanced to 75 feet bgs, which will enable the characterization of the deeper subsurface soil within the surficial aquifer. The borehole will be grouted to the ground/surface immediately after completion.

One soil boring, 19SB/GW03A will be advanced to facilitate the installation of a deep (Type II or Type III) monitoring well. If conditions warrant the installation of a surface cased Type III monitoring well, a thin walled open (shelby) tube sample will be collected within the confining unit. The shelby tube sample will be collected according to ASTM Method D1587-83 (04.08) (ASTM, 1983) and analyzed for vertical hydraulic conductivity and grain size (sieve and hydrometer). This boring will be located adjacent to the shallow monitoring well 19GW03 and will characterize the deeper subsurface soil in an area where nitramine compounds were detected in groundwater. Soil boring 19SB/GW04 will be located southwest of 19GW03 and will characterize the subsurface soil in the area where elevated concentrations of nitramine compounds were detected in the groundwater during the Round One RI sampling event. Soil borings 19SB/GW05 and 19SB/GW06 will be located adjacent to the areas that contained elevated nitramine compounds in the surface soil from the treatability study. Soil boring 19SB/HP07 will be used to complete two HydroPunches™ within the surficial unconfined aquifer and the deeper confined aquifer. The location of this soil boring is midway between 19GW03 and 19GW06 immediately northwest of the conveyor belt. The soil boring will be approximately 65 to 75 feet bgs which will enable the collection of the deep within the Yorktown-Eastover aquifer. These borehole locations are shown in Figure 4-2. From each of these borings, three subsurface soil samples will be collected whether or not there is visual evidence or HNu readings indicating potential contamination. One sample from the upper one to two feet,

one from just above the top of the water table, and one from the midpoint between these two locations will be collected. If evidence of contamination is apparent, samples will be collected as follows: one from the area with highest HNu readings/odor/visible evidence of contamination, one from the interval below the apparent contamination, and one from just above the water table. The sampling protocols are described in Section 3.9 of the Master FSP.

No subsurface soil samples were collected for analysis during the Round One RI. Therefore, each of these samples collected during Round Two will be analyzed for TCL VOCs, SVOCs, pesticides, PCBs, nitramine compounds, TAL inorganics, and soil pH. In addition, three samples of differing lithologies (e.g., sand, silt, and clay) will be collected and analyzed for grain size (sieve and hydrometer), bulk density, and total organic carbon. A summary of the number of samples to be collected and the analytical parameters is presented in Table 4-2.

4.2.2 Groundwater Investigation

4.2.2.1 HydroPunch™ Completion

HydroPunch™ sampling procedures will be used to collect groundwater samples without installing permanent monitoring wells. HydroPunch™ samples will collected at 19SB/HP07 at two discrete depths. The location, as shown on Figure 4-2, was chosen to evaluate if surface soil contamination migrated to the groundwater (surficial and deeper confined aquifers). In addition, analytical results from the HydroPunch™ will determine if Type II or Type III monitoring wells will be installed, if necessary, at this location within the surficial aquifer and/or the deeper confined aquifer. One sample will be collected within the surficial aquifer which is estimated to be approximately 14- to 25-feet bgs and a second sample will be collected within the deeper confined aquifer which is estimated to be 45- to 55-feet bgs.

The groundwater samples will be analyzed for TCL VOAs and nitramine compounds with a 7-day turnaround time from the laboratory. Field parameters including pH, specific conductivity, temperature, and Eh will be recorded. A summary of the number of samples to be collected and the analytical parameters are presented on Table 4-2.

4.2.2.2 Monitoring Well Installation

Four monitoring wells will be installed at Site 19 to evaluate the extent of groundwater contamination. In addition, the newly installed wells will be used with the existing wells to monitor the hydrogeologic conditions at the site. Monitoring well 19GW04 will be located south of 19GW03 and will the address the possibility of lateral migration of contaminants in groundwater. The locations of monitoring wells 19GW05 and 19GW06 will be adjacent to the areas that showed elevated nitramine compounds in the surface soil in samples collected for the treatability study. These monitoring wells will address contaminant migration from soil to groundwater. The existing monitoring well 19GW02 will be used to characterize the upgradient groundwater conditions. Finally, monitoring well 19GW03A will be installed adjacent to 19GW03. This monitoring well will be of Type II or Type III construction dependent upon lithologic data obtained from the background soil boring. If a low hydraulic conductivity lithology, at least 6 inches thick is encountered, a 10-inch steel surface casing will be installed into this lithology. The casing will be grouted in place. The grout will be permitted to set for 12 to 24 hours prior to resumption of drilling through the casing. A monitoring well will be constructed and 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 a maximum depth of 75 feet bgs. This well will characterize the groundwater at a greater depth to determine if the nitramine compounds detected in the Round One RI have migrated vertically. Also, hydrogeological data from deep monitoring wells 9GW02A and 9GW04A and this well will be used to evaluate the deep hydrogeologic conditions of the area.

It is anticipated that wells will be 2-inch diameter, Schedule 40 PVC with a 10- to 15-foot, 0.010 inch slot screens. An Insta-Pak® screen-within-a-screen unit, filled in the field with sand will be attached to the screened section of PVC. If two aquifers are present, the uppermost aquifer will be cased off to avoid aquifer cross-contamination. 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. At one location, a subsurface soil sample will be collected of the aquifer material and sent to the laboratory for analysis of total organic carbon. This will allow for evaluation of the effect of organic carbon on the potential migration of constituents in the aquifer.

4.2.2.3 Well Development

Well development at newly installed and existing monitoring wells will be completed as described in Section 4.1.2.2.

4.2.2.4 Groundwater Sampling

Prior to groundwater sampling, three to five well volumes will be purged from each new and existing well. Purging will be accomplished using low flow pumps or bailers. Field measurements of pH, temperature, and specific conductivity will be taken after each well volume. Purging will be complete when three successive field measurements of a single parameter are within 10 percent of each other. Groundwater sampling will take place from the existing and newly installed monitoring wells. Wells will be sampled using a low flow pump. Well purging and groundwater sampling procedures also are detailed in Section 3.15 of the Master FSP. One round of groundwater sampling is anticipated.

Because additional information is needed for the RA, groundwater samples will be analyzed for TCL VOCs, SVOCs, pesticides, PCBs, nitramine compounds, TAL inorganics (both total and dissolved), TSS, TDS, and nitrates. Field measurements of pH, specific conductivity, temperature, and Eh also will be recorded.

4.2.2.5 Hydrologic Measurements

Hydrologic measurements consisting of water level measurements and in-situ hydraulic conductivity tests in monitoring wells will be conducted at Site 19. Refer to Section 4.1.2.4 and for details in completing these tasks.

4.2.3 Surface Water and Sediment Investigation

Since surface water is not present at Site 19 no surface water or sediment samples will be collected. However, overland drainage patterns for runoff were taken onto account when selecting surface soil sampling locations.

4.3 Other Field Activities

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

4.3.1 Land Surveying

All newly installed and existing monitoring well/subsurface soil boring locations and surface soil sampling locations will be surveyed to Station benchmarks; 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.

In addition to sampling locations, a land survey of the site and surrounding area will be conducted. This land survey will include the location of site features such as roads, bodies of water, utilities, building corners, railroad tracks, fences, sidewalks, and culverts. One foot contours also will be obtained during this survey. This type of survey is necessary since it appears that the existing Station maps for WPNSTA Yorktown are not accurate with respect to current conditions and are missing several details such as fences, culverts, and additional drainage ways.

Details of the surveying procedures are described in the Master FSP, Section 3.2.1.

4.3.2 Investigation Derived Waste Management

Wastes generated during the field investigation will include soil from subsurface borings (cuttings), groundwater (from developing and purging wells), decontamination water, and miscellaneous items such as gloves, Tyvek®, and other used personal protective equipment (PPE). This IDW will be segregated by type (soil, water, miscellaneous items) and by site to facilitate waste disposal. The procedures are described below.

4.3.2.1 Soil

Soil generated during field activities at Sites 9 and 19 usually will be placed in a roll-off box. If highly contaminated material is noted in the field through high HNu readings or other testing or visual indication, this material will be segregated in a 55-gallon drum and labeled following the procedures specified in Section 3.26.2 of the Master FSP. This will reduce the potential for contaminating larger amounts of soil when roll-off boxes are used.

After the field investigation is completed, one soil sample from the roll-off box and one from the drum(s) will be collected. Samples will be gathered from several (5 to 8) locations in a roll-off box and composited. Several grab samples also will be gathered from any drums used. Samples will be collected using a small trowel, hand auger, or appropriate sample collection instrument. Sample collection procedures are presented in Section 3.26 of the Master FSP.

Each sample will be analyzed for the full suite of Resource Conservation and Recovery Act (RCRA) characteristics including ignitability, corrosivity, reactivity, and toxicity. The toxicity tests will be performed using the Toxicity Characteristic Leaching Procedures (TCLP) for all parameters, including volatiles, semivolatiles, pesticides, herbicides, and inorganics. Also, each sample will be analyzed for PCBs. The results of these tests will help determine if the soil generated is considered hazardous waste under RCRA. If the soil is found to be hazardous wastes, it may be disposed off-site by LANTDIV/WPNSTA Yorktown or stored on-site in a secure area pending final FS evaluation. If the soil is not found to be hazardous, it may be returned to the site of origin pending USEPA and VDEQ approval or disposed off-site as nonhazardous.

4.3.2.2 Liquid

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

Development and purge water from Sites 9 and 19 will be placed initially in 55-gallon drums located adjacent to the monitoring well location for immediate transport to a tanker located at each site. Water will be transferred and stored in the tanker until final disposition is completed. Highly

contaminated water (noted by HNu reading or other field measurements) will be segregated into 55-gallon drums and labeled as noted in the Master FSP, Section 3.26.3. Drums will be placed on wooden pallets in a secure area of Site 19 until disposition is determined.

Decontamination water will be generated during steam cleaning activities at each site. The water collected in the decontamination pad will be pumped to the tanker on site. This water may be combined with water from development/purging activities. Water from decontamination of PPE also will be combined with this water. The tanker will remain at this location until final disposition 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 Site 19 until final disposition is determined.

After all field activities are completed, water samples will be collected from each tank and drum(s). Analytical parameters will be selected based on input from the disposal facility. It is anticipated that liquid IDW will be sent to the HRSD facility. HRSD personnel will specify analytical requirements. Water samples will be collected from the tanker using a bailer or other appropriate device, depending on the site and location of the opening on the tank. Sampling procedures are described in the Master FSP, Section 3.26.

4.3.2.3 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.

4.3.3 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 Field Team Leader 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 meters, pH meters, specific conductivity meters, sample bottles, PPE, and decontamination equipment.

4.4 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 hardness, TSS, TDS, and nitramine compounds, 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).

In order to meet data quality objectives for groundwater at the Station, specialized analyses for the volatile fraction will be used. This method of analysis, "Superfund Analytical Methods for Low Concentration Water for Organic Analysis," has lower detection limits than the standard CLP methods for volatile compounds. This analytical method also will be completed for surface water samples to achieve the lowest detection limits possible for comparison to the Ambient Water Quality Criteria.

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

4.5 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). Data that are evaluated and do not pass the validation will still be reported and flagged with qualifiers.

4.6 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, Eh, soil boring and well construction logs; calculating slug test results; and developing water level monitoring charts. Also, data assembly will include review and compilation of the previously existing data, both from the Round One RI and from the treatability study and the removal action investigations.

Data interpretation will include review of the compiled data and construction of maps and charts showing items such as geologic cross-sections, isoconcentration maps, groundwater contour maps, statistical analyses of sampling results, and other similar items. It is anticipated that data collected from Sites 9 and 19 may be combined for certain media interpretation (such as groundwater, surface water, sediment, and biota) because of the close proximity of the sites, similar types of contaminants, and similar receptors.

4.7 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 and will not be repeated here. The Baseline RA will be included as a separate chapter in the Remedial Investigation Report.

4.8 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, 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).

4.9 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.

4.10 Meetings

Progress meetings will be held periodically throughout the RI process to update USEPA 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 Work Plan and RI and FS Reports.

TABLES

TABLE 4-1

SUMMARY OF ENVIRONMENTAL AND QUALITY CONTROL SAMPLES AND ANALYTICAL PARAMETERS
SITE 9
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
Surficial Soil	7	TCL VOCs, SVOCs, Pest/PCBs, nitramine compounds, TAL inorganics, soil pH	1	1	1	1
Subsurface Soil (hand augered samples)	7	TCL VOCs, SVOCs, Pest/PCBs, nitramine compounds, TAL inorganics, soil pH	1	1	1	1
Subsurface Soil (soil borings)	15	TCL VOCs, SVOCs, Pest/PCBs, nitramine compounds, TAL inorganics, soil pH	2	1	3	3
Subsurface Soil (FS/Risk parameters)	3	Grain size, bulk density, TOC	NA	NA	NA	NA
Subsurface Soil (aquifer characteristics)	1	Grain size (sieve and hydrometer)	NA	NA	NA	NA
Monitoring Wells-Soil	1	TOC	NA	NA	NA	NA
Site-specific Background Soil	2	TCL VOCs, SVOCs, Pest/PCBs, nitramine compounds, TAL inorganics, soil pH	1	1	1	1
Monitoring Wells - Groundwater(1) (2)	5	TCL VOCs, SVOCs, Pest/PCBs, nitramine compounds, TAL inorganics (total and dissolved), TDS/TSS, nitrates, pH, spec. cond., Eh, temp.	1	1	3	3
Surface Water(1)(3)	8(4)	TCL VOCs, SVOCs, Pest/PCBs, nitramine compounds, TAL inorganics (total and dissolved), hardness, pH, spec. cond., Eh, temp., D.O., Secchi disk, salinity	1	1	2	2

TABLE 4-1 (Continued)

SUMMARY OF ENVIRONMENTAL AND QUALITY CONTROL SAMPLES AND ANALYTICAL PARAMETERS
SITE 9
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
Sediment (associated with surface water)	8(5)	TCL VOCs, SVOCs, Pest/PCBs, nitramine compounds, TAL inorganics, soil pH, TOC, grain size	1	1	2	2
Field Blank(6)	6	TCL VOCs, SVOCs, Pest/PCBs, nitramine compounds, TAL inorganics (total and dissolved), TDS/TSS, nitrates, hardness	NA	NA	2	NA

Notes:

(1) Parameters including pH, specific conductivity, temperature, Eh, D.O., salinity, and turbidity will be measured in the field, as appropriate.
(2) Assumes one round of sampling.
(3) Four benthic macroinvertebrate samples collected in association with surface water and sediment sampling.
(4) Assumes 4 locations with 2 surface water samples per location.
(5) Assumes 4 locations with 2 sediment samples per location.
(6) Field Blanks will be collected as part of background sampling. (2 field events sampling, store bought distilled water, laboratory grade water, and potable water)

Assumes that QA/QC samples counted and collected on a site-by-site basis.

ACRONYMS/ABBREVIATIONS:

MS/MSDs: Matrix Spike/Matrix Spike Duplicates
TCL: Target Compound List
VOCs: Volatile Organic Compounds
SVOCs: Semivolatile Organic Compounds
TAL: Target Analyte List
TOC: Total Organic Carbon
Pest/PCB: Pesticides/Polychlorinated Biphenyls
CLP: Contract Laboratory Program
Spec. Cond.: Specific Conductivity
Eh: Oxidation-Reduction potential
TDS/TSS: Total Dissolved Solids/Total Suspended Solids
NA: Not Applicable
D.O.: Dissolved Oxygen

TABLE 4-2

SUMMARY OF ENVIRONMENTAL AND QUALITY CONTROL SAMPLES AND ANALYTICAL PARAMETERS
SITE 19
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
Surficial Soil	8	TCL VOCs, SVOCs, Pest/PCBs, nitramine compounds, TAL inorganics, and soil pH	1	1	1	1
Subsurface Soil (hand augered samples)	8	TCL VOCs, SVOCs, Pest/ PCBs, nitramine compounds, TAL inorganics, soil pH	1	1	1	1
Subsurface Soil (soil borings)	15	TCL VOCs, SVOCs, Pest/PCBs, nitramine compounds, TAL inorganics, soil pH	2	1	3	3
Subsurface Soil (FS/Risk parameters)	3	Grain size, bulk density, TOC	NA	NA	NA	NA
Monitoring Wells - Soil	1	TOC	NA	NA	NA	NA
Subsurface Soil (aquifer characteristics)	1	Grain size (sieve and hydrometer)	NA	NA	NA	NA
Site-Specific Background Soil	1	TLC VOCs, SVOC, Pest/PCBs, nitramine compounds, TAL inorganics, soil pH	1	1	1	1
Monitoring Wells - Groundwater(1)	7	TCL VOCs, SVOCs, Pest/PCBs, nitramine compounds, TAL inorganics (total and dissolved), TDS/TSS, nitrates, pH, spec. cond., Eh, temp.	1	1	4	4

TABLE 4-2 (Continued)

SUMMARY OF ENVIRONMENTAL AND QUALITY CONTROL SAMPLES AND ANALYTICAL PARAMETERS
SITE 19
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
Hydropunch - Groundwater[2]	2	TCL VOCs, nitramine compounds	NA	NA	NA	NA
IDW - Water	1	TCL VOCs, SVOCs Pest/PCBs, nitramine compounds, TAL inorganics, ignitability, reactivity (cyanide and sulfide), corrosivity	NA	NA	NA	NA
IDW - Soil	1	TCLP, ignitability, reactivity (cyanide and sulfide), corrosivity	NA	1	NA	NA

Notes: [1] Assumes one round of sampling of new and existing wells.

[2] Assumes samples from shallow and deep Hydropunch.

Field Blanks will be collected as part of background sampling (see Table 4-1).

Assumes that QA/QC samples counted and collected on a site-by-site basis.

ACRONYMS/ABBREVIATIONS:

MS/MSDs: Matrix Spike/Matrix Spike Duplicates
TCL: Target Compound List
VOCs: Volatile Organic Compounds
SVOCs: Semivolatile Organic Compounds
TAL: Target Analyte List
TOC: Total Organic Carbon
CLP: Contract Laboratory Program
Spec. Cond.: Specific Conductivity
D.O.: Dissolved Oxygen
temp.: Temperature
Eh: Oxidation-Reduction potential
TDS/TSS: Total Dissolved Solids/Total Suspended Solids
NA: Not Applicable
PEST/PCBs: Pesticides/Polychlorinated Biphenyls

TABLE 4-3

SUMMARY OF ANALYSES
SITES 9 AND 19
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Location/Media	Sample ID	Analyses Requested						QA/QC Samples		C-O-C Number	Date Collected	Date Submitted
		TCL VOA	TCL SVOA	TCL Pest/ PCB	Nitra-mine	TAL Metals/ CN	Other	Dupli-cate	MS/MSD			
Site 9 Surface Soil	9SS21-01	X	X	X	X	X	soil pH	X	X			
	9SS22-01	X	X	X	X	X	soil pH					
	9SS23-01	X	X	X	X	X	soil pH					
	9SS24-01	X	X	X	X	X	soil pH					
	9SS25-01	X	X	X	X	X	soil pH					
	9SS26-01	X	X	X	X	X	soil pH					
	9SS27-01	X	X	X	X	X	soil pH					
	9BGSS01	X	X	X	X	X	soil pH	X	X			
	9BGSS02	X	X	X	X	X	soil pH					
Site 9 Subsurface Soil (hand augered)	9SS21-02	X	X	X	X	X	soil pH	X	X			
	9SS22-02	X	X	X	X	X	soil pH					
	9SS23-02	X	X	X	X	X	soil pH					
	9SS24-02	X	X	X	X	X	soil pH					
	9SS25-02	X	X	X	X	X	soil pH					
	9SS26-02	X	X	X	X	X	soil pH					

TABLE 4-3 (Continued)

SUMMARY OF ANALYSES
SITES 9 AND 19
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Location/Media	Sample ID	Analyses Requested						QA/QC Samples		C-O-C Number	Date Collected	Date Submitted
		TCL VOA	TCL SVOA	TCL Pest/ PCB	Nitra-mine	TAL Metals/ CN	Other	Dupli-cate	MS/MSD			
Site 9 Subsurface Soil (hand augered) (cont.)	9SS27-02	X	X	X	X	X	soil pH					
	9BGSS01-02	X	X	X	X	X	soil pH					
	9BGSS02-02	X	X	X	X	X	soil pH					
Site 9 Subsurface Soil[1] (soil borings)	9SB01-01	X	X	X	X	X	soil pH	X	X			
	9SB01-02	X	X	X	X	X	soil pH					
	9SB01-03	X	X	X	X	X	soil pH					
	9SB02-01	X	X	X	X	X	soil pH					
	9SB02-02	X	X	X	X	X	soil pH					
	9SB02-03	X	X	X	X	X	soil pH					
	9SB02A-01	X	X	X	X	X	soil pH					
	9SB02A-02	X	X	X	X	X	soil pH					
	9SB02A-03	X	X	X	X	X	soil pH					
	9SB03-01	X	X	X	X	X	soil pH					
	9SB03-02	X	X	X	X	X	soil pH	X				
	9SB03-03	X	X	X	X	X	soil pH					
	9SB04A-01	X	X	X	X	X	soil pH					
	9SB04A-02	X	X	X	X	X	soil pH					

TABLE 4-3 (Continued)

SUMMARY OF ANALYSES
SITES 9 AND 19
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Location/Media	Sample ID	Analyses Requested						QA/QC Samples		C-O-C Number	Date Collected	Date Submitted
		TCL VOA	TCL SVOA	TCL Pest/ PCB	Nitra-mine	TAL Metals/ CN	Other	Dupli-cate	MS/MSD			
Site 9 Subsurface Soil[1] (soil borings)	9SB04A-03	X	X	X	X	X	soil pH					
Site 9 Groundwater[2]	9GW01	X	X	X	X	X	TDS/TSS nitrates	X	X			
	9GW02	X	X	X	X	X	TDS/TSS nitrates					
	9GW02A	X	X	X	X	X	TDS/TSS nitrates					
	9GW03	X	X	X	X	X	TDS/TSS nitrates					
	9GW04A	X	X	X	X	X	TDS/TSS nitrates					
Site 9 Surface Water[2]	9SW08-01	X	X	X	X	X	Hardness					
	9SW08-02	X	X	X	X	X	Hardness					
	9SW09-01	X	X	X	X	X	Hardness					
	9SW09-02	X	X	X	X	X	Hardness					
	9SW10-01	X	X	X	X	X	Hardness					
	9SW10-02	X	X	X	X	X	Hardness					

TABLE 4-3 (Continued)
SUMMARY OF ANALYSES
SITES 9 AND 19
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Location/Media	Sample ID	Analyses Requested						QA/QC Samples		C-O-C Number	Date Collected	Date Submitted
		TCL VOA	TCL SVOA	TCL Pest/ PCB	Nitra-mine	TAL Metals/ CN	Other	Dupli-cate	MS/MSD			
Site 9 Surface Water[2] (cont.)	9SW11-01	X	X	X	X	X	Hardness					
	9SW11-02	X	X	X	X	X	Hardness	X	X			
Site 9 Sediment	9SD08-01	X	X	X	X	X	TOC soil pH Grain Size	X	X			
	9SD08-02	X	X	X	X	X	TOC soil pH Grain Size					
	9SD09-01	X	X	X	X	X	TOC soil pH Grain Size					
	9SD09-02	X	X	X	X	X	TOC soil pH Grain Size					
	9SD10-01	X	X	X	X	X	TOC soil pH Grain Size					
	9SD10-02	X	X	X	X	X	TOC soil pH Grain Size					
	9SD11-01	X	X	X	X	X	TOC soil pH Grain Size					

TABLE 4-3 (Continued)
SUMMARY OF ANALYSES
SITES 9 AND 19
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Location/Media	Sample ID	Analyses Requested						QA/QC Samples		C-O-C Number	Date Collected	Date Submitted
		TCL VOA	TCL SVOA	TCL Pest/ PCB	Nitra-mine	TAL Metals/ CN	Other	Dupli-cate	MS/MSD			
Site 9 Sediment (cont.)	9SD11-02	X	X	X	X	X	TOC soil pH Grain Size					

TABLE 4-3 (Continued)

SUMMARY OF ANALYSES
SITES 9 AND 19
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Location/Media	Sample ID	Analyses Requested						QA/QC Samples		C-O-C Number	Date Collected	Date Submitted
		TCL VOA	TCL SVOA	TCL Pest/ PCB	Nitra-mine	TAL Metals/ CN	Other	Dupli-cate	MS/MSD			
Site 19 Surface Soil	19SS21-01	X	X	X	X	X	soil pH	X	X			
	19SS22-01	X	X	X	X	X	soil pH					
	19SS23-01	X	X	X	X	X	soil pH					
	19SS24-01	X	X	X	X	X	soil pH					
	19SS25-01	X	X	X	X	X	soil pH					
	19SS26-01	X	X	X	X	X	soil pH					
	19SS27-01	X	X	X	X	X	soil pH					
	19SS28-01	X	X	X	X	X	soil pH					
	19BGSS02-01	X	X	X	X	X	soil pH	X	X			
Site 19 Subsurface Soil (hand augered)	19SS21-02	X	X	X	X	X	soil pH	X	X			
	19SS22-02	X	X	X	X	X	soil pH					
	19SS23-02	X	X	X	X	X	soil pH					
	19SS24-02	X	X	X	X	X	soil pH					
	19SS25-02	X	X	X	X	X	soil pH					
	19SS26-02	X	X	X	X	X	soil pH					

TABLE 4-3 (Continued)

SUMMARY OF ANALYSES
SITES 9 AND 19
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Location/Media	Sample ID	Analyses Requested						QA/QC Samples		C-O-C Number	Date Collected	Date Submitted
		TCL VOA	TCL SVOA	TCL Pest/ PCB	Nitra-mine	TAL Metals/ CN	Other	Dupli-cate	MS/MSD			
Site 19 Subsurface Soil (hand augered) (cont.)	19SS27-02	X	X	X	X	X	soil pH					
	19SS28-02	X	X	X	X	X	soil pH					
	19BGSS02-02	X	X	X	X	X	soil pH					
Site 19 Subsurface Soil[1] (soil borings)	19SB01-01	X	X	X	X	X	soil pH	X	X			
	19SB01-02	X	X	X	X	X	soil pH					
	19SB01-03	X	X	X	X	X	soil pH					
	19SB03A-01	X	X	X	X	X	soil pH					
	19SB03A-02	X	X	X	X	X	soil pH					
	19SB03A-03	X	X	X	X	X	soil pH					
	19SB04-01	X	X	X	X	X	soil pH					
	19SB04-02	X	X	X	X	X	soil pH					
	19SB04-03	X	X	X	X	X	soil pH					
	19SB05-01	X	X	X	X	X	soil pH					
	19SB05-02	X	X	X	X	X	soil pH	X				
	19SB05-03	X	X	X	X	X	soil pH					
	19SB06-01	X	X	X	X	X	soil pH					
	19SB06-02	X	X	X	X	X	soil pH					

TABLE 4-3 (Continued)

SUMMARY OF ANALYSES
SITES 9 AND 19
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Location/Media	Sample ID	Analyses Requested						QA/QC Samples		C-O-C Number	Date Collected	Date Submitted
		TCL VOA	TCL SVOA	TCL Pest/ PCB	Nitra-mine	TAL Metals/ CN	Other	Dupli-cate	MS/MSD			
Site 19 Subsurface Soil[1] (soil borings) (cont.)	19SB06-03	X	X	X	X	X	soil pH					
Site 19 Groundwater[2]	19GW01	X	X	X	X	X	TDS/TSS nitrates	X	X			
	19GW02	X	X	X	X	X	TDS/TSS nitrates					
	19GW03	X	X	X	X	X	TDS/TSS nitrates					
	19GW03A	X	X	X	X	X	TDS/TSS nitrates					
	19GW04	X	X	X	X	X	TDS/TSS nitrates					
	19GW05	X	X	X	X	X	TDS/TSS nitrates					
	19GW06	X	X	X	X	X	TDS/TSS nitrates					
	19HP01	X			X							
	19HP02	X			X							

TABLE 4-3 (Continued)

SUMMARY OF ANALYSES
SITES 9 AND 19
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Location/Media	Sample ID	Analyses Requested						QA/QC Samples		C-O-C Number	Date Collected	Date Submitted
		TCL VOA	TCL SVOA	TCL Pest/ PCB	Nitra-mine	TAL Metals/ CN	Other	Dupli-cate	MS/MSD			
Sites 9 and 19 IDW Water	9IDWW1	X	X	X	X	X	RCRA characteristics[3]					
Sites 9 and 19 IDW Soil	9IDWS1						TCLP, RCRA characteristics[3]		X			
Field Blanks[2]	FBD1-01	X	X	X	X	X	TDS/TSS, nitrates, hardness					
	FBD1-02	X	X	X	X	X	TDS/TSS, nitrates, hardness					
	FBLG-01	X	X	X	X	X	TDS/TSS, nitrates, hardness					
	FBLG-02	X	X	X	X	X	TDS/TSS, nitrates, hardness					
	FBRIG-01	X	X	X	X	X	TDS/TSS, nitrates, hardness					

(1) TOC, grain-size, and bulk density will be analyzed on selected samples identified in the field.
(2) TAL metals will be analyzed for total and dissolved metals. Field measurements will be taken for pH, specific conductivity, Eh, temperature, salinity, and turbidity (Secchi disk), as appropriate.
(3) RCRA characteristics include ignitability, corrosivity, and reactivity.

FIGURES

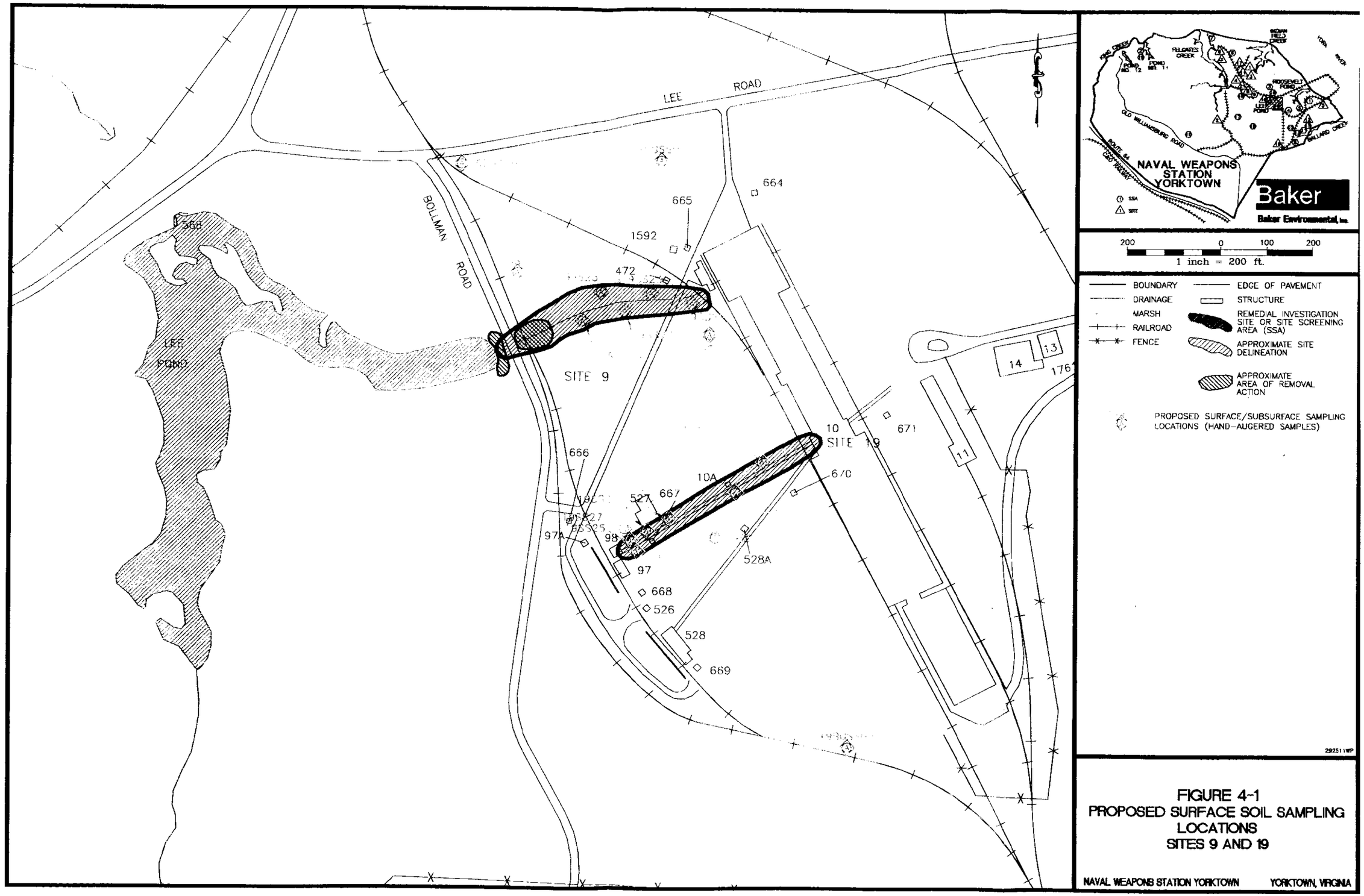


FIGURE 4-1
PROPOSED SURFACE SOIL SAMPLING LOCATIONS
SITES 9 AND 19

NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

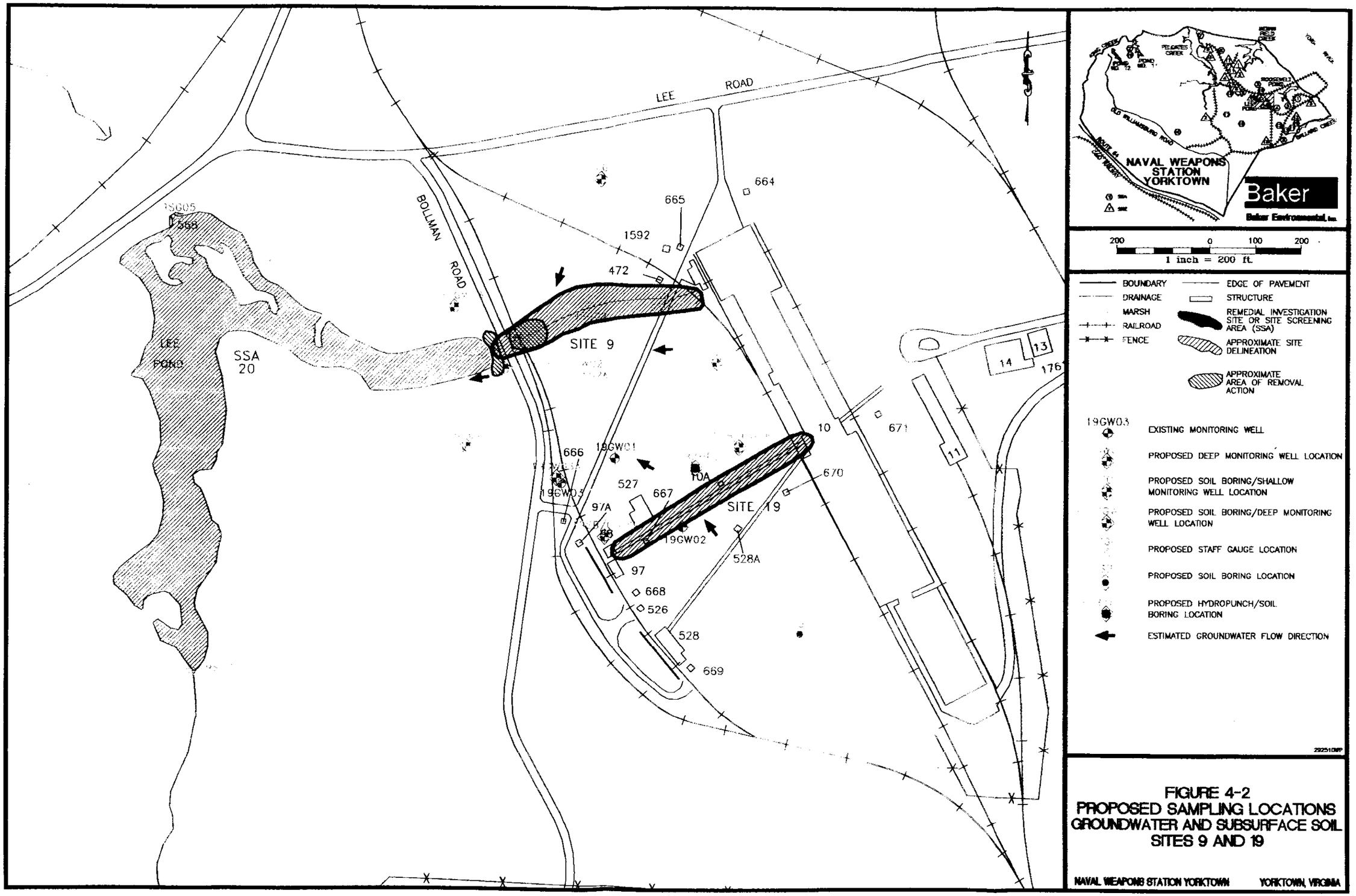


FIGURE 4-2
PROPOSED SAMPLING LOCATIONS
GROUNDWATER AND SUBSURFACE SOIL
SITES 9 AND 19

NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

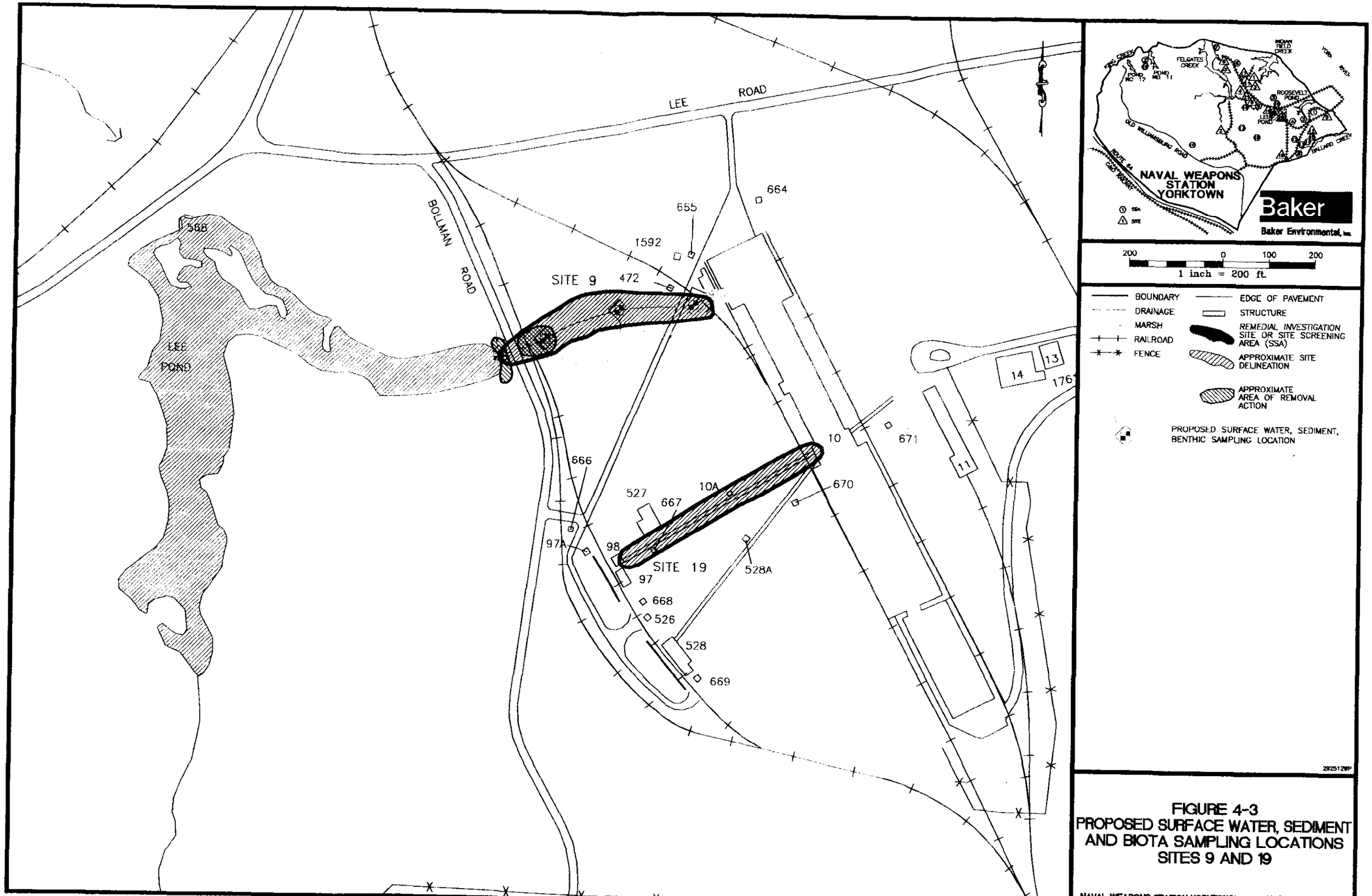
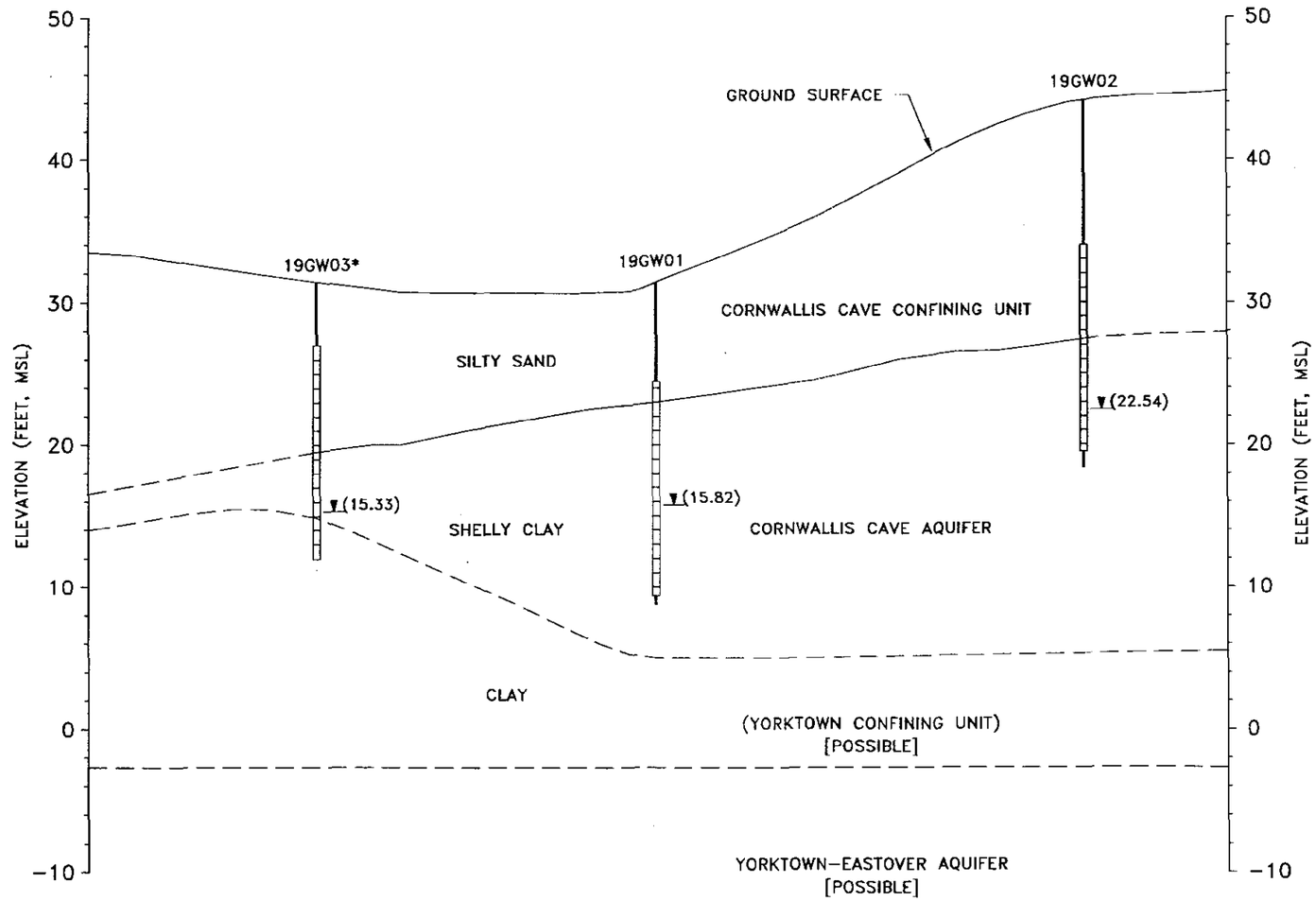


FIGURE 4-3
PROPOSED SURFACE WATER, SEDIMENT AND BIOTA SAMPLING LOCATIONS SITES 9 AND 19

NAVAL WEAPONS STATION YORKTOWN YORKTOWN, VIRGINIA

291534WP



Baker
Baker Environmental, Inc.

LEGEND

(3.49) GROUNDWATER ELEVATION – RECORDED 11/6/92 (FEET ABOVE MEAN SEA LEVEL)

WELL SCREEN INTERVAL

ESTIMATED

ESTIMATED AND PROJECTED

* WELL WOULD NOT BE USED IN USGS MODEL

MSL MEAN SEA LEVEL

NOTE: DETERMINATION OF GEOLOGIC UNIT MADE BASED UPON REVIEW OF TABLE 1 – SUMMARY OF WELL AND BOREHOLE INFORMATION AT WPNSTA YORKTOWN (BROCKMAN, 1994), WESTON GEOLOGIC CROSS SECTIONS, AND BORING LOGS.

50 0 25 50 100

Horizontal Scale: 1 inch = 50 ft.

10 0 5 10 20

Vertical Scale: 1 inch = 10 ft.

THE SOIL BORING INFORMATION IS CONSIDERED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THE RESPECTIVE BORING LOCATIONS. SUBSURFACE CONDITIONS INTERPOLATED BETWEEN BORINGS ARE ESTIMATED BASED ON ACCEPTED SOIL ENGINEERING PRINCIPLES AND GEOLOGIC JUDGEMENT.

FIGURE 4-4
CROSS SECTION DEPICTING ESTIMATED DEPTHS OF HYDROGEOLOGIC UNITS AT SITE 19

NAVAL WEAPONS STATION YORKTOWN

YORKTOWN, VIRGINIA

5.0 PROJECT MANAGEMENT AND STAFFING

Project management tasks for the work to be completed at Sites 9 and 19 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 Protection Specialist to help ensure that project-specific information is disseminated among the WPNSTA project team.

The Project Manager will keep the 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 Protection Specialist/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 Protection Specialist
- Mr. Bernard Setterholm, Environmental Protection Specialist

LANTDIV

- Mr. Gregory P. Hatchett, 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. Donald Shields, Quality Assurance Officer
- Mr. John Mentz, Senior Technical Advisor

Baker Environmental, Inc. (continued)

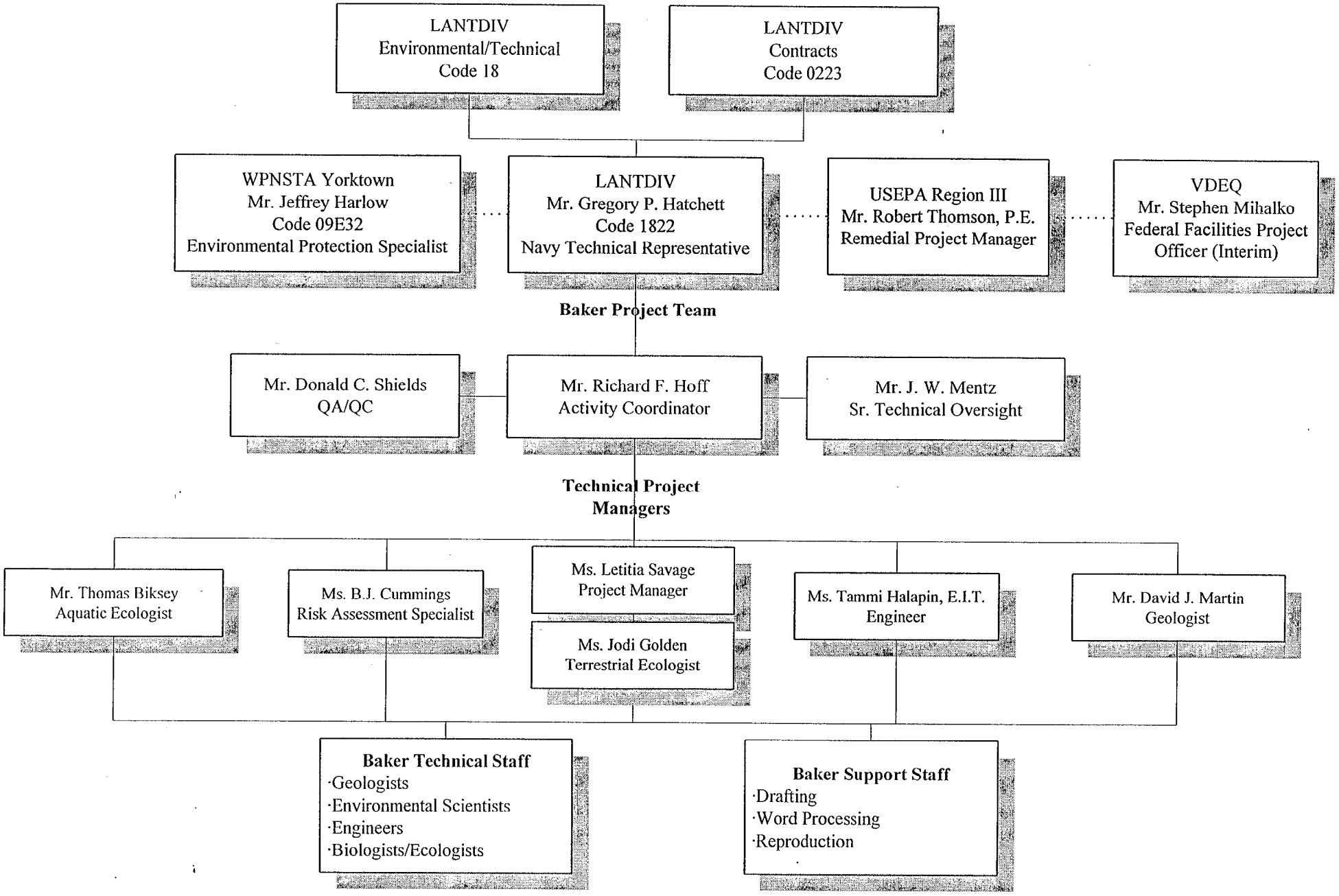
- Ms. Letitia Savage, Project Manager
- Mr. Thomas Biksey, Aquatic Ecologist
- Ms. Barbara Cummings, Health and Safety Officer/Risk Assessment Specialist
- Ms. Tammi Halapin, Project Engineer
- Mr. David Martin, Project Geologist
- Ms. Jodi Golden, Terrestrial Ecologist

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.

FIGURES

FIGURE 5-1

PROJECT ORGANIZATION



6.0 SCHEDULE

The schedule for completion of the planned activities at Sites 9 and 19 is shown in Figure 6-1. This schedule provides dates and durations for finalization of the Site-Specific Work Plan, field activities, and data analysis and validation. Figure 6-2 provides a schedule for completion of the Remedial Investigation report, Feasibility Study, Proposed Plan, and Record of Decision at Sites 9 and 19.

FIGURES

Figure 6 - 1

FY 1995: Sites 9 and 19 Remedial Investigation, Feasibility Study, Proposed Plan, and Record of Decision
Naval Weapons Station Yorktown, Yorktown, Virginia

Task	Days	Start	Finish
Sites 9 and 19	369ed	12/1/94	12/5/95
RI WORK PLAN	**267ed**	**12/1/94**	**8/25/95**
Preliminary Draft	74ed	12/1/94	2/13/95
Review (Navy)	16ed	2/13/95	3/1/95
Draft	30ed	3/1/95	3/31/95
Review (EPA/State)	59ed	3/31/95	5/29/95
Draft Final	30ed	5/29/95	6/28/95
Review (EPA/State)	30ed	6/28/95	7/28/95
Final	28ed	7/28/95	8/25/95
RI FIELD INVESTIGATION	**60ed**	**8/21/95**	**10/20/95**
Mobilization	4ed	8/21/95	8/25/95
Field Investigation	56ed	8/25/95	10/20/95
SAMPLE ANALYSIS/VALIDATION	**89ed**	**9/7/95**	**12/5/95**
Sample Analysis	74ed	9/7/95	11/20/95
Data Validation	60ed	10/6/95	12/5/95

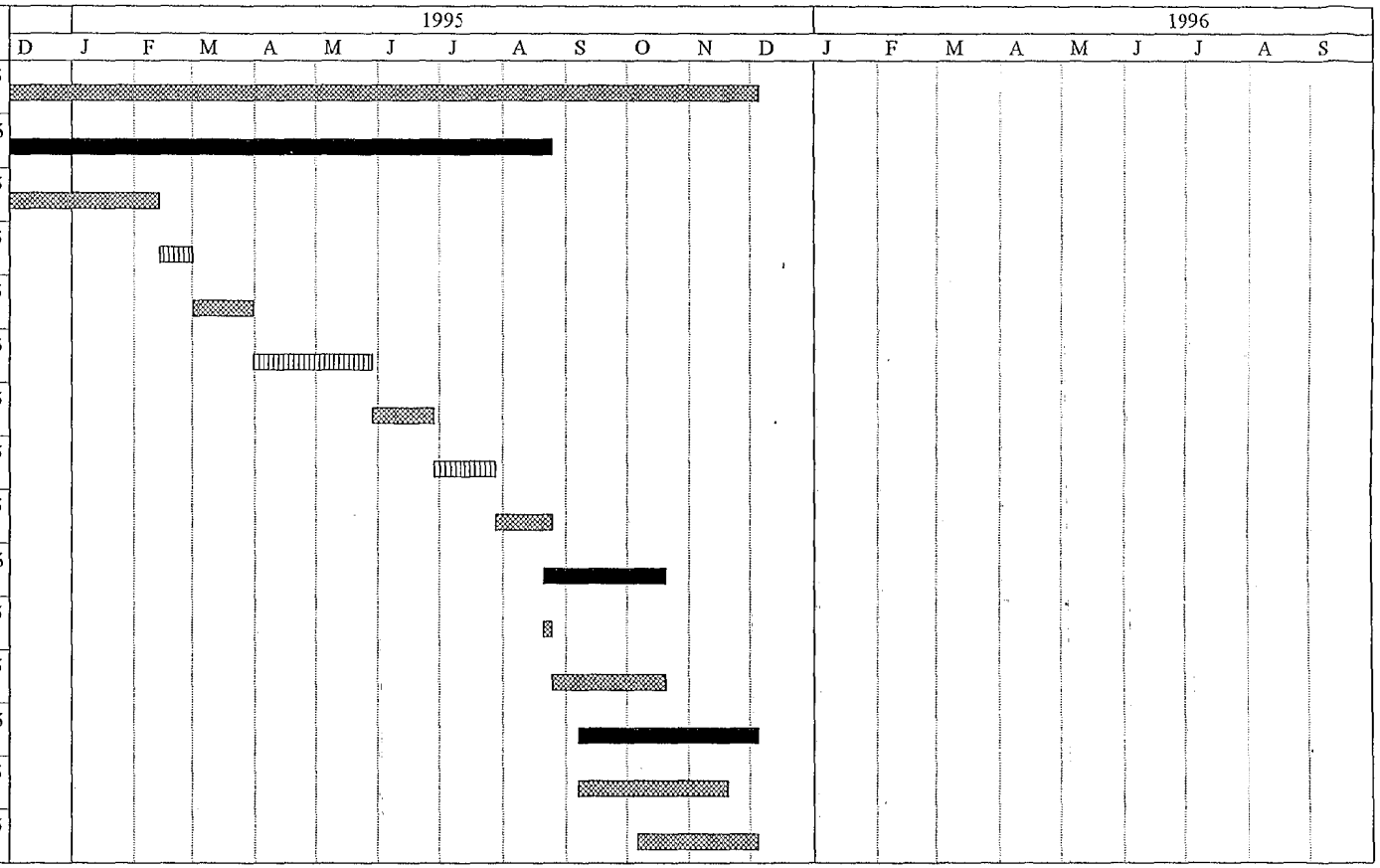


Figure 6 - 2

FY 1995: Sites 9 and 19 Remedial Investigation, Feasibility Study, Proposed Plan, and Record of Decision
Naval Weapons Station Yorktown, Yorktown, Virginia

Task	Days	Start	Finish
Sites 9 and 19	358ed	11/2/95	10/25/96
REMEDIAL INVESTIGATION REPORT	**277ed**	**11/2/95**	**8/5/96**
Preliminary Draft	61ed	11/2/95	1/2/96
Review (Navy)	30ed	1/2/96	2/1/96
Draft	33ed	2/1/96	3/5/96
Review (EPA/State)	62ed	3/5/96	5/6/96
Draft Final	30ed	5/6/96	6/5/96
Review (EPA/State)	30ed	6/5/96	7/5/96
Final	31ed	7/5/96	8/5/96
FEASIBILITY STUDY	**306ed**	**12/1/95**	**10/2/96**
Preliminary Draft	91ed	12/1/95	3/1/96
Review (Navy)	31ed	3/1/96	4/1/96
Draft	30ed	4/1/96	5/1/96
Review (EPA/State)	61ed	5/1/96	7/1/96
Draft Final	31ed	7/1/96	8/1/96
Review (EPA/State)	32ed	8/1/96	9/2/96
Final	30ed	9/2/96	10/2/96
PROPOSED PLAN	**306ed**	**12/8/95**	**10/9/96**
Preliminary Draft	91ed	12/8/95	3/8/96
Review (Navy)	31ed	3/8/96	4/8/96
Draft	30ed	4/8/96	5/8/96
Review (EPA/State)	61ed	5/8/96	7/8/96

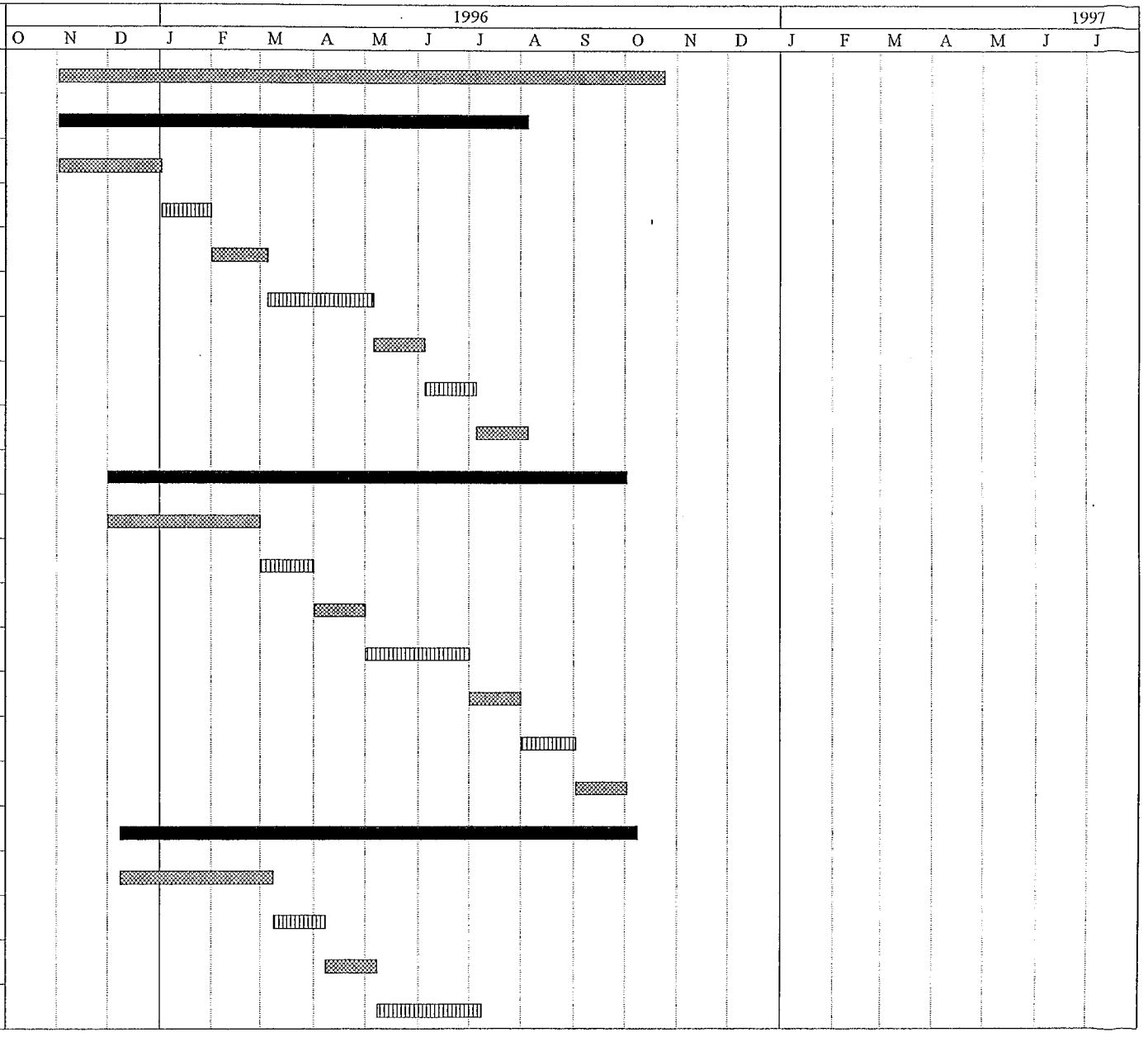
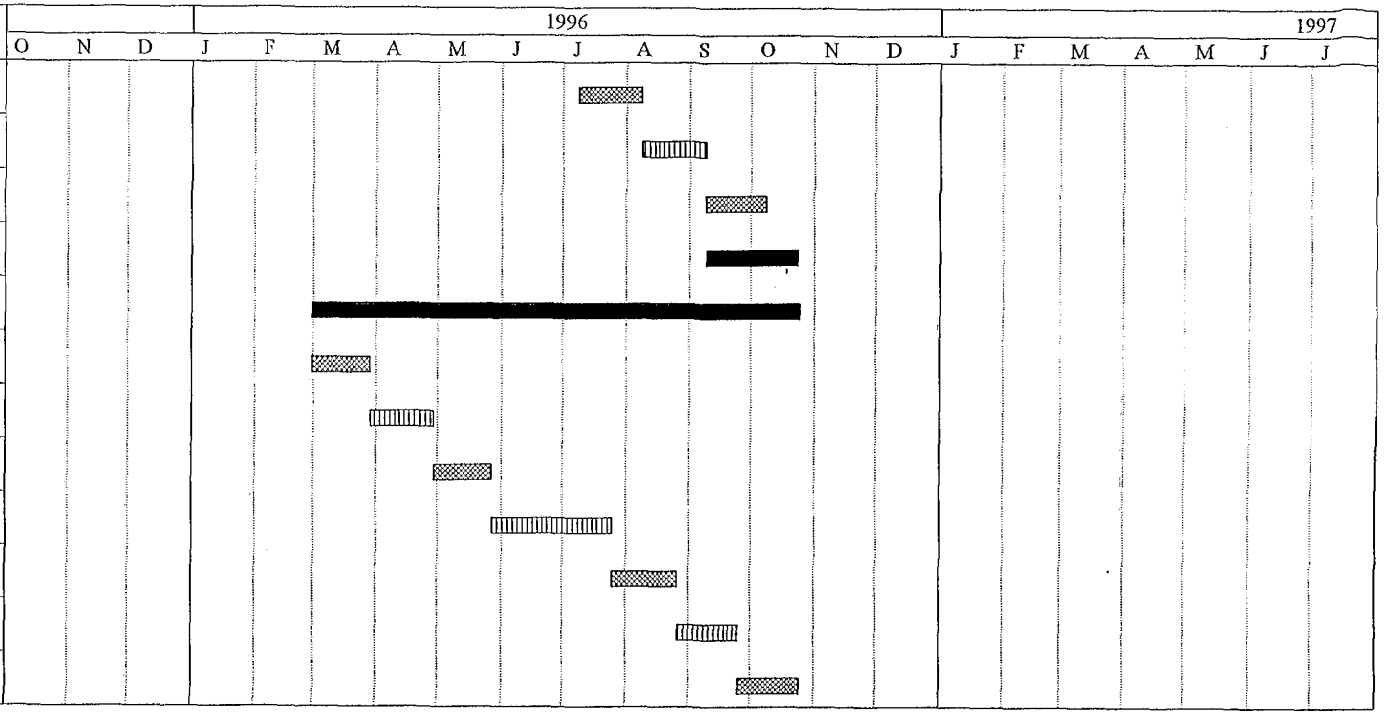


Figure 6 - 2

FY 1995: Sites 9 and 19 Remedial Investigation, Feasibility Study, Proposed Plan, and Record of Decision
Naval Weapons Station Yorktown, Yorktown, Virginia

Task	Days	Start	Finish
Draft Final	31ed	7/8/96	8/8/96
Review (EPA/State)	32ed	8/8/96	9/9/96
Final	30ed	9/9/96	10/9/96
PUBLIC COMMENT PERIOD	**45ed**	**9/9/96**	**10/24/96**
RECORD OF DECISION	**239ed**	**2/29/96**	**10/25/96**
Preliminary Draft	29ed	2/29/96	3/29/96
Review (Navy)	31ed	3/29/96	4/29/96
Draft	28ed	4/29/96	5/27/96
Review (EPA/State)	59ed	5/27/96	7/25/96
Draft Final	32ed	7/25/96	8/26/96
Review (EPA/State)	30ed	8/26/96	9/25/96
Final	30ed	9/25/96	10/25/96



7.0 REFERENCES

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FINAL

HEALTH AND SAFETY PLAN ADDENDUM
SITES 9 AND 19

NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

CONTRACT TASK ORDER 0292

JUNE 30, 1995

Prepared for:

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

Under:

LANTDIV CLEAN Program
Contract N62470-89-D-4814

Prepared by:

BAKER ENVIRONMENTAL, INC.
Coraopolis, Pennsylvania

PREFACE

The purpose of this Health and Safety Plan (HASP) Addendum is to provide specific health and safety information for Sites 9 and 19 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. 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.

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ATTACHMENTS

A **Emergency Procedures for Exposure to Hazardous Materials/Waste**
B *Baker Environmental, Inc. Safety Standard Operating Procedures*

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

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*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
LANTDIV	Atlantic Division, Naval Facilities Engineering Command
LEL	Lower Explosive Limit
mu	meter unit
NPDES	National Pollutant Discharge Elimination System
PHSO	Project Health and Safety Officer
PID	Photoionization Detector
PPE	Personal Protective Equipment
ppm	part per million
RI	Remedial Investigation
SHSO	Site Health and Safety Officer
USEPA	United States Environmental Protection Agency
WPNSTA Yorktown	Naval Weapons Station Yorktown, Yorktown, Virginia

2.2 Site-Specific Personnel

The following personnel will be responsible for the activities to be performed at Sites 9 and 19 (the responsibilities for these personnel are described in Section 2.2 of the Master Site HASP):

Baker Site Personnel:

Site Manager	-	David Martin
Site Health and Safety Officer/ Field Team Leader	-	Martin Taube
Field Team Members	-	Jodi Golden Scott Herbst Mike Smith John Zimmerman

Subcontractor Companies:

Drilling Subcontractor	-	Parratt Wolff, Inc.
Surveying Subcontractor	-	(To be named)
Laboratory Subcontractor	-	Weston Environmental Metric, Inc.
Environment Sampling Subcontractor	-	Engineering and Environment, Inc.

3.2 Description of Areas Under Investigation

Descriptions for Sites 9 and 19 are provided in the following sections.

3.2.1 Site 9 - Plant 1 Explosive-Contaminated Wastewater Discharge Area

Site 9 is a discharge area which had been used as a drainage way for the Plant 1 (Building 10) explosives-contaminated wastewater and possibly for substantial quantities of organic solvents. The drainage area was reportedly used from the late 1930s to 1975. In 1975, a carbon adsorption tower was installed to treat the contaminated wastewater prior to discharge to the drainage way. An National Pollutant Discharge Elimination System (NPDES) permit was granted by the USEPA Region III to allow this discharge. In 1986, the discharge from the treatment tower was diverted to the sanitary sewer and ultimately to the Hampton Roads Sanitation District (HRSD).

Site 9 is topographically downgradient from Site 19, Conveyer Belt Soil at Building 10. Based on estimated discharges of 100 parts per million (ppm) of TNT and RDX and 30 ppm of HMX at 5 gallons per minute (gpm) for 2 hours per workday for 40 years, an estimated 5,200 pounds of TNT and RDX and 1,600 pounds of HMX may have been discharged to the site (C.C. Johnson & Associates, Inc. and CH_2M Hill, 1984). Solvents such as TCE may have been discharged from Plant 1 with the explosives wastewater. Contaminants from Plant 1 may have migrated via surface water into Lee Pond or across the upper soil via overland flow in the area of the pond near Building 10. Lee Pond empties into the eastern branch of Felgates Creek, which in turn flows northward to the York River, approximately 1.5 miles from Site 9.

3.2.2 Site 19 - Conveyor Belt Soil at Building 10

The conveyor belt at Site 19 (between Buildings 10 and 98) carried TNT powder packaged in containers across a depression into the loading building. The conveyer belt is completely enclosed with corrugated metal, but holes are visible along the floors and walls. TNT dust may have been released to the soil below when boxes fell from the conveyor. The conveyor and walls/floors, were sprayed with water to control dust; this rinse water may have dripped onto the ground below.

TNT-contaminated soil has been reported in the vicinity of the conveyor belt. Soil beneath the belt was removed in 1973-1974 but later tests indicated the presence of RDX and TNT. It is possible that contamination from Site 19 has migrated via runoff toward Lee Pond. Analyses have confirmed TNT contamination in Lee Pond. Lee Pond will be investigated in the future as a Separate Site Screening Area (SSA).

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) and Project Manager will be informed.

3.3.1 Chemical Hazards

Table 3-1 identifies the chemical/physical properties, the highest concentration detected for each site (media is identified in large type), and routes of entry for those organic constituents detected during the Round One Remedial Investigation (RI) at Sites 9 and 19. This information provides the basis for the chemical hazard determination by the PHSO for each area under investigation. It contains a summary of the most current analytical data which will be used by the SHSO, field team members, subcontractors, visitors, and regulatory agencies as one means by which they can ascertain their potential risk to chemical hazards.

The risk of exposure to site personnel from metals found with each respective media is considered low. Therefore, the benefits to listing the chemical/physical properties, etc., are limited; instead, each metal detected that exceeded applicable criteria, regardless of media, is listed with the exposure limit and primary routes of entry in Table 3-2.

Chemical/Material Safety Data Sheets for constituents that were previously identified at WPNSTA Yorktown have been compiled, and are included as Appendix B to the Master Project Plans. The data presented herein 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

Chemical/Material Safety Data Sheets will, therefore, be utilized as reference information when questions arise as to a constituent's chemical/toxicological properties, or measures for emergency response.

The potential for exposure, via inhalation, ingestion, dermal and/or eye contact absorption, to the chemicals detected during previous sampling investigations is feasible; however, given these routes of exposure, personnel can be adequately protected and exposure reduced or eliminated by engineering controls such as safe procedural sampling techniques conducted in upwind locations, administrative controls such as effective training programs, and personal protective equipment (PPE) such as chemical protective clothing.

3.3.3 Radiation Hazards

Given the history of these sites, a radiation survey meter will not be assigned.

3.3.5 Task-Specific Hazards

Table 3-3 lists the field activities to be performed at each area under investigation. Section 3.4.5 in the Master Site HASP specifically describes each of these hazards. A summary of potential hazards at each area under investigation is included in the following subsections.

3.3.5.1 Site 9 - Plant 1 Explosives-Contaminated Wastewater Discharge Area

Site 9 is a drainage ditch to Lee Pond that receives drainage from Site 19. The types of hazards expected at this site and from the surrounding area include feral and poisonous animal life, deep water (i.e., Lee Pond), and heavy mud/sediment making it difficult to walk. In addition, steep slopes, spiders, ticks, chiggers, and uneven terrain are to be expected.

3.3.5.2 Site 19 - Conveyor Belt Soil at Building 10

Due to the location and surrounding areas of Site 19, very few hazards are associated with the site. Aside from steep slopes, the presence of feral and poisonous animal life, uneven terrain, and possibly spiders, ticks, and chiggers are to be expected.

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 the summer/fall of 1995, the weather conditions are anticipated to be warm and humid with occasional showers and afternoon thunderstorms. Winds generally will be from the southwest. The topography for each site is presented below:

- Site 9 is a drainage ditch located adjacent to Site 19, which feeds into Lee Pond. Steep, uneven slopes follow along the drainage way.

- Site 19 is the soil around a conveyor belt to Building 10. Steep slopes lead down to the conveyor area from the upper grass slopes.

5.0 ENVIRONMENTAL MONITORING

The specific monitoring requirements and the action levels for the monitoring to be conducted at Sites 9 and 19 are discussed below. Monitoring equipment and frequency to be used for each field activity, as it applies to each site under investigation, is outlined in Table 5-1. Due to the short duration and variability of field tasks, only realtime air monitoring (versus integrated air monitoring) will be used to assess action levels. The action levels for the photoionization detector (PID), as specified in Section 5.1 below, are based on a "worst-case" contaminant 8-hour TWA-PEL of 1 part per million (ppm), and are consistent with those listed by the USEPA in Section 6.9 of the Standard Operating Safety Guides (June 1992).

5.1 Personal Monitoring

Personal monitoring, at a minimum, will include the use of a PID directed at the breathing zone (BZ) of work party personnel which is defined as 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 level 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 with an 11.7 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 = >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

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 with 11.7 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 aerate.

- For elevated levels that are sustained, contact the SHSO for guidance.

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

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

5.3 Perimeter Monitoring

Perimeter monitoring which is monitoring performed at borders beyond the Support Zone and often at the "fence line" will be required based on action levels at either the BZ or point source. The PID action levels are:

- The PID will be used periodically to scan the perimeter as a means of documenting any volatile releases that may extend past the work zone when volatile concentrations exceed 50 meter units (mu) on the 2X scale at the point source or 10 mu on the 1X scale at the breathing zone.

6.0 PERSONAL PROTECTIVE EQUIPMENT

The assigned levels of protection for the field activities to be conducted are listed in Table 6-1. The PPE number corresponds to the table found in the Master Site HASP; equipment numbers applicable to anticipated field activities 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 Number	Personal Protective Equipment
2	Polyethylene-coated coveralls
3	Uncoated Tyvek®/Kleenguard Coveralls
4	Normal Work Clothes or Coveralls
10	Full-face Cartridge Respirator (on standby)
12	Chemical-Resistant Gloves (nitrile-inner-double layer)
13	Chemical-Resistant Gloves (nitrile-inner-single layer)
15	Chemical-Resistant Gloves (nitrile-outer)
16	Work Gloves (as necessary)
18	Chemical-Resistant Overboots (w/o steel toe)
19	Steel-Toe Boots
20	Safety Glasses
23	Hard Hat
25	Chest/Hip Waders (as necessary)

Respiratory protection protocols will comply with the Master Site HASP. If Level C is required, an organic vapor/high efficiency particulate air (HEPA) cartridge will be used.

8.0 EMERGENCY PROCEDURES

Much of the information regarding emergency procedures is presented in the Master Site 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 permanent telephone will be in place in the Baker field trailer. Mobile telephones will be available for health and safety emergencies. Operating instructions will be reviewed during site mobilization. Two-way radios will be utilized for internal communications between the field personnel when WPNSTA Yorktown provides the proper clearance and authorization for use.

Emergency Medical Services

For non-chemical exposure incidents (i.e., cuts, bruises, sprains, heat stress), the nearest public hospital is (refer to Figure 8-1):

Mary Immaculate Hospital
800 Denbigh Boulevard
Newport News, VA 23602
(804) 886-6000 (General Information)
(804) 886-6437 (Emergency Room)

Note: In emergency situations, 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), the nearest public hospital is (refer to Figure 8-2):

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:

Name	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 presents the necessary emergency telephone numbers for both on-Station and off-Station telephones.

8.6 Emergency Hospital Route

An emergency hospital route for off-site public hospitals and a building identification map for the Branch Medical Clinic (Building 1806), 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.

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 also 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 persons during each phase of field activities that will be trained in standard first aid and adult cardiopulmonary resuscitation (CPR). These personnel also will 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 subcontractors as necessary.

8.7.1 Physical Injury

If an employee working in a contaminated area is physically injured, first aid procedures will be followed. 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 Site HASP). 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. Emergency first aid may be administered by Baker personnel prior to transporting to an awaiting ambulance or to a local emergency medical facility, as necessary.

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 personal eye wash bottle when an eye wash station is not immediately 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 you cannot provide victim with transportation to the nearest medical facility.
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.
6. Monitor airway, breathing, and circulation.
7. Obtain physical description of snake, if possible.

8. 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.

9. Inform the SHSO as soon as possible.

8.7.4 Spiderbite Injury

There are two spiders commonly found in the United States whose bite can be serious: the black widow spider and the brown recluse spider. These bites may be serious, even life-threatening. Many other spiders will bite, but they do not produce serious complications. The black widow spider measures approximately 1 inch long with its legs extended. It is glossy black in color and has a distinctive yellow-orange marking in the shape of an hourglass on its belly. On its back, however, there is no marking, and unless you happen to turn the spider over, you cannot see this mark. The danger of the black widow spider bite lies in its systemic manifestations. The venom from this spider attacks the nervous system, resulting in severe muscle cramps with boardlike rigidity of the abdominal muscles, tightness in the chest, and difficulty in breathing. Sweating, nausea, and vomiting also will occur.

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 brown recluse spider is a little bit smaller than the black widow spider and is dull brown in color. It has a violin-shaped mark on its back, which can be seen when you are looking at the spider from above. The spider gets its name because it tends to live in dark areas, corners, and old unused buildings. The bite from this animal produces local rather than systemic manifestations. The venom of the brown recluse spider causes severe local tissue damage and can lead to an ulcer and gangrene. The bitten area becomes red, swollen, and tender within a few hours after the bite. A small blister forms, and several days later, this may form a large scab, covering a deep ulcer. Death is rarely reported, but these bites need surgical treatment, and these patients should be brought to the hospital. Again, if possible, identification of the spider should be carried out.

9.2 Site-Specific Training

Training history for site personnel is provided in Table 9-1. Training requirements are specified in Section 9.0 of the Master Site HASP.

11.0 HEALTH AND SAFETY PLAN APPROVAL

This HASP Addendum for Sites 9 and 19 has been reviewed by the following personnel prior to submission to Atlantic Division, Naval Facilities Engineering Command (LANTDIV).

David Martin (Name)	Site Manager (Role)	David J Martin (Signature)
Barbara Cummings (Name)	Project Health and Safety Officer (Role)	Barbara J Cummings (Signature)
Letitia Savage (Name)	Project Manager (Role)	Letitia Savage (Signature)

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 9 and 19 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)

* This page is to be reproduced to accommodate the members of personnel who receive training prior to performing activities or visiting a site, and is to remain in the Baker field trailer until demobilization.

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TABLES

TABLE 3-1

CHEMICAL/PHYSICAL PROPERTIES OF CONSTITUENTS DETECTED DURING ROUND ONE RI SAMPLING
SITES 9 AND 19
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Chemical	Site	Highest Concentration Detected (ppb)	Source				Exposure Limit (EL)[1]	Vapor Pressure[2]	Ionization Potential	Routes of Entry
			SL	SW	SD	GW/ HP				
VOCs										
Acetone	9 19	440J 89J	 X		x	X	1,000 ppm	180	9.6 eV	Inhalation, Ingestion, Skin/Eye Contact
2-Butanone (methyl ethyl ketone)	9	57J			X		200 ppm	78	9.54 eV	Inhalation, Ingestion, Skin/Eye Contact
1,1-Dichloroethane	9	6J		X			200 ppm	230 (at 77°F)	11.06 eV	Inhalation, Ingestion, Skin/Eye Contact
Toluene	9	7J		X			200 ppm	20 (at 65°F)	8.82 eV	Inhalation, Absorption, Ingestion, Skin/Eye Contact
1,1,1-Trichloroethane (Methyl Chloroform)	9	18		X			350	100	11.00 eV	Inhalation, Ingestion, Skin/Eye Contact
SVOCs										
PAHs (as benzene-soluable coal tar pitch volatiles)	9 19	12,000 27,000	x x		X X		0.2 mg/m^3	NA	NA	Inhalation, Skin/Eye Contact
Bis(2-ethylhexyl)phthalate (Di-sec octyl phthalate)	9 19	880J 380J	x x	x x	X X		5 mg/m^3	<0.01	Unknown	Inhalation, Ingestion, Skin/Eye Contact
Di-n-Butylphthalate	9 19	330J 51J	x X		X		5 mg/m^3	<0.1	NA	Inhalation, Ingestion, Skin/Eye Contact
Diethylphthalate	9 19	1J 35J	 X			X	5 mg/m^3	NA	NA	Inhalation, Absorption, Ingestion, Skin/Eye Contact
4-Methylphenol (as creosol)	9	74J		x	X		22 mg/m^3	1 (@ 100°F)	8.93 to 8.98	Inhalation, Absorption, Ingestion, Skin/Eye Contact

TABLE 3-1 (Continued)

CHEMICAL/PHYSICAL PROPERTIES OF CONSTITUENTS DETECTED DURING ROUND ONE RI SAMPLING
SITES 9 AND 19
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Chemical	Site	Highest Concentration Detected (ppb)	Source				Exposure Limit (EL)[1]	Vapor Pressure[2]	Ionization Potential	Routes of Entry
			SL	SW	SD	GW/ HP				
Munitions										
2,4-DNT	9 19	3,400 1,300J	X X	x		x	1.5 mg/m^3 (skin)	1	Unknown	Inhalation, Absorption, Ingestion, Skin/Eye Contact
2,6-DNT	9 19	0.29J 770J	 X	X			1.5 mg/m^3 (skin)	1	Unknown	Inhalation, Absorption, Ingestion, Skin/Eye Contact
HMX	9	4		X			NA	NA	NA	Inhalation, Absorption, Ingestion, Skin/Eye Contact
RDX (Cyclonite)	9	43		X			1.5 mg/m^3 (skin)	NA	NA	Inhalation, Absorption, Ingestion, Skin/Eye Contact
1,3,5-Trinitrobenzene	9 19	3,000 4,900	X X	x		x x	0.1 mg/m^3 (skin)	1 (at 383°F)	Unknown	Inhalation, Absorption, Skin/Eye Contact
2,4,6-TNT	9 19	2,100,000 120,000	X X	x		x x	1.5 mg/m^3 (skin)	0.05 (at 180°F)	10.59 eV	Inhalation, Absorption, Ingestion, Skin/Eye Contact

(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 Limits 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 otherwise mentioned).

ppm - parts per million (in air)
NA - Not Available
SL = Soil sample (ppb as μg/kg)
SW = Surface water sample (ppb as μg/L)
mg/m^3 - milligrams per cubic meter (in air)
HP-Hydropunch groundwater sample (ppb as μg/L)
GW = Groundwater sample (ppb as μg/L)
SD = Sediment sample (ppb as μg/kg)
Skin - Potential for dermal absorption
X - Medium with highest detected concentration
x - Medium with detected constituent

TABLE 3-2

ROUTES OF ENTRY FOR METALS EXCEEDING AVAILABLE CRITERIA
DURING ROUND ONE RI SAMPLING
SITES 9 AND 19
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Substance	Exposure Limit (EL)[a] (mg/m^3)	Routes of Entry
Arsenic	0.01	Inhalation, Absorption, Skin/Eye Contact, Ingestion
Barium	0.5	Inhalation, Ingestion, 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
Mercury	0.05	Inhalation, Ingestion, Absorption, Skin/Eye Contact
Nickel	1	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 Limits according to the following hierarchical order: (1) OSHA PELs; (2) NIOSH RELs; (3) ACGIH TLVs; and (4) other recognized sources.

NA = Not Available

TABLE 3-3

FIELD ACTIVITIES
SITES 9 AND 19
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Field Activity	Site	
	9	19
Land Surveying	X	X
Surface Soil Sampling	X	X
Soil Boring - Sampling	X	X
Monitoring Well/Hydropunch Installation	X	X
Monitoring Well Development	X	X
Groundwater Sampling/Slug Test	X	X
Surface Water/Sediment/Biota Sampling	X	
IDW Drum Sampling	X	X
IDW Tanker/Roll-off Box Sampling	X	X

* Section 3.4.5 in the Master Site HASP describes the chemical, physical, and environmental hazards associated with each field activity.

TABLE 5-1

MONITORING EQUIPMENT AND FREQUENCY FOR EACH
FIELD ACTIVITY CONDUCTED AT
SITES 9 AND 19
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Field Activity	PID	Oxygen/ Combustible Gas Meter
Land Surveying		
Surface Soil Sampling	I&P	
Soil Boring Sampling	C	C
Monitoring Well/Hydropunch Installation	C	C
Monitoring Well Development	I&P	
Groundwater Sampling/Slug Test	I&P	
Surface Water/Sediment Sampling	I&P	
Aquatic (Biota) Sampling		
IDW Drum Sampling	I&P	
IDW Tanker/Roll-Off Box Sampling	I&P	

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, data should be documented in the individual's field logbook. In the case of continuous monitoring, every 15 minutes.

TABLE 6-1

PERSONAL PROTECTIVE EQUIPMENT REQUIRED DURING FIELD ACTIVITIES
SITES 9 AND 19
NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Site(s)	Field Activity	Level of Protection					PPE Item No.
		B	C	D+	D	Other	
9 and 19	Land Surveying				X		4, 16, 19
9 and 19	Surface Soil Sampling				X		4, 12, 16, 19, 20
9 and 19	Soil Boring - Sampling			X			3/4, 10, 12, 16, 18/19, 20, 23
9 and 19	Monitoring Well/ Hydropunch Installation			X			3/4, 10, 12, 16, 18/19, 20, 23
9 and 19	Monitoring Well Development			X			4, 10, 12, 19, 20
9 and 19	Groundwater Sampling/Slug Test			X			4, 10, 12, 19, 20
9	Surface Water/Sediment Sampling				X		4, 12, (18), 19, 20, 25
9	Aquatic (Biota) Sampling[1]				X[2]		4, 15, (18), 19, 20, 25
9 and 19	IDW Drum Sampling			X[3]			4, 10, 12, 16, 19, 20
9 and 19	IDW Roll-Off Box Sampling			X[3]			2, 4, 10, 12, 16, 18, 19, 20
9 and 19	IDW Tanker Sampling			X			4, 10, 12, 19, 20

(1) Sampling from boats will follow Baker's SOP on boat operations in Appendix A of the Master Project Plans and the Safety SOP in Attachment A of the Master Site HASP.

(2) If shocking equipment is to be used for biota sampling, steel-toed boots will not be required for this task.

(3) Upgrades may be required; this will be based upon the real-time monitoring results and the SHSO's discretion.

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.

TABLE 8-1

EMERGENCY TELEPHONE NUMBERS
SITES 9 AND 19
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	(804) 887-4911	Dispatch
Spill Response	ext. 4676	(804 887-4676	Dispatch
Hot Work Permits	ext. 4950	(804) 887-4950	Asst. Fire Chief Dinkins
Fire	ext. 4911	(804) 887-4911	Dispatch
Security	ext. 4676	(804) 887-4676	Response Operator
Ambulance (Branch Medical Clinic)	ext. 4911	(804) 887-4911	Dispatch
Ambulance (Public)	(9) 911	911	Response Operator
Branch Medical Clinic (Non-Emergency)	ext. 7404	(804) 887-7404	Tommy Stainback, RN
Branch Medical Clinic (Emergency)	ext. 4911	(804) 887-4911	Tommy Stainback, RN
Public Hospital (Chemical Exposure)	(9) 594-2050	(804) 594-2050	Emergency Room Attendant
Public Hospital (Non-Chemical Exposure)	(9) 886-6437	(804) 886-6437	Response Operator
On-Scene Coordinator	ext. 4911	(804) 887-4911	Dispatch
Central Virginia Poison Information Services	(9) 786-9123	(804) 786-9123	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

(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 number, including area code.

(3) Points of contact will be reconfirmed during site mobilization.

TABLE 9-1
OSHA TRAINING HISTORY OF BAKER PROJECT PERSONNEL*
SITES 9 AND 19
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Personnel	Title/Role	Training Status
David Martin	• Site Manager	• 40-hr. training completed: 3/92 • Supervisory training: 3/92 • 8-hr. refresher completed: 3/95 • First Aid Training: 7/92 • CPR Training: 6/94 • Medical surveillance: 3/95
Martin Taube	• Field Team Leader/SHSO	• 40-hr. training completed: 8/89 • Supervisory training: 6/94 • 8-hr. refresher completed: 4/95 • First Aid Training: 3/94 • CPR Training: 3/94 • Medical surveillance: 8/94
Jodi Golden	• Environmental Scientist	• 40-hr. training completed: 3/90 • Supervisory training: NA • 8-hr. refresher completed: 4/95 • First Aid Training: 3/94 • CPR Training: 3/94 • Medical surveillance: 3/95

* Training documentation for Baker and subcontractor personnel will be maintained at the command post.
NA - Not Applicable

TABLE 9-1 (Continued)
OSHA TRAINING HISTORY OF BAKER PROJECT PERSONNEL*
SITES 9 AND 19
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Personnel	Title/Role	Training Status
Scott Herbst	• Environmental Scientist	• 40-hr. training completed: 1/95 • Supervisory training: NA • 8-hr. refresher completed: NA • First Aid Training: NA • CPR Training: NA • Medical surveillance: 12/94
Mike Smith	• Environmental Scientist	• 40-hr. training completed: 9/91 • Supervisory training: 9/91 • 8-hr. refresher completed: 4/95 • First Aid Training: 10/93 • CPR Training: 6/94 • Medical surveillance: 6/95
John Zimmerman	• Geologist	• 40-hr. training completed: 3/92 • Supervisory training: 3/92 • 8-hr. refresher completed: 2/95 • First Aid Training: 7/92 • CPR Training: 6/94 • Medical surveillanc: 1/95

* Training documentation for Baker and subcontractor personnel will be maintained at the command post.
NA - Not Applicable

FIGURES

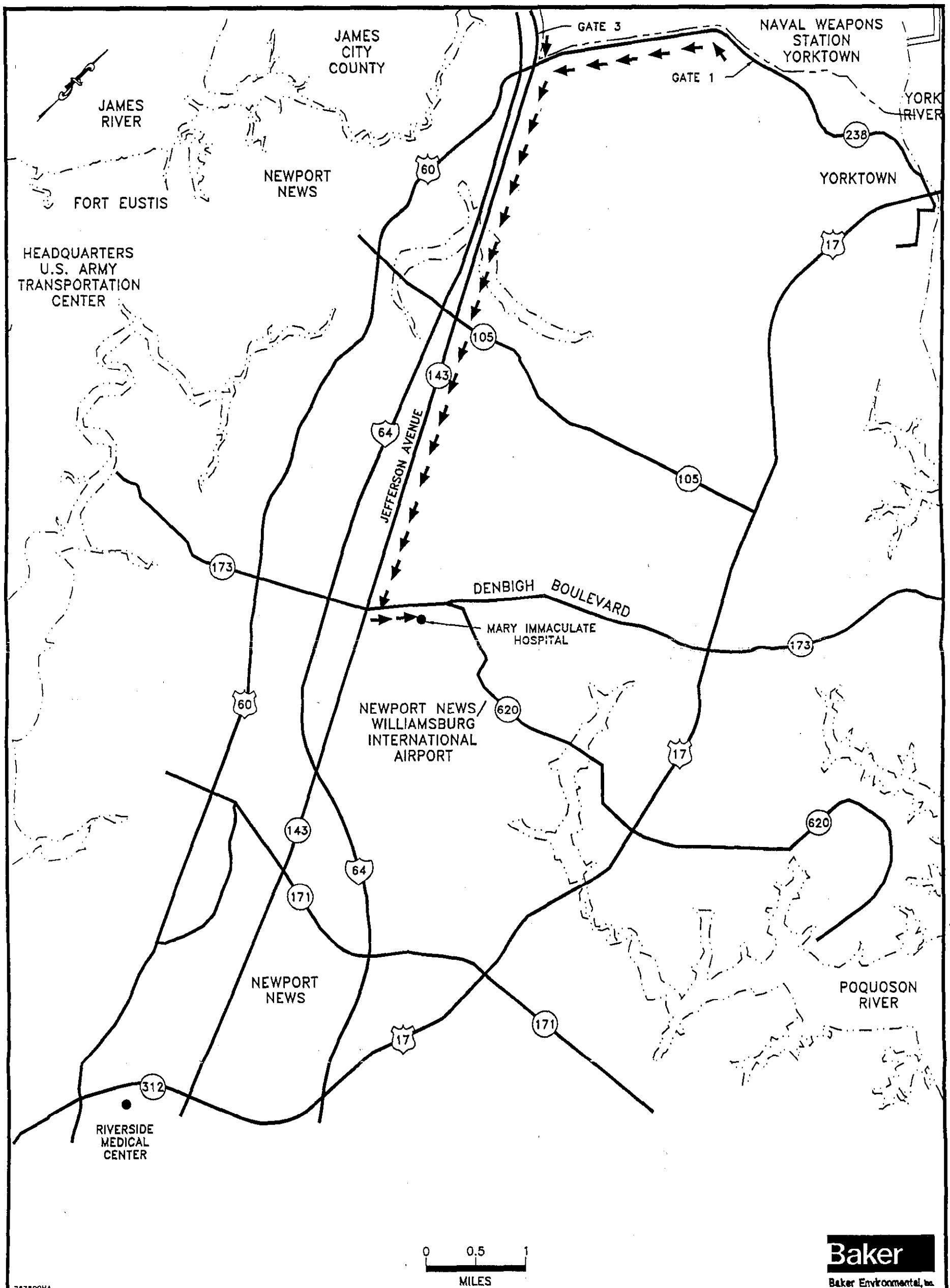

FIGURE 8-1
EMERGENCY HOSPITAL ROUTE
NON-CHEMICAL EXPOSURE INCIDENTS
MARY IMMACULATE HOSPITAL

NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

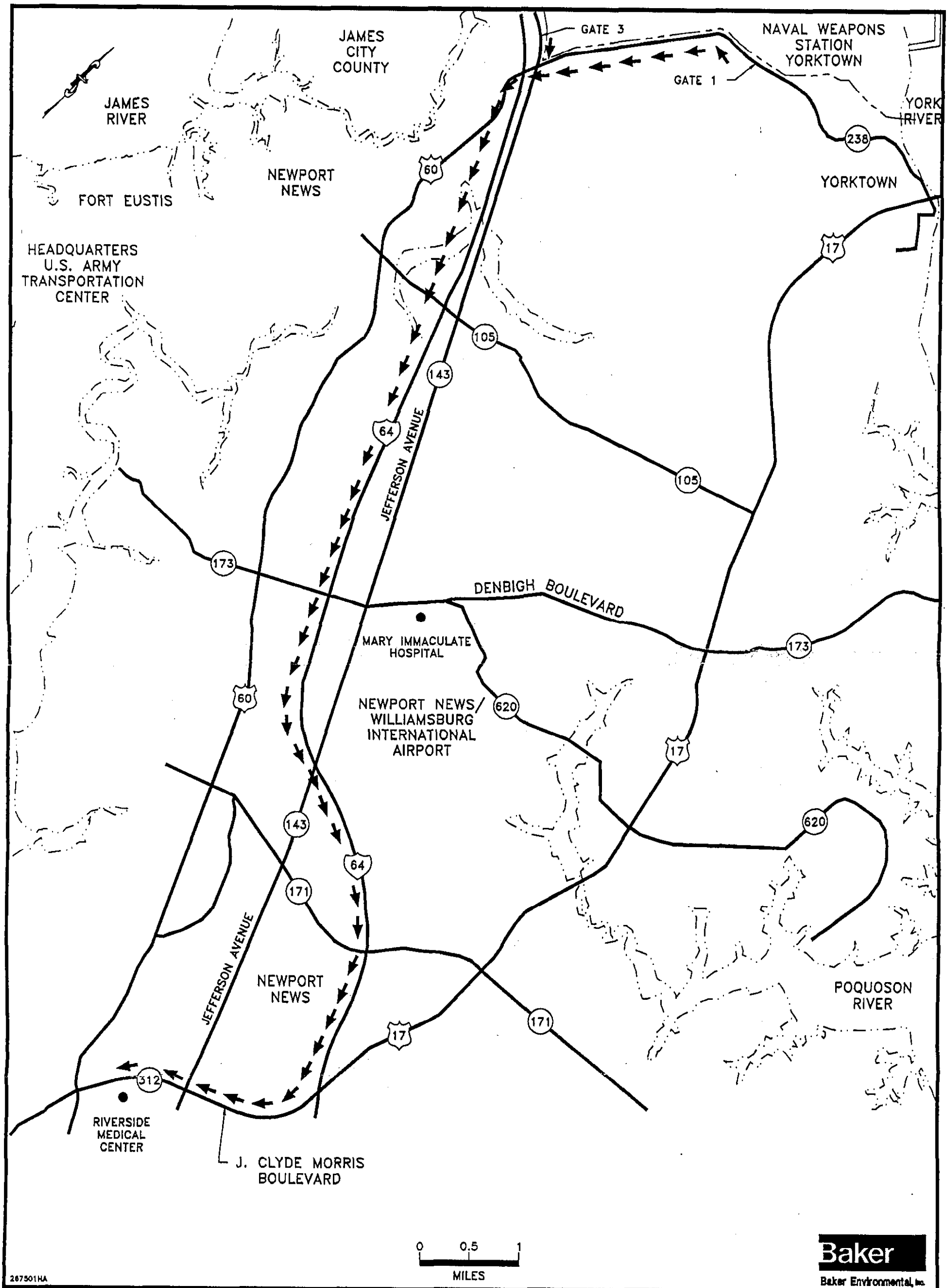

FIGURE 8-2
EMERGENCY HOSPITAL ROUTE
CHEMICAL EXPOSURE INCIDENTS
RIVERSIDE MEDICAL CENTER

NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

FIGURE 8-3

WRITTEN DIRECTIONS TO PUBLIC HOSPITALS

Non-chemical Exposure Incidents - Mary Immaculate Hospital (refer to Figure 8-1):

Gate 1

1 From Gate 1 proceed south (turn right) on State Route 238 until intersecting with State Route 143 (approximately 2.4 miles).
2 Turn left, following State Route 143 south for approximately 5.3 miles until intersecting with Denbigh Boulevard.
3 Turn left onto Denbigh Boulevard and proceed east until intersecting with McManis Boulevard, following signs for emergency room entrance.

Gate 3

1 From Gate 3 turn left and proceed south on Route 143 for approximately 5.5 miles until intersecting with Denbigh Boulevard.
2 Turn left onto Denbigh Boulevard and proceed east until intersecting with McManis Boulevard, following signs for the Emergency Room Entrance.

Chemical Exposure Incidents - Riverside Medical Center (refer to Figure 8-2):

Gate 1

1 From Gate 1 proceed south (turn right) on State Route 238 until intersecting with Interstate 64 (approximately 2.5 miles).
2 Follow Interstate 64 east (southeast) for approximately 11.0 miles until intersecting with J. Clyde Morris Boulevard (State Route 312) at Exit 258A.
3 Proceed west-southwest for approximately 2.3 miles, Riverside Medical Center will be on the left-hand side.
4 Follow signs for Emergency Room Entrance.

Gate 3

1 From Gate 3 proceed south (turn left) onto State Route 143 until intersecting with Route 238 (approximately 0.2 miles).
2 Turn right then move into left lane to access Interstate 64 south.
3 Follow Interstate 64 east (southeast) for approximately 11.0 miles until intersecting with J. Clyde Morris Boulevard (State Route 312) at Exit 258A.
4 Proceed west-southwest for approximately 2.3 miles, Riverside Medical Center will be on the left-hand side.
5 Follow signs for Emergency Room Entrance.

UPON ARRIVING AT RIVERSIDE MEDICAL CENTER, FOLLOW THE PROCEDURES OUTLINED IN ATTACHMENT A ENTITLED "EMERGENCY PROCEDURES FOR EXPOSURE TO HAZARDOUS CHEMICALS/WASTE".

ATTACHMENT A
EMERGENCY PROCEDURES FOR EXPOSURE TO HAZARDOUS MATERIALS/WASTE

ATTACHMENT A

EMERGENCY PROCEDURES FOR EXPOSURE TO HAZARDOUS MATERIALS/WASTE

1. Call ambulance or transport individual to hospital/clinic immediately. Monitor airway, breathing, and circulation during trip to hospital or while waiting for the ambulance. Administer first aid or CPR, as necessary. Don't forget to take the HASP Addendum with you; it contains information on the contaminants expected to be found on site and will assist the physician in his/her assessment of the exposure.

2. Fill in Potential Exposure Report, answering each of the questions to the best of your ability.

3. Contact our physician at EMR as soon as possible. The procedure is as follows:

   a. **Call EMR at 1-800-229-3674!**

   b. Ask to speak with:

      Dr. David L. Barnes;
      Dr. Elaine Theriault; or
      Ms. T.J. Wolff, R.N.

Note: During nonbusiness hours (i.e., after 6 p.m.) call 1-800-229-3674 and follow directions for paging the aforementioned individuals.

4. Once in contact with any of these individuals, explain what has happened. They will review the information on the form with you and may ask you to fax the form to them, if possible, and allow either of them to speak with the attending physician.

5. When asked about payment (and they will ask), inform the Hospital/Clinic/Physician that this is a "work related injury" and have them contact the Benefits Coordinator at (412) 269-2744. Have invoices sent to:

   Michael Baker Jr. Inc.
   Attn: Benefits Coordinator
   Airport Office Park, Bldg. 3
   Coraopolis, PA 15108

6. Contact the Project Manager and the PHSO as soon as it is feasible, but wait no longer than 24 hours.

Baker

Baker Environmental, Inc.

POTENTIAL EXPOSURE REPORT

Name: _____ Date of Exposure: _____

Social Security No.: _____ Age: _____ Sex: _____

I. Exposing Agent

Name of Product or Chemicals (if known) _____

_____

Characteristics (if the name is not known)

Solid Liquid Gas Fume Mist Vapor

II. Dose Determinants

What was individual doing? _____

How long did individual work in area before signs/symptoms developed?

_____

Was protective gear being used? If yes, what was the PPE?

_____

Was there skin contact? _____

Was the exposing agent inhaled? _____

Were other persons exposed? If yes, did they experience symptoms?

_____

III. Signs and Symptoms (check off appropriate symptoms)

Immediately with Exposure:

- ☐ Burning of eyes, nose, or throat
- ☐ Tearing
- ☐ Headache
- ☐ Cough
- ☐ Shortness of breath
- ☐ Delirium
- ☐ Chest tightness/pressure
- ☐ Nausea/vomiting
- ☐ Dizziness
- ☐ Weakness
- ☐ Heat flashes
- ☐ Other _____

Delayed Symptoms:

- ☐ Weakness
- ☐ Nausea/vomiting
- ☐ Shortness of breath
- ☐ Cough
- ☐ Loss of appetite
- ☐ Abdominal pain
- ☐ Headache
- ☐ Numbness/tingling
- ☐ Other _____

IV. Present Status of Symptoms (check off appropriate symptoms)

☐	Burning of eyes, nose, or throat	☐	Nausea/vomiting
☐	Tearing	☐	Dizziness
☐	Headache	☐	Weakness
☐	Cough	☐	Loss of appetite
☐	Shortness of breath	☐	Abdominal pain
☐	Chest tightness/pressure	☐	Numbness/tingling
☐	Cyanosis (bluish skin color)	☐	Other _____

Have symptoms (please check off appropriate response and give duration of symptoms):

Improved _____ Worsened _____ Remain Unchanged _____

V. Treatment of Symptoms (check off appropriate response)

None _____ Self-medicated _____ Physician treated _____

VI. Name _____
(Attending physician)

VII. Hospital/Clinic _____

ATTACHMENT B
BAKER ENVIRONMENTAL, INC.
SAFETY STANDARD OPERATING PROCEDURES

REFER TO MASTER SITE HEALTH AND SAFETY PLAN