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PILOT-SCALE AIR SPARGING/SOIL VAPOR EXTRACTION TREATABILITY STUDY WORK PLAN AND NATURAL ATTENUATION SAMPLING AND ANALYSIS PLAN FOR OPERABLE UNIT 7 (OU 7) SITE 16 DRAFT AS FINAL NAS CECIL FIELD FL

8/1/1998

TETRA TECH NUS INC

Pilot-Scale Air Sparging/Soil Vapor Extraction (AS/SVE) Work Plan and Natural Attenuation Sampling and Analysis Plan Operable Unit 7, Site 16

at

Naval Air Station Cecil Field

Jacksonville, Florida

Southern Division Naval Facilities Engineering Command

Contract Number N62467-94-D-0888

Contract Task Order 051

August 1998

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PILOT SCALE AS/SVE TREATABILITY STUDY WORK PLAN AND NATURAL ATTENUATION SAMPLING AND ANALYSIS PLAN FOR OPERABLE UNIT 8, SITE 3 AT

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Southern Division
Naval Facilities Engineering Command
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North Charleston, South Carolina 29406

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1.0 INTRODUCTION

1.1 AUTHORITY

The Southern Division of the Naval Facilities Engineering Command has issued Contract Task Order (CTO) 51 to Tetra Tech NUS, Inc. (TtNUS) under Comprehensive Long-Term Environmental Action Navy (CLEAN III) Contract No N62467-94-D-0888. Under CTO 51, TtNUS will design and perform an Air Sparging/Soil Vapor Extraction (AS/SVE) pilot-scale treatability study within the identified groundwater contamination source location at Operable Unit 7, Site 16, Naval Air Station (NAS), Cecil Field, Jacksonville, Florida. Under this CTO natural attenuation of the identified groundwater plume will also be evaluated over a two year period.

1.2 SCOPE AND OBJECTIVES

TtNUS shall design, install, and operate a pilot-scale AS/SVE system to determine the physical parameters needed for design of a full scale AS/SVE system to treat of Volatile Organic Compounds (VOCs) present in the groundwater at Site 16. The scope of this study is limited to evaluation of physical parameters such as: radius of influence, flow rates, emission control requirements, and operation considerations.

This report also provides information and details for the monitoring of groundwater parameters that indicate the presence of naturally occurring biological, physical, and chemical processes that may reduce VOC and SVOC concentrations.

1.3 NATURE AND EXTENT OF CONTAMINATION

It has been determined that VOCs, in particular TCE, are present in the groundwater in the vicinity of Site 16 in concentrations which exceed regulatory limits. Figure 1-1 provides a map of Site 16 which identifies the VOC plume in the shallow aquifer.

A summary of the organic analytical results for groundwater is presented in Table 1-1. The results are also provided graphically on the cross section shown in Figure 1-2. Chemical analytical results for the volatile fraction are discussed in detail in the RI (AB, July 1995).

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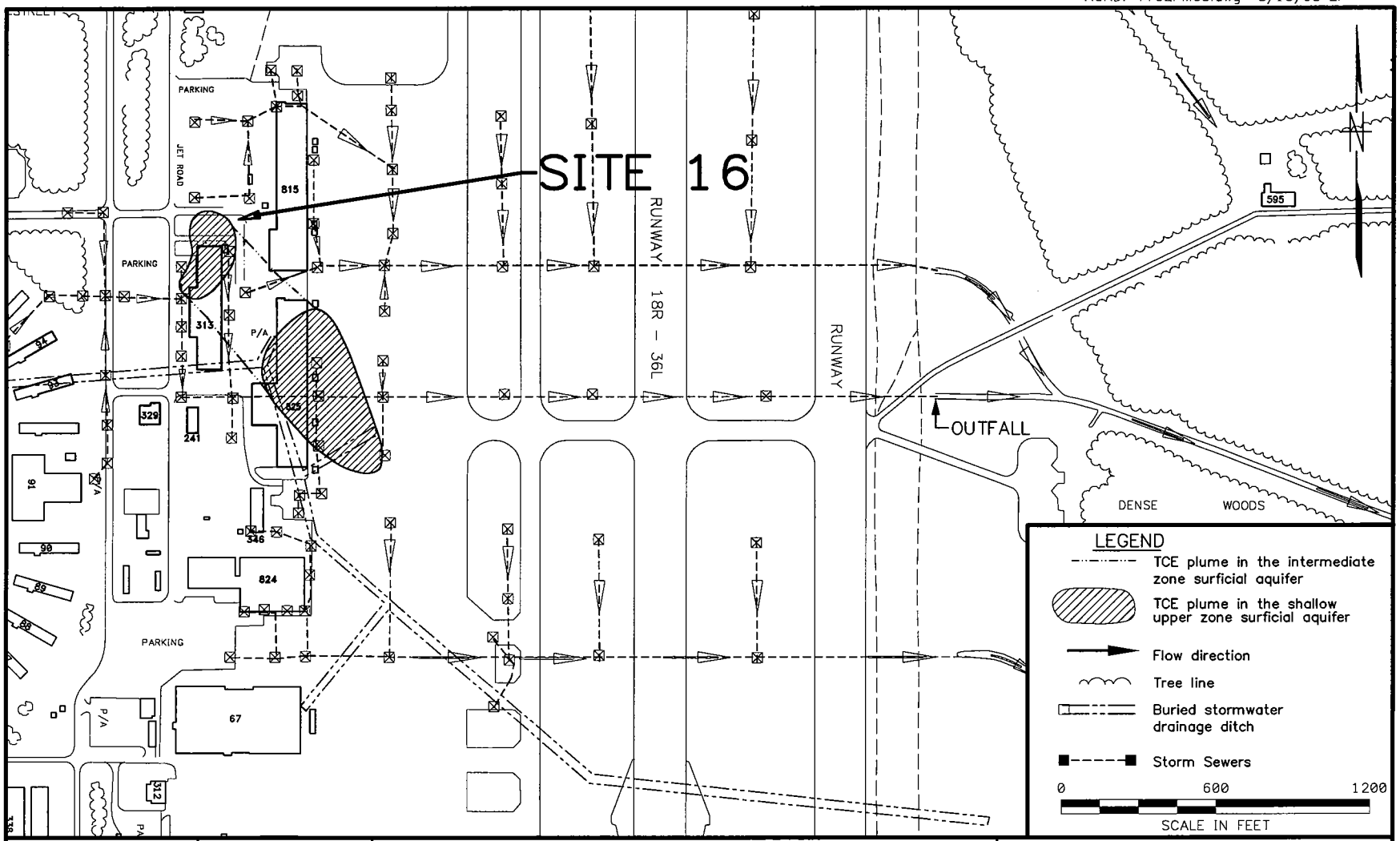

DRAWN BY TAD DATE 2/20/98	SHALLOW AQUIFER PLUME SITE 16, OPERABLE UNIT 7 NAS CECIL FIELD JACKSONVILLE, FLORIDA	CONTRACT NO. 7792	
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TABLE 1-1

SUMMARY OF ORGANIC COMPOUNDS DETECTED IN GROUNDWATER
REMEDIAL INVESTIGATION
OPERABLE UNIT 7, NAS CECIL FIELD
JACKSONVILLE, FLORIDA

Analyte	Frequency of Detection	Range of Detected Concentrations	Federal Primary MCL[3]	Florida Primary Standard[4]	Florida Guidance Concentration[5]
Surfical Aquifer					
VOCs (µg/l)					
1,1,1-Trichloroethane	1/26	3,000[2]	200	200	200
1,1-Dichloroethane	1/26	1	NA	NA	70
1,1-Dichloroethene	1/26	400[2]	7	7	7
1,2-Dichloroethene (total)	2/26	270J to 12,500[2]J	70[6]	70[6]	70[6]
4-Methyl-2-pentanone	1/21	1	NA	NA	350
Trichloroethene	7/26	12J to 630[2]J	5	3	3
SVOCs (µg/l)					
2-Methylnaphthalene	1/26	2.75[2]J	NA	NA	NA
Diethylphthalate	2/26	1J	NA	NA	5,600
Naphthalene	1/26	3.5[2]J	NA	NA	6.8
Phenanthrene	1/26	3J	NA	NA	10
Phenol	3/26	0.8J to 1.45[2]J	NA	NA	10
bis(2-Ethylhexyl)phthalate	21/26	0.5J to 20.5[2]	6	6	6
Pesticides and PCBs (µg/l)					
Endrin	1/26	0.02J	2	2	2
Intermediate Aquifer					
SVOCs (µg/l)					
Di-n-butylphthalate	1/4	1J	NA	NA	700
bis(2-Ethylhexyl)phthalate	4/4	1J to 10	6	6	6

Notes:

1 Frequency of detection is the number of samples in which the analyte was detected divided by the total number of samples analyzed.
2 Value is the average of a sample and its duplicate.
3 Federal Primary MCLs are taken from USEPA Drinking Water Regulations and Health Advisories (May 1994).
4 Florida Primary Standards are taken from Chapter 1 (Primary Standards) of the FDEP Groundwater Guidance Concentrations (June 1994).
5 Florida Guidance Concentrations are taken from Chapter 6 (Guidance Concentrations Index) of the FEDP Groundwater Guidance Concentrations (June 1994).
6 Primary MCL is for cis-1, 2-Dichloroethylene.

µg/l = microgram per liter.
PCBs = polychlorinated biphenyls.
NA = not applicable.

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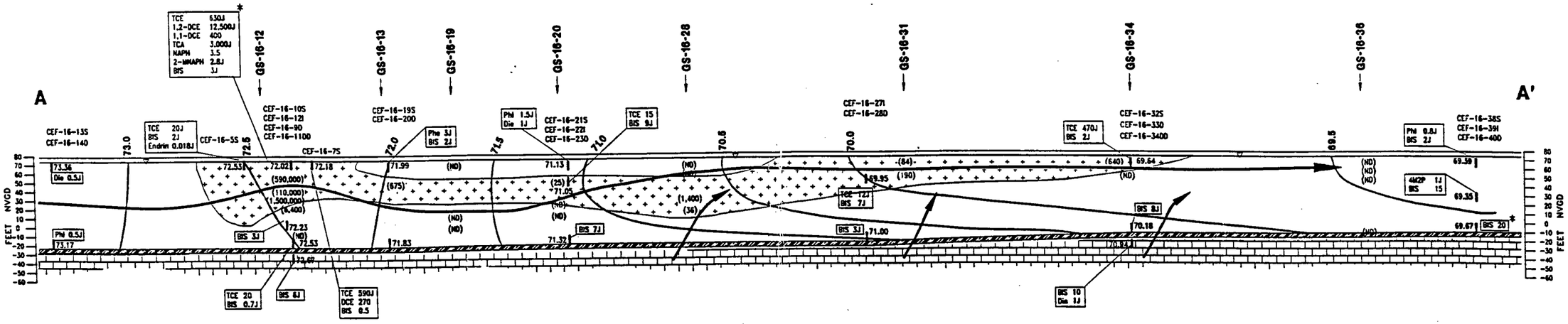

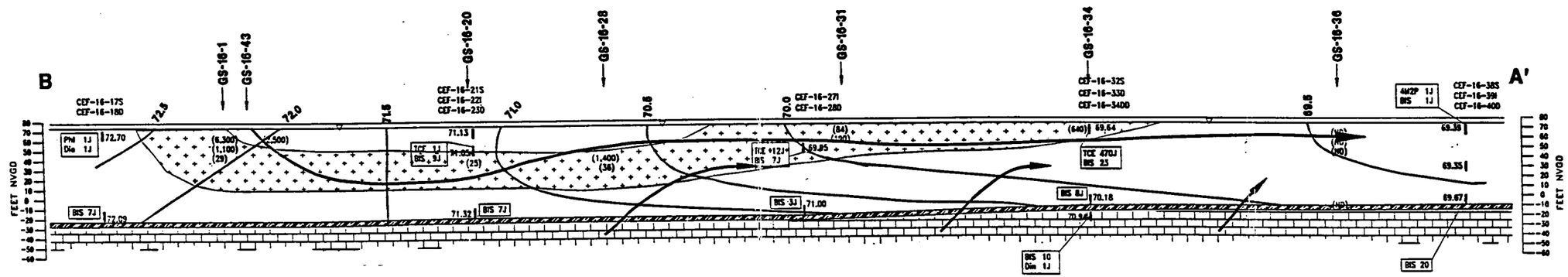

LEGEND:

- Estimated extent of TCE contamination
- Sand (surface aquifer)
- Clay and dolomite
- Dolomite (intermediate aquifer)
- Monitoring well screen location

TCE 15	Groundwater result from monitoring well in micrograms per liter
73.36	Groundwater elevation (August 1994) in feet National Geodetic Vertical Datum, (NGVD)
73.0	Groundwater equipotential line
(640)	Groundwater TCE concentration in micrograms per liter from representative Aquaprobe™ sample (GS-16-12)
ND	TCE not detected (Aquaprobe™)
J	Estimated value
*	Average of sample and duplicate

TCE	Trichloroethene
1,1-DCE	1,1-Dichloroethene
1,2-DCE	1,2-Dichloroethene (total)
4M2P	4 Methyl-2-propanone
BIS	bis(2-Ethylhexyl)phthalate
Din	Di-n-butylphthalate
NAPH	Naphthalene
2-MNAPH	2-Methylnaphthalene
Die	Diethylphthalate
Phl	Phenol
Phe	Phenanthrene

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SCALE IN FEET

SOURCE: CROSS SECTIONS WERE PROVIDED BY ABB ENVIRONMENTAL SERVICES, INC.

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ORGANICS DISTRIBUTION ALONG FLOWPATH PROFILES
REMEDIAL INVESTIGATION
OU7 SITE 16
NAS CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NO. 7792
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2.0 PILOT SCALE AS/SVE SYSTEM DESIGN AND INSTALLATION

A pilot-scale AS/SVE system will be installed at the Site 16 source area. The system will inject air into the groundwater via two injection wells screened at different intervals in the surifical aquifer and extract vapors via two extraction wells screened in the vadose zone. The pilot-scale study will determine the applicability of AS/SVE for removing VOCs present in the groundwater via volatilization. System air emission will also be evaluated to determine off-gas treatment requirements.

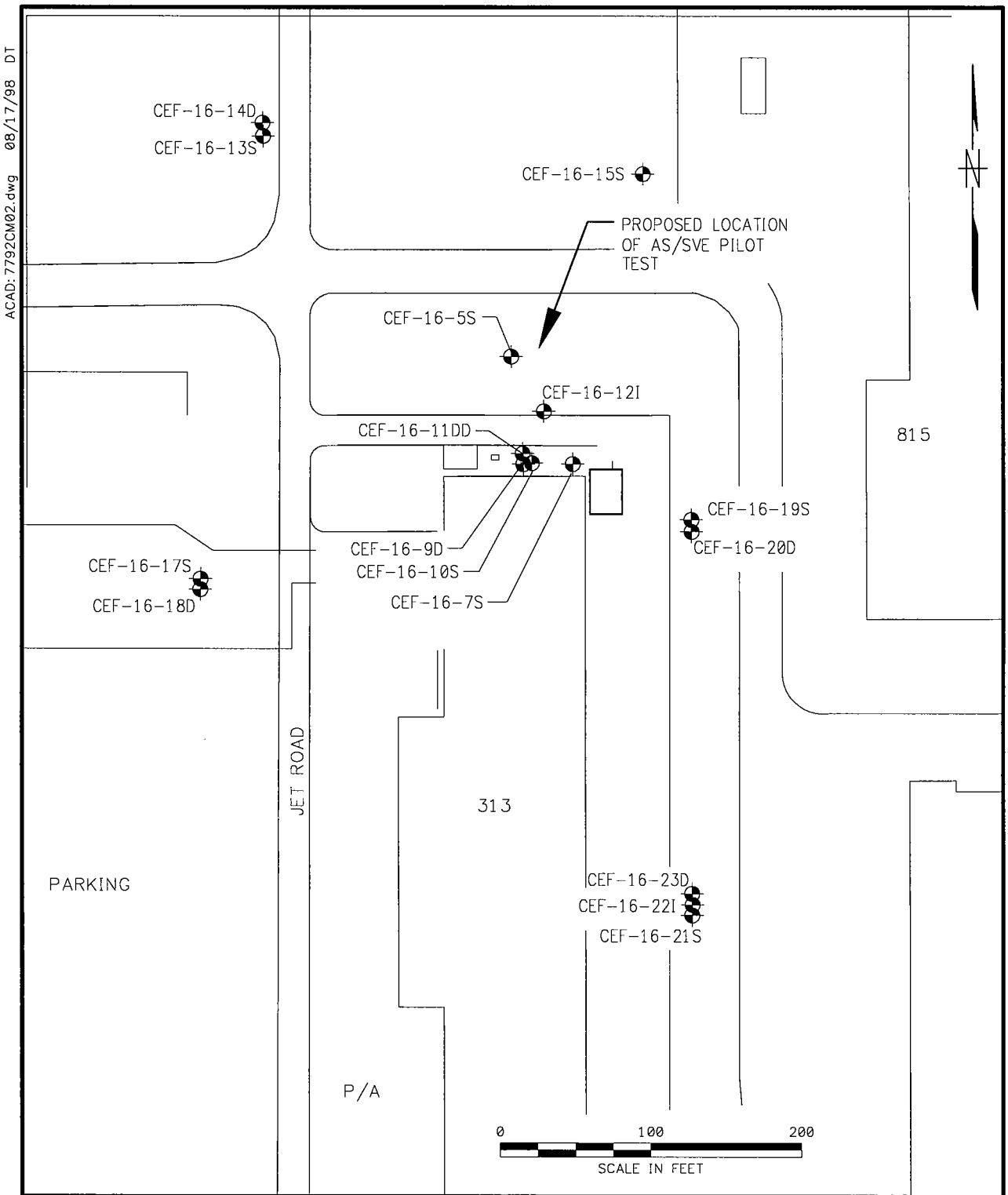
The pilot-scale evaluation, and associated sampling and analysis activities, are intended to provide information to be used for the design of a full scale AS/SVE system. Operation of the pilot-scale system will be used to determine the effective radii of influence, emission concentration and needs for off-gas treatment, groundwater conditions, well location and depth requirements, vacuum and injection pressures, and flow rate requirements. The pilot-scale test is anticipated to last approximately one week. The results of the test will be presented in the full scale AS/SVE design and will include a risk assessment evaluation for the air emission and recommendations for treatment. Placement of the pilot-scale system wells has been designed such that they can be used during the full scale operation.

2.1 INSTALLATION OF PILOT-SCALE SYSTEM

The pilot-scale system consists of an air injection system, a soil vapor extraction system, and soil vapor/groundwater monitoring points. Prior to, during, and after the pilot-scale system operation, samples of soil, groundwater, and soil gas will be collected and analyzed. See Section 3.0 for further discussion of monitoring and sampling activities. The proposed pilot-scale system location is presented in Figure 2-1. An equipment layout is provided in Figure 2-2 and Figure 2-3 provides a layout of the pilot scale system wells. Figure 2-4 provides a schematic of the proposed well installation in relationship to the expected geology and identified plume.

Field forms to be used throughout the installation of the system are provided in Appendix A. TtNUS will prepare specifications and obtain subcontractors for well drilling, investigation derived waste (IDW) disposal, and laboratory analysis services. All field team members will review this Work Plan and the Health and Safety Plan (HASP), provided in Appendix B, prior to mobilization.

A bound, weatherproof site logbook shall be maintained by the Field Operations Leader (FOL). The requirements of the site logbook are outlined in TtNUS SOP SA-6.3. This book will contain a summary of the day's activities and will reference the field notebooks when applicable.



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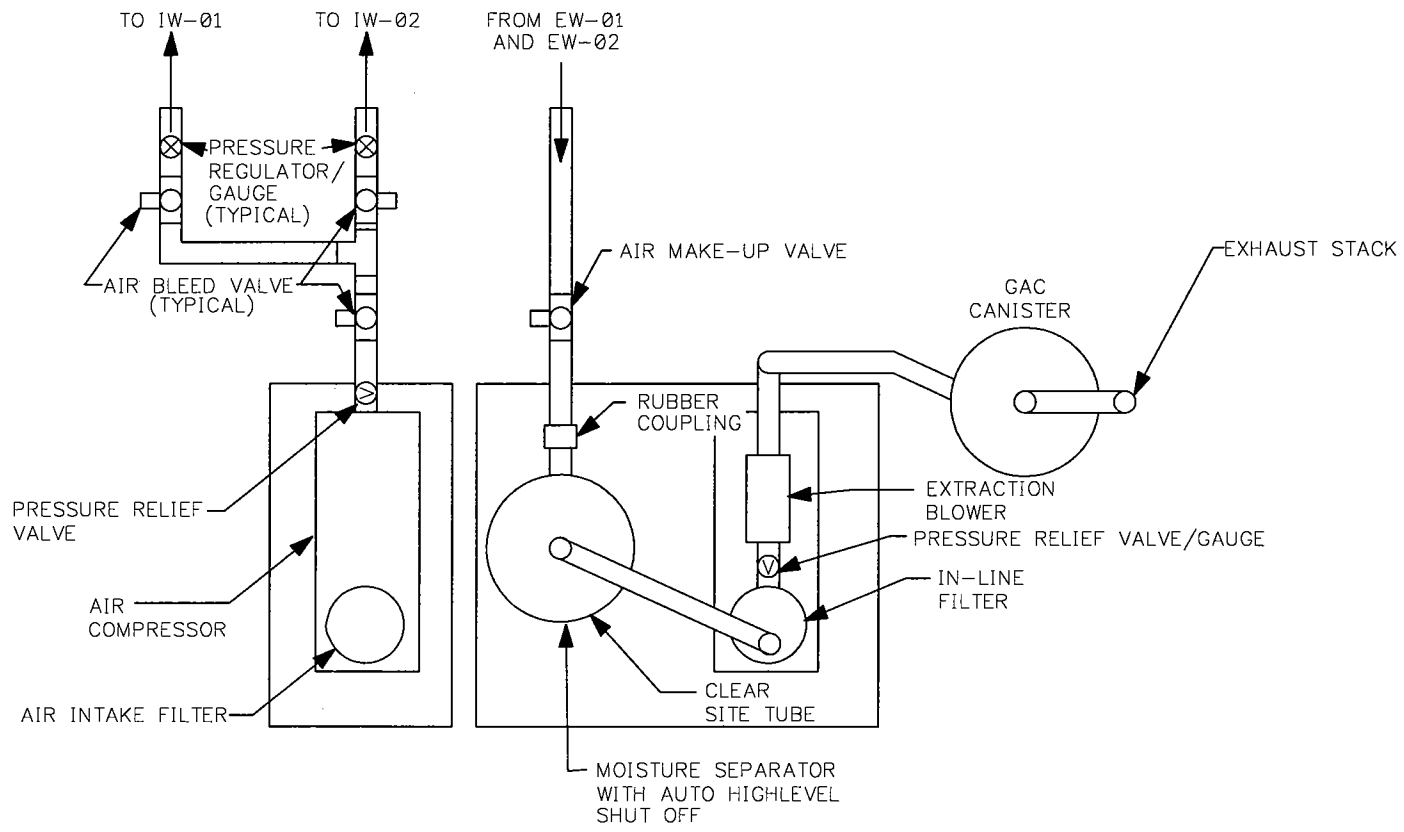

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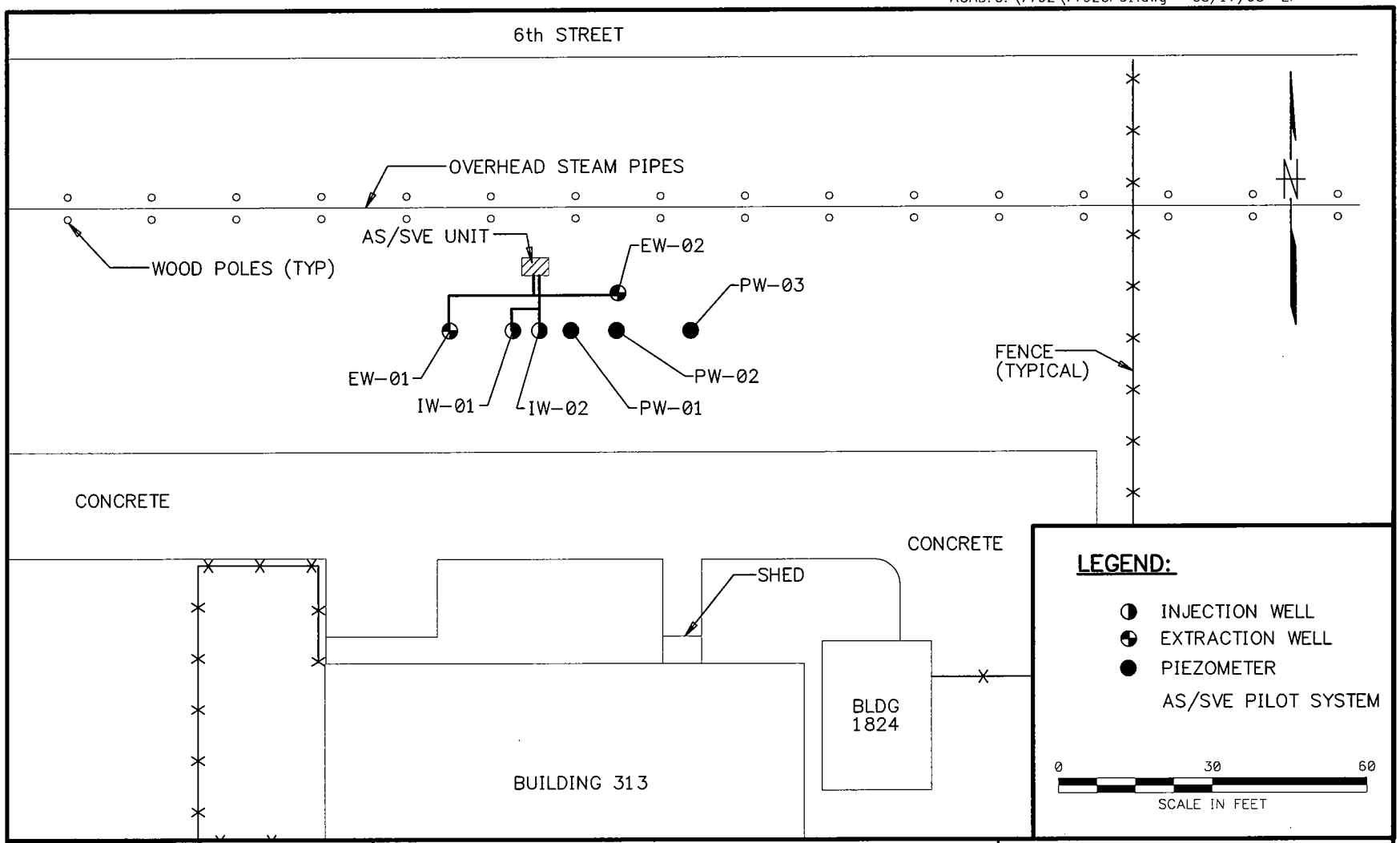

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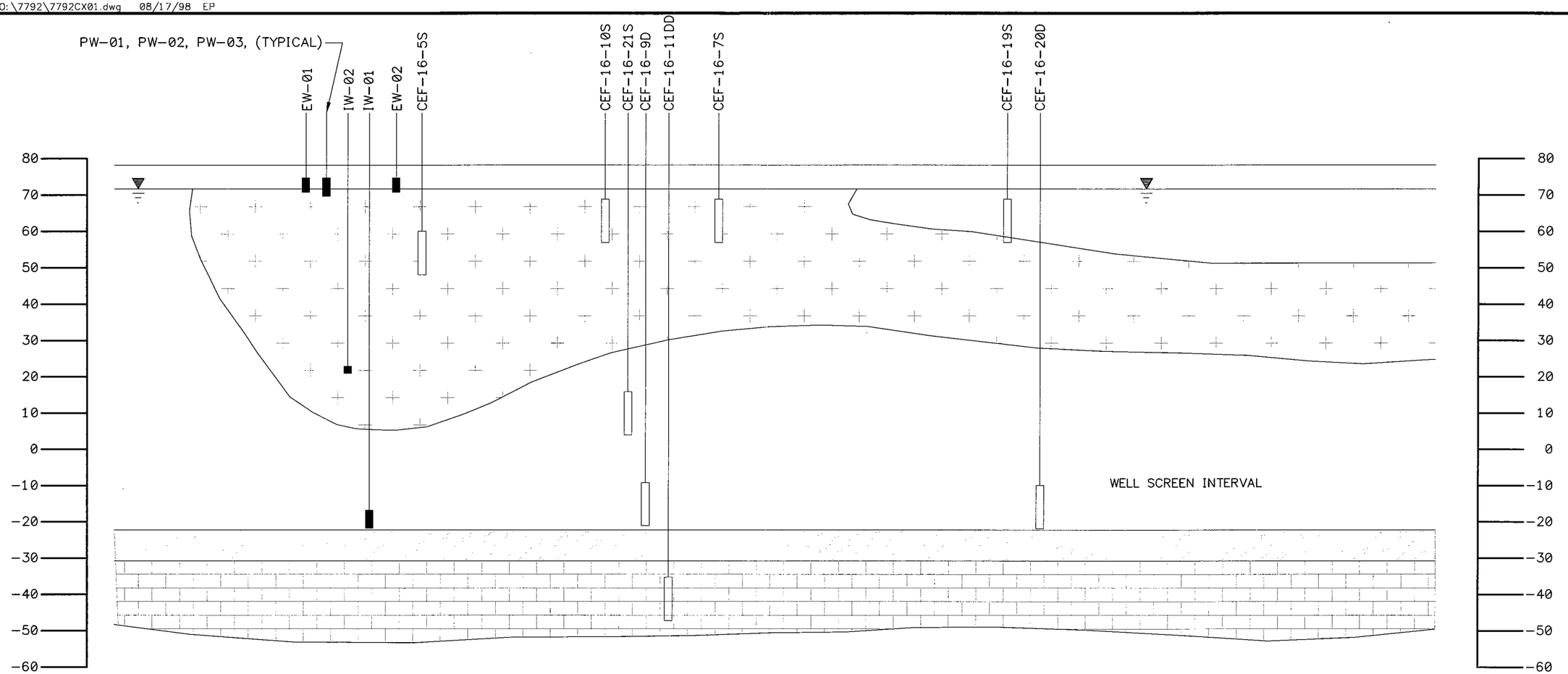

LEGEND

- CLAY AND DOLOMITE
- ESTIMATED EXTENT OF TCE CONTAMINATION
- DOLOMITE (INTERMEDIATE AQUIFER)
- SAND (SURFACE AQUIFER)
- PROPOSED AS/SVE SYSTEM WELL SCREEN INTREVAL
- EXISTING MONITORING WELL SCREEN INTREVAL

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CROSS SECTION
SITE 16, OPERABLE UNIT 7
AS/SVE TREATABILITY STUDY SYSTEM
NAS CECIL FIELD
JACKSONVILLE, FLORIDA

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REV. 0

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2.1.1 Well Installation

Two air injection wells, two vapor extraction wells, and three piezometer wells will be installed. Installation procedures common to all of these wells are outlined below. Installation details specific to each well type are in the following subsections.

All well borings will be advanced using a minimum 6-inch outside diameter hollow-stem auger. If the monitoring well boring cannot be advanced using hollow stem auger drilling techniques due to heaving sands, then the boring will be advanced using potable water/pure bentonite mud rotary techniques in accordance with ASTM Methods. Continuous split-spoon sampling will be conducted for the deep injection well to identify site lithology and split-spoons will be used to accurately locate the water table for installation of the other wells. Once a boring has been completed, the well will be installed. The well will be constructed of Schedule 40, flush-joint, 2-inch diameter National Sanitation Foundation (NSF) approved, Polyvinly Chloride (PVC) well screen and riser pipe. The well screens will have a slot size of 0.02 inches and be supplied with a PVC end cap.

Once the screen and riser pipe are in place, the annulus of the boring will be backfilled with clean silica sand (Nos. 20 and 30 U.S. Standard Sieve size or as determined by site geologist) from the bottom of the boring to one to three feet above the top of the well screen. Sand will always be maintained several inches inside of the augers during installation to ensure an adequate sandpack around the well. A bentonite pellet seal (minimum 2-foot thickness) will then be installed and allowed to hydrate as per the manufacturer's recommendations. However, a bentonite slurry seal may need to be emplaced instead of bentonite pellets if the amount of standing water in the boring causes problems with pellet placement. The remainder of the annulus of the borehole (from the seal to the ground surface) will be grouted by placing a cement/bentonite slurry (one bag cement, five to 10 percent bentonite, and 6.5 to seven gallons water) through a tremie pipe until the grout reaches the ground surface. The depths of the backfill materials will be constantly monitored during installation using a weighted stainless steel or plastic tape.

All wells which contain water will be developed no sooner than 24 hours after installation to remove fine material from around the well screen. The well will be developed by vigorous airlift, bailing, pumping, and surging as determined by the field geologist. Measurements of pH, temperature, specific conductance, and turbidity will be collected after each well casing volume and recorded in the field logbook. The wells will be developed until two consecutive readings are similar (+/- 10 percent) for all parameters.

The drilling subcontractor will prepare a written boring log and well completion log for each boring/well drilled and submit them to the TtNUS field geologist at the conclusion of the field activities. The field team leader who is supervising a drilling subcontractor must complete Daily Activity Records as a means of

documenting daily drilling activities. The information contained within this report is used for billing verification and progress reports. The driller's signature is required at the end of each working day to verify work accomplished, hours worked, standby time, and materials used.

2.1.1.1 Air Injection Wells

Two air injection wells will be installed in the location shown on Figure 2-3. The deep injection well (IW-01) will be drilled into the lower clay layer which is at a depth of approximately 100 feet bgs, and approximately 94 feet below the water table as shown in Figure 2-4. The shallow injection well (IW-02) will be drilled to a depth approximately 60 feet bgs, and approximately 54 feet below the water table as shown in Figure 2-4.

Figure 2-5 provides the air injection well details for the deep and shallow well. Split spoon sampling will be used to accurately locate the lower clay layer to ensure that the bottom of the 5-foot well screen is installed at the clay/sand interface.

2.2.1.2 Vapor Extraction Wells

Two vapor extraction wells will be installed in the locations shown on Figure 2-3. Extraction well 01 (EW01) and extraction well 02 (EW02) will be installed at the water table interface (approximately 6 feet bgs) and be constructed with a 4-foot screen interval with one foot below the water table and 3 feet in the vadose zone as shown in Figure 2-4. Typical vapor extraction wells are shown on Figure 2-5.

2.1.1.3 Piezometer Wells

Three piezometers will be installed for purposes of monitoring effective radius of influence distances for the extraction and injection systems. The piezometers (PW01, PW02, and PW03) will be installed in sandy soil, at the locations presented in Figure 2-3. Figure 2-5 provides a typical piezometer well detail. The wells will be installed to a depth of approximately 8 feet bgs, with a 5-foot screen interval, 2 feet into the water table and 3 feet in the vadose zone, which will be verified in the field based on the actual lithology observed. Split spoon samples obtained during installation of the piezometer wells will be used to accurately locate the water table.

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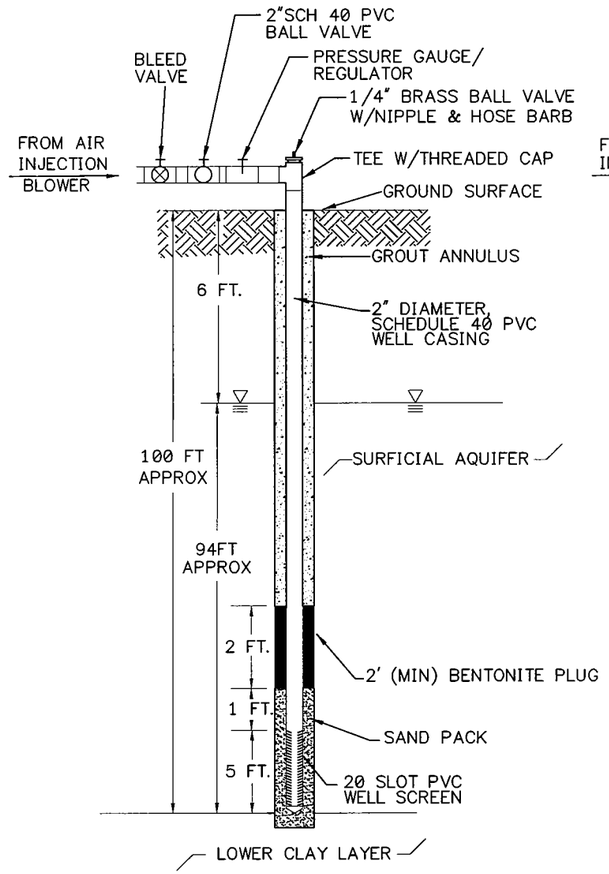
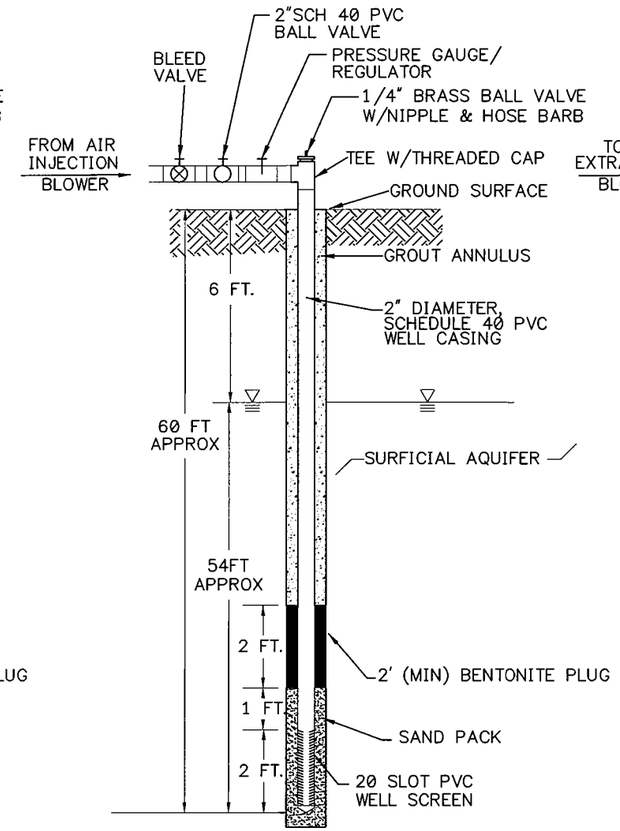


INJECTION WELL DETAIL
IW01
NOT TO SCALE



INJECTION WELL DETAIL
IW02
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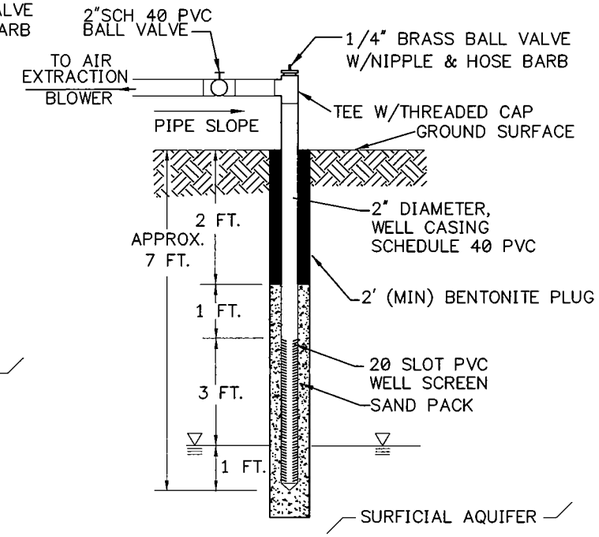
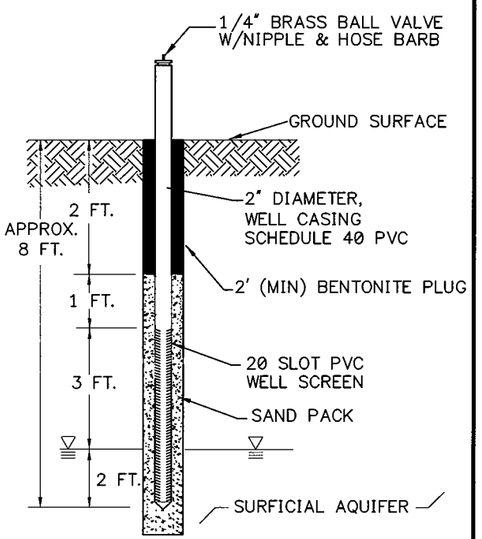


EXTRACTION WELL DETAIL
EW01 AND EW02
NOT TO SCALE



PIEZOMETER WELL DETAIL (TYPICAL)
PW01,PW02,PW03
NOT TO SCALE

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DEPARTMENT OF THE NAVY SOUTHERN DIV FACILITIES ENGINEERING COMD

WELL INSTALLATION DETAILS
SITE 16, OPERABLE UNIT 7
AS/SVE TREATABILITY STUDY SYSTEM
NAS CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NO. 7792
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APPROVED BY DATE
DRAWING NO. FIGURE 2-5
REV. 0

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2.1.2 Air Sparging/Soil Vapor Extraction Equipment

A plan view of the relative locations of the various components of the pilot-scale system is illustrated in Figure 2-2. All components of the pilot-scale system will be installed by the Tetra Tech NUS field team. The major components of system are presented in the following sections.

2.1.2.1 Air Injection System

The injection system consists of an air compressor capable of delivering a minimum of 60 psi with an output of 30 cfm. This size compressor is capable of evacuating the water column in the deep injection well, while also providing the additional pressure needed to provide the desired radius of influence, including head losses due to friction in the transfer line.

A motor starter, flow relief valve, and inlet filter, will be included. An air bleed-off valve and pressure regulator will be installed at each air injection line to the injection wells to regulate flow. The main transfer line will also have an air bleed-off valve for major adjustments to the system. In line gage will provide direct read locations of air flows and pressure in the transfer lines connecting to the compressor.

2.1.2.2 Vapor Extraction System

The vapor extraction blower will be capable of extracting approximately 60 cfm of air at a vacuum of five inches of mercury (in Hg). A minimum extraction rate of 2 times the injection rate will ensure more air is being extracted than is being injected to ensure capture of vapor. A motor starter, vacuum relief valve, and inlet filter will also be included. Valves to balance the system and an air make-up valve will be installed to regulate flow. Sample ports will be provided on the vacuum header and each extraction pipe to measure flowrate and vacuum, plus allow for the collection of air samples.

2.1.2.3 Moisture Separator

A moisture separator will be connected in-line as part of the skid-mounted extraction system. The moisture separator will be a high-efficiency, cyclonic-type separator, capable of processing the maximum air flow rate of the extraction blower. The separator will have a minimum 20-gallon capacity and 2-inch diameter inlet and outlet adapters. An air-pressure relief valve and condensate drain port will also be included. An automatic shut-off switch will connect the moisture separator and the blower unit so that the unit will shut down in the event the moisture separator fills with condensate. A clear sight tube will provide a visual means for determining the water level in the separator.

2.1.2.4 Electrical Power Supply

If an electric source from Building 313 is not available then, a portable generator of sufficient size to power the equipment will be used.

2.1.2.5 Vapor Phase, Granular Activated Carbon, Air Treatment System

A GAC air treatment unit will be connected on the extraction blower exhaust line. Sample ports will be provided prior to and after the carbon units to measure flow rate and allow for sample collection.

2.1.2.6 Aboveground Air Transfer Lines

Air transfer piping between the blower units and the injection and extraction wells will be installed aboveground using 2-inch diameter Schedule 40 PVC. However, in order to reduce air temperatures within the transfer lines to protect the plastic pipe, the pipe leading directly off the exhaust ports of both compressor and vacuum blower will be constructed of 2-inch diameter carbon steel.

All fittings and joints for the aboveground air transfer lines will be constructed of 2-inch diameter, Schedule 40 PVC, except for fittings required in the carbon steel pipe sections.

The rate of air flow into each air injection well and from each of the vapor extraction wells will be controlled by installing 2-inch diameter Gate Valve at each well location. Air-bleed and air make-up valves will be installed along the main trunk lines to adjust applied pressures and vacuums.

2.1.3 Drill Cuttings

Drill cuttings will be containerized in 55-gallon drums. Disposition of these materials will be based on the analytical results one composite sample collected after completion of well construction.

2.1.4 Decontamination

Decontamination of major equipment and sampling equipment will be in accordance with TtNUS SOP SA-7.1, “Decontamination of Field Equipment and Waste Handling.” An area for the decontamination pad for major equipment and a source of potable water for stream washing will be arranged by the field operations leader through NAS Cecil Field personnel.

2.1.5 Waste Handling

All solid and liquid wastes generated as a result of this investigation will be stored in 55-gallon drums and will be handled in accordance with the procedures described in TtNUS SOP SA-7.1, “Decontamination of Field Equipment and Waste Handling.”

3.0 AS/SVE PILOT-TEST EVALUATION AND SAMPLING

Sampling will include collection of soil, groundwater, and air samples during the installation, start-up, and operation of the pilot-scale system. Table 3-1 summarizes the proposed analytical testing. The holding times and bottleware requirements for field samples are summarized on Table 3-2.

3.1 SOIL SAMPLING

Subsurface soil samples will be collected during installation of the treatability study system for geotechnical evaluation. The analytical methods for each sample are summarized in Table 3-2. An additional sample may be obtained from IW01 and submitted to a laboratory for geotechnical testing if noticeable changes in the saturated zone lithology are observed. During the installation of the deep injection well (IW01), continuous split spoon samples will be collected to define lithology, as well as to better define potential VOC contamination of the soils via PID field screening.

3.2 GROUNDWATER SAMPLING

Groundwater samples will be obtained from the air injection wells (IW01 and IW02). Baseline samples will be collected prior to start-up of the system as identified in Table 3-1. Samples will be analyzed for TCL VOCs.

Prior to obtaining a groundwater sample, the static water level and depth of the well shall be measured with an electronic water level meter to determine the amount of water in one casing volume. The wells will then be purged at a rate of 0.3 liters per minute using a low-flow suction lift peristaltic pump and dedicated hose to minimize turbulence. Measurements of pH, specific conductance, temperature, oxidation reduction potential (Redox), and turbidity shall be recorded every five minutes during purging in accordance with TtNUS SOP SA-1.1 and the manufacturer's instructions.

A well shall not be sampled until two consecutive readings of pH, specific conductance, temperature, Redox, and turbidity are within plus or minus ten percent, or until three well volumes have been removed. One measurement of all purging parameters and dissolved oxygen shall also be taken prior to sample collection in accordance with TtNUS SOP SA-1.1 and the manufacturer's instructions. If the well is purged dry before five casing volumes have been removed, the water level will be allowed to recover and a groundwater sample will then be collected. In the event that recovery is too slow to adequately fill all sample containers, the sample shall be collected the following day.

TABLE 3-1

PROPOSED ANALYTICAL TESTING
SITE 16, NAS CECIL FIELD
JACKSONVILLE, FLORIDA

Task	Description of Activities	Sample Event	Sample Depth/Location	Number of Samples	Analysis
Geotechnical Evaluation	Collect geotechnical soil samples from borings during installation of IW-01.	System Installation	IW01- One sample in the vados zone and one sample in the surifical aquifer.(1)	2	Geotechnical parameters(2)
Soil Disposal	IDW Classification	After installation of system wells	Drum Composite	1	TCLP Organics TCLP Metals
Groundwater Geotechnical	Collect water samples from air injection wells.	Prior to AS/SVE start-up	Screened Interval, IW-01 & IW-02	2	VOCs
Air Samples	Collect air samples from extraction system.	At AS/SVE start-up	System Exhaust	1	VOCs
		At completion of radius of influence testing	System Exhaust	1	VOCs

1 If, during IW01 installation, a noticeable change in lithology is found within the saturated zone above the confining unit, an additional sample shall be obtained for geotechnical testing.

2 Shelby tube samples shall be collected from IW01 and analyzed for permeability, as well as for standard soil classification parameters via ASTM D2487.

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TABLE 3-2

HOLDING TIME AND BOTTLEWARE REQUIREMENTS
SITE 16, NAS CECIL FIELD
JACKSONVILLE, FLORIDA

Matrix	Analysis	Bottle Ware	Preservation	Holding Time
Air	Volatile Organic Compounds via **EPA TO-14**	Suma Canister	None	30 days
Groundwater	TCL Volatile Organic Compounds **CLP SOW OLM03.1**	3, 40 mL volatile vials with Teflon-lined septum	Add hydrochloric acid to pH < 2 and cool to 4°C	14 days
Soil	Soil Classification **ASTM D2487**	1 qt wide mouth glass jar or Shelby tube	None	None
	Flex Wall Permeability **ASTM D5084**	Shelby Tube (1)	None	None
Soil (for IDW Characterization)	TCLP Organics SW-846 1311 followed by 8260B, 8270C, 8081A, 8151A Series	16 oz Clear wide mouth glass jar.	None	14 days until leachate preparation. 14 days until analysis of volatiles. 7 days until extraction of SVOCs, Pesticides, and Herbicides. 40 days until analysis.
	TCLP Metals SW-836 1311 followed by 6010B/7000A Series	16 oz Clear wide mouth glass jar.	None	28 days until leachate preparation for Hg. 28 days until analysis for Hg. Other metals 180 days from collection to TCLP preparation. 180 days from preparation to analysis.

EPA - U.S. Environmental Protection Agency
ASTM - American Society for Testing and Materials

1 Sample to be shipped undisturbed in a thin-walled tube samples as per ASTM D1587.

The samples will be collected using the same peristaltic pump set at the same speed as used for purging the well. To obtain samples for TCL VOC analysis, the discharge end of the sample tubing will be crimped once filled. The inlet end of the sample tubing will be removed from the well and suspended above the vial. Water will be allowed to fill each vial by gravity flow.

3.3 AIR SAMPLING

3.3.1 Fixed-Base Laboratory Air Sampling

Off-gas air samples will be collected to verify compliance with air emissions standards. A total of two samples, one at start-up and one after physical system testing completed, will be collected and evaluated for VOCs.

Suma canisters will be used for the collection of air samples. Air samples for fixed base laboratory analysis will be collected between the vacuum blower and the GAC off gas treatment system. The sample is collected by installing a nipple in the 1/4 inch capped system sample port and attaching the Suma canister via a flexible tubing and nipple setup. The valve on the Suma canister is opened for a few seconds allowing the vacuum in the canister and the pressure of the AS/SVE system to fill the canister. The valve is then closed, the flexible tube removed, and the cap replaced on the nozzle of the Suma canister prior to shipment.

3.3.2 Field VOC Analysis

Field analysis will be conducted using PID field instrumentation. Monitoring will be used to check vapors in the extraction wells and at the AS/SVE unit, prior to and during system operation. The performance of the system will be monitored using a PID to measure total VOC concentrations at each of the extraction wells, the piezometer wells, and at the vapor extraction blower exhaust.

3.4 RADIUS OF INFLUENCE TESTING

Testing will consist of operating the extraction wells and injection wells both separately and at the same time. Variable extraction and injection rates will be tested. During the course of the tests, the soil vapor pressures will be allowed to stabilize at each flow rate. The soil vapor pressure will be considered stable when readings fluctuate less than 10 percent over two consecutive readings. During the tests, the tables provided in Figure 3-1, Figure 3-2, Figure 3-3, and Figure 3-4, will be completed for each test conducted for IW01, IW02, EW01, and EW02 respectively. The wells will be tested as follows:

FIGURE 3-1

RADIUS OF INFLUENCE TESTING WORKSHEET
INJECTION WELL - IW01
SITE 16, NAS CECIL FIELD
JACKSONVILLE, FLORIDA

Test No.:_____ Date:_____

Start Time:_____ Well (s) Operating:_____

Target Flow rate:_____

Initial Header Pressure/Vacuum:_____

Time (hrs)	IW01 Flow Rate	IW01 Pressure (1)	IW02 Level	PW01 Water Level	PW02 Water Level	PW03 Water Level	EW01 Water Level	EW02 Water Level	CEF-16-5S Water Level	CEF-16-12I Water Level	CEF-16-9D Water Level	CEF-16-7S Water Level	CEF-16-10S Water Level
0.0													
0.25													
0.5													
0.75													
1.0													
1.25													
1.5													
1.75													
2.0													
Dissolved oxygen (3)													
Initial Reading													
Final Reading													

Time 0.0 hours is recorded prior to the start of the test.
The criteria for completing the test is to have three consecutive readings with less than a 10% difference for each of the wells.

1 Pressure reading recorded at well head.
2 Water level measurement are from top of rises.
3 Dissolved oxygen recorded prior to start of test and after test completed for selected wells only.

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FIGURE 3-2

RADIUS OF INFLUENCE TESTING WORKSHEET
INJECTION WELL - IW02
SITE 16, NAS CECIL FIELD
JACKSONVILLE, FLORIDA

Test No.:_____ Date:_____
Start Time:_____ Well (s) Operating:_____
Target Flow rate:_____
Initial Header Pressure/Vacuum:_____

Time (hrs)	IW02 Flow Rate	IW02 Pressure (1)	IW01 Level	PW01 Water Level	PW02 Water Level	PW03 Water Level	EW01 Water Level	EW02 Water Level	CEF-16-5S Water Level	CEF-16-12I Water Level	CEF-16-9D Water Level	CEF-16-7S Water Level	CEF-16-10S Water Level
0.0													
0.25													
0.5													
0.75													
1.0													
1.25													
1.5													
1.75													
2.0													
Dissolved oxygen (3)													
Initial Reading													
Final Reading													

Time 0.0 hours is recorded prior to the start of the test.
The criteria for completing the test is to have three consecutive readings with less than a 10% difference for each of the wells.
1 Pressure reading recorded at well head.
2 Water level measurement are from top of rises.
3 Dissolved oxygen recorded prior to start up of test and after test completed for selected wells only.

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FIGURE 3-3

RADIUS OF INFLUENCE TESTING WORKSHEET
EXTRACTION WELL - EW01
SITE 16, NAS CECIL FIELD
JACKSONVILLE, FLORIDA

Test No.:_____ Date:_____
Start Time:_____ Well (s) Operating:_____
Target Flow rate:_____
Initial Header Pressure/Vacuum:_____

Time (hrs)	EW01 Flow Rate	EW01 Pressure(1)	EW02 Pressure	PW01 Pressure	PW02 Pressure	PW03 Pressure
0.0						
0.25						
0.5						
0.75						
1.0						
1.25						
1.5						
1.75						
2.0						

Time 0.0 hours is recorded prior to the start of the test.
The criteria for completing the test is to have three consecutive readings with less than a 10% difference for each of the wells.
1 Pressure reading recorded at well head.

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FIGURE 3-4

RADIUS OF INFLUENCE TESTING WORKSHEET
EXTRACTION WELL - EW02
SITE 16, NAS CECIL FIELD
JACKSONVILLE, FLORIDA

Test No.:_____ Date:_____
Start Time:_____ Well (s) Operating:_____
Target Flow rate:_____
Initial Header Pressure/Vacuum:_____

Time (hrs)	EW02 Flow Rate	EW02 Pressure (1)	EW01 Pressure	PW01 Pressure	PW02 Pressure	PW03 Pressure
0.0						
0.25						
0.5						
0.75						
1.0						
1.25						
1.5						
1.75						
2.0						
2.25						
2.5						
2.75						
3.0						

Time 0.0 hours is recorded prior to the start of the test.
The criteria for completing the test is to have three consecutive readings with less than a 10% difference for each of the wells.
1 Pressure reading recorded at well head.

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IW01: Minimum pressure (Approximately 41 psi)
Operation pressure (Approximately 60 psi)

IW02: Minimum pressure (Approximately 25 psi)
Operation pressure (Approximately 40 psi)

IW01/IW02: Operate wells at specified individual pressures, both minimum and operation, at the same time.

EW01: Minimum Vacuum (air make-up completely open)
Operating Vacuum (air make-up adjusted to prevent extraction of water)

EW02: Minimum Vacuum (air make-up completely open)
Operating Vacuum (air make-up adjusted to prevent extraction of water)

EW01/EW02: Operating Vacuum (air make-up adjusted to prevent extraction of water)

Vacuums will be measured in the piezometers at 15 minute intervals for 2 hours or until readings have leveled out. Following testing, the system will be shutdown and the soil vapor pressures allowed to return to normal prior to testing the next well.

After the individual and combined radius of influence test is completed the system will be operated by running both the injection and extraction systems and the physical parameters will be recorded in the Table presented in Figure 3-5.

FIGURE 3-5

Date: _____
Time: _____
Field Personnel: _____

AIR FLOW AND PRESSURE SYSTEM EVALUATION WORKSHEET SITE 16, NAS CECIL FIELD JACKSONVILLE, FLORIDA

1. Extraction Wells

Well	Vacuum (inches H_2O)	Water Level	Flow Rate (ft/min)	PID Reading
EW01				
EW02				

2. Injection Wells

Well	Pressure (PSI)	Flow Rate (ft/min)
IW01		
IW02		

3. Monitoring Points

Well	Pressure/Vacuum (inches of water)	Water Level
PW01		
PW02		
PW03		
CEF-16-5S		
CEF-16-12I		
CEF-16-9D		
CEF-16-7S		
CEF-16-10S		

4. Blowers

Location	Pressure (PSI)	Flow Rate (ft/min)	PID Reading
Injection			NA
Before Bleed Valve			NA
After Bleed Valve			NA
Extraction Blower			
Before Bleed Valve			
After Bleed Valve			

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4.0 LONG-TERM MONITORING PLAN

4.1 OVERVIEW

The objective of long-term groundwater monitoring is to evaluate the performance, progress and effectiveness of natural attenuation in reducing contaminant concentrations and retarding their migration. To achieve this objective, this monitoring plan is designed to measure plume migration and contaminant level trend over time, while verifying that natural attenuation is occurring.

This groundwater monitoring plan will also document the effectiveness of natural attenuation in reducing COC concentrations located both inside outside the area of influence of the proposed full-scale air sparging system. To achieve this objective, this monitoring plan is designed to take into consideration the location of the proposed full-scale air sparging system to be installed in the groundwater contamination source area.

In the event that data collected under this monitoring plan indicate that intrinsic remediation is insufficient to protect human health and the environment, a contingency plan will be developed to augment or replace the intrinsic remediation alternative. This decision will be made as part of the 5-year review process.

4.2 MONITORING WELL LOCATIONS

The monitoring wells selected for the natural attenuation monitoring are as follows:

- CEF-16-9D
- CEF-16-10S
- CEF-16-21S
- CEF-16-22I
- CEF-16-23D
- CEF-16-27I
- CEF-16-32S
- CEF-16-38S
- CEF-16-35S
- CEF-16-11DD

Two clusters of shallow aquifer monitoring wells (shallow and intermediate depth) and one intermediate depth monitoring well will be constructed in the source area portion of the plume at the locations indicated on Figure 4-1. The shallow depth wells (CEF-16-GW41S and CEF-16-GW43S) will be screened at a depth interval of 10 to 15 feet below ground surface (bgs). The intermediate depth wells (CEF-16-GW42I, CEF-16-GW44I, and CEF-16-GW45I) will be screened at a depth interval of 27 to 32 feet bgs.

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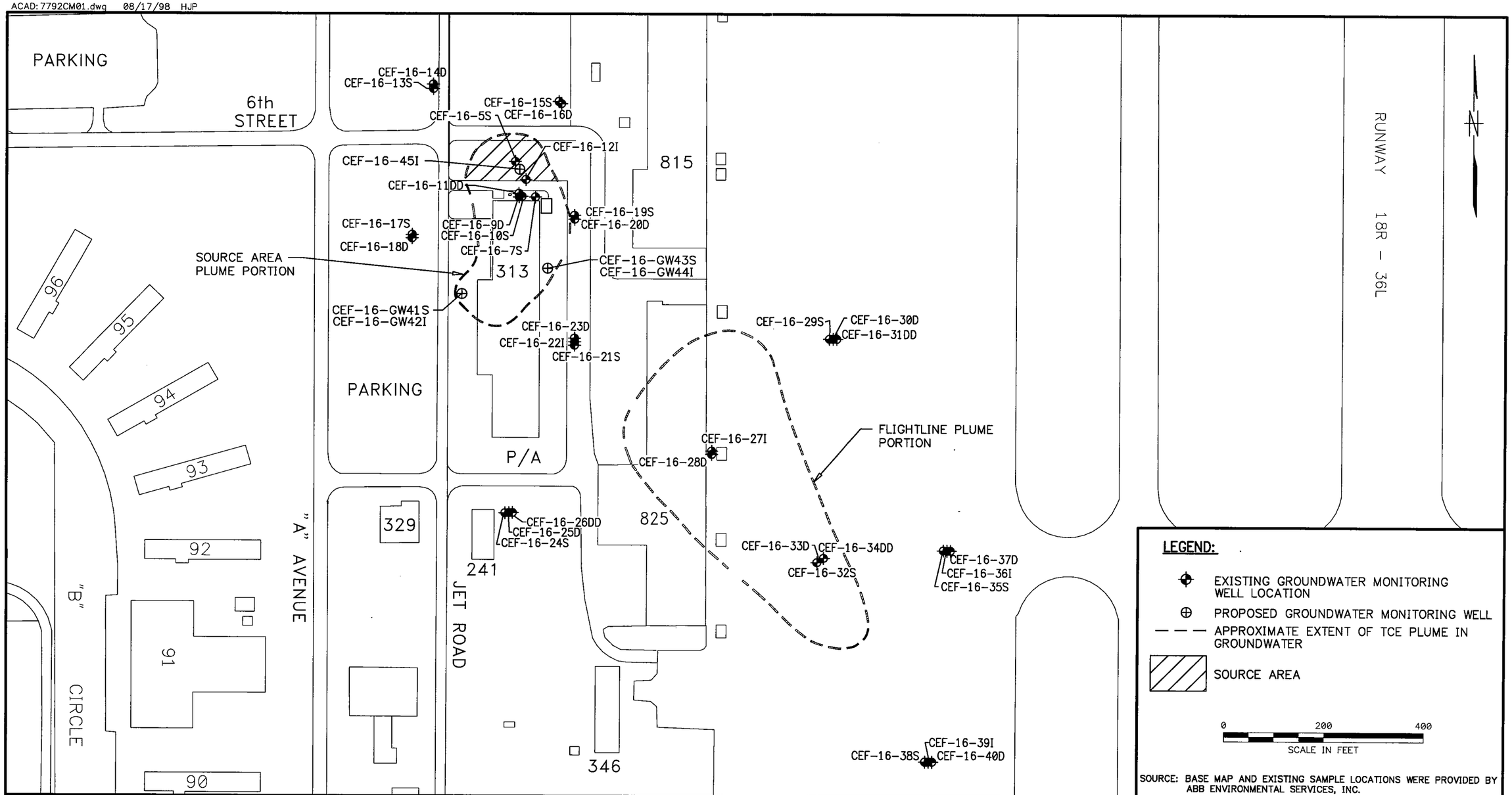

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY DLT DATE 8/13/98
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

DEPARTMENT OF THE NAVY ★ SOUTHERN DIV FACILITIES ENGINEERING COMD ★

EXISTING AND PROPOSED GROUNDWATER MONITORING WELLS
OU7, SITE 16
NAS CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NO. 7792
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 4-1
REV. 0

FORM CADD NO. SDIV_BH.DWG – REV 0 – 1/20/98

4.3 NEW MONITORING WELL INSTALLATION

The two new monitoring well clusters will be located in the areas of highest probability for the presence of Dense Non-Aqueous Phase Liquid (DNAPL), as determined from the results of laboratory studies of site-specific TCE solubility limit (see Section 4.6). The two clusters will help determine if the DNAPL is migrating, and also provide data on natural attenuation of the downgradient area within the source area portion of the plume.

The other intermediate depth monitoring well will be installed at the location of the RI Aquaprobe sample GS-16-12 which had the highest TCE concentrations. Results indicate that free product is possible in this area and therefore the well will be constructed of stainless steel.

4.4 LONG-TERM SAMPLING AND ANALYSIS

Groundwater will be sampled and analyzed to verify that the contaminant mass and mobility are being effectively reduced. Water-level measurements will also be performed during each sampling event for all 15 monitoring wells. One round of samples will be collected and analyzed for the natural attenuation parameters, TCL chlorinated VOCs, and bis(2-ethylhexyl)phthalate as shown on Table 4-1 and Table 4-2, respectively.

The sample collected from well CEF-16-11 DD will be analyzed only in the first year and every five years to ensure that contamination is not migrating into the deeper portion of the aquifer.

Depending on the results of the first round of monitoring, the number of wells sampled in the second round will be reduced to approximately eight. The selection of wells for the second round of monitoring will depend on the detection of natural attenuation parameters in the first round. Following the results of the second round of monitoring, a representative set of four wells, plus CEF-16-38S and CEF-16-35S (the down gradient wells) will be retained for monitoring during the following years. The representative set of wells will be selected for each sampling round based on the locations where indications of natural attenuation are strongest from the previous round.

Monitoring results will be tabulated and presented to the BCT in the form of annual reports. If natural attenuation is determined to be occurring at an unacceptable rate, then further remedial measures may be considered.

TABLE 4-1

INTRINSIC REMEDIATION PARAMETERS
LONG-TERM GROUNDWATER MONITORING
OPERABLE UNIT 7 SITE 16
NAS CECIL FIELD
JACKSONVILLE, FLORIDA
PAGE 1 OF 2

Parameter	Method[2]/ Reference	Data Use	Sample Volume, Container, & Preservation	Holding Time	Field or Fixed Base Laboratory
Temperature	Direct-reading thermometer	Biological processes are temperature dependent.	100-250 ml in glass or plastic container.	Analyze Immediately	Field
Dissolved Oxygen	HACH test kit	Concentration of less than 1 mg/L indicates anaerobic conditions.	Follow test kit instructions. Analyze to nearest 0.2 mg/L	Analyze Immediately	Field
pH	Direct-reading meter	Biological processes are pH sensitive.	100-250 ml in glass or plastic container.	Analyze Immediately	Field
Conductivity	Direct-reading meter	General water quality parameter used to verify that site samples are obtained from the same groundwater system.	100-250 ml in glass or plastic container.	Analyze Immediately	Field
Alkalinity/Dissolved inorganic carbon	HACH test kit and 310.1. Manual titrimetric	General water quality parameter used to verify that site samples are obtained from the same groundwater system and to measure the buffering capacity of the groundwater.	100-250 ml in glass or plastic container.	Analyze within 6 hours.	Field & Fixed
Ferrous Iron (Fe^{+2})	HACH test kit	Presence of ferrous iron may indicate presence of an anaerobic degradation process due to depletion of oxygen, nitrate, and manganese.	Follow test kit instructions. Analyze to nearest 0.1 mg/L	Analyze within 6 hours.	Field
Nitrate (NO_3^-), Nitrite (NO_2^-)	EPA 300	Substrates for microbial respiration if oxygen is depleted.	250 ml in plastic container. Cool to 4°C.	48 Hours	Fixed
Sulfate (SO_4^{-2})	EPA 300	Substrate for microbial respiration if oxygen is depleted.	250 ml in plastic container. Cool to 4°C.	28 Days	Fixed
Oxidation/Reduction Potential (ORP)	Direct-Reading Meter	ORP provides information on environmental conditions and to interpret the nature and state of chemical compounds and biological conditions within the groundwater. ORP typically ranges from +200mV in normal aerobic, oxidating conditions to -400mV in strongly anaerobic, reductive conditions.	10-250 ml in glass container filling from the bottom.	Analyze Immediately	Field
Dissolved Sulfide (S^{-2})	EPA 376.1	Product of sulfate-based anaerobic degradation. Analyze in conjunction with sulfate.	40 ml in volatile organic analyte (VOA) vial with Teflon lined cap. Cool to 4°C.	7 Days	Fixed

TABLE 4-1

INTRINSIC REMEDIATION PARAMETERS
LONG-TERM GROUNDWATER MONITORING
OPERABLE UNIT 7 SITE 16
NAS CECIL FIELD
JACKSONVILLE, FLORIDA
PAGE 2 OF 2

Parameter	Method[2]/ Reference	Data Use	Sample Volume, Container, & Preservation	Holding Time	Field or Fixed Base Laboratory
Hydrogen Sulfide (H_2S)	HACH test kit HS-C	If groundwater lacks ferrous iron but contains concentrations of sulfate greater than 1 mg/L and hydrogen sulfide greater than 0.05 mg/L, sulfate reduction is the predominant process.	Follow test kit instructions. Analyze to nearest 0.01 mg/L	Analyze Immediately.	Field
Methane, Ethane, Ethene	RSK SOP-147 & 175	Presence of methane indicates biological degradation via an anaerobic pathway utilizing CO_2 as an electron acceptor. An ORP of less than -200mV could be indicative of methanogenesis. Ethane and ethene are also analyzed to indicate biological degradation of chlorinated VOCs.	40 ml in volatile organic analyte (VOA) vial with butyl gray Teflon lined cap. Cool to 4°C.	As Soon As Possible	Fixed
Carbon Dioxide (CO_2)	HACH test kit CA-DT	Presence of free CO_2 dissolved in groundwater is unlikely because of alkalinity buffering. However, if detected, CO_2 concentrations can be compared with background values to determine whether or not they are elevated, which could indicate an aerobic process for bacterial degradation of petroleum hydrocarbons.	Follow test kit instructions.	Analyze Immediately.	Field
Dissolved Organic Carbon (DOC)	Standard Methods A5310 C	Provides an indirect indication of possible microbial activity by quantifying potentially available substrate.	100 ml in amber-colored glass with Teflon lined cap. Preserve with sulfuric acid to pH less than 2.0 and cool to 4°C.	14 Days	Fixed
Major/minor ions, including, chloride (Cl)), bromide (Br), Phosphate (PO_4)	EPA 300	Provides additional information on microbial conditions.	250 ml in plastic container. Cool to 4°C.	O-Phosphate 48 hours Cl, Br - 28 days	Fixed
BOD	EPA 405.1	Provides relative oxygen requirements	1 < HDPE Cool to 4°C	48 Hours	Fixed
COD	EPA 410	Provides a measure of oxygen equivalent of the organic matter content which is susceptible to oxidation	125 m/L HDPE H_2SO_4 pH<2 Cool to 4°C	28 Days	Fixed

NOTES:

1 Table adapted from overview of the Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater (Wiedemeier, 1996).
2 Method refers to U.S. EPA test methods. Standard Methods are based on Standard Methods for the Examination of Water and Wastewater (Clesceri, et al, 1992)

TABLE 4-2

SUMMARY OF CHEMICALS OF CONCERN ANALYTICAL REQUIREMENTS
LONG-TERM GROUNDWATER MONITORING
OPERABLE UNIT 7 SITE 16
NAS CECIL FIELD
JACKSONVILLE, FLORIDA

Parameter	Sample Container	Container Volume	Preservation[1]	Maximum Holding Time	Analytical Methodology
TCL Chlorinated VOCs	Glass, black phenolic plastic screw cap, Teflon-lined	2x40 mL	Cool to 4°C, dark, HCl to pH < 2	14 days	U.S. EPA-CLP SOW for Organic Analysis, Low Concentration (Doc. #OLC02.0)
SVOCs [bis(2-ethylhexl)phthalate only]	Amber glass, Teflon-lined cap	1,000 mL	Cool to 4°C, dark	Extraction 7 days; analysis within 40 days	U.S. EPA SW-846 Method 8270B

NOTES:

1 Preservation agents: HCl = Hydrochloric acid, HNO_3 = Nitric Acid

During the first 5-year period, sampling and analysis will be conducted quarterly for the first year and semiannually for the next four years. If the data collected during this initial period supports the observed efficiency of intrinsic remediation, the monitoring frequency may be reduced to once per year. If data collected at any time during the monitoring program indicate plume migration or a risk to human health and the environment, the sampling frequency will be adjusted accordingly and a contingency plan will be developed and implemented.

4.5 EVALUATION CRITERIA

The primary evaluation criterion to determine the effectiveness of intrinsic remediation will be a decrease in the concentrations of COCs detected in the groundwater, in particular that of TCE and 1,1-DCE. Remediation will be deemed to have been achieved when these concentrations have reached the cleanup criteria listed in Table 1-1.

In addition, testing results for the parameters listed in Table 4-1 will be used to verify whether intrinsic remediation is taking place and to evaluate the possibility of reaching cleanup goals. The following guidelines will be used for this evaluation:

Oxidation/Reduction Potential (ORP): Dechlorination of VOCs generally requires reductive conditions. ORP values of less than +50 millivolts (mV) indicate that reducing conditions are possible and values of less than -100mV indicate a high possibility of reducing conditions.

Dissolved Oxygen (DO): Values of 0.5 milligrams per liter (mg/L) or greater indicate aerobic conditions; unfavorable conditions for reductive dechlorination for TCE and 1,1-DCE. However, if values exceed 1.0 mg/L, certain chlorinated VOCs, such as vinyl chloride, may be aerobically degraded.

Nitrates (NO_3^-): Values of 1.0 mg/L or greater indicate that reductive dechlorination may be inhibited.

Ferrous Iron (Fe^{2+}): Values greater than 1.0 mg/L indicate that reductive dechlorination is possible.

Sulfates (SO_4^{2-}): Values greater than 20 mg/L indicate that reductive dechlorination may be inhibited.

Sulfides (S^{2-}): Values greater than 1.0 mg/L indicate that reductive dechlorination is possible.

Methane (CH_4): Values greater than 1.0 mg/L indicate that reductive dechlorination is potentially occurring but that vinyl chloride may accumulate.

Carbon Dioxide (CO_2), Chlorides (Cl^-), Alkalinity (as $CaCO_3$): Values greater than twice background levels indicate that complete degradation of organic COCs may be occurring.

4.6 WORK PLAN FOR SOLUBILITY LIMIT STUDY

A solubility study will be conducted to determine the site-specific solubility limit of TCE in the groundwater at Site 16 using a saturation test. Previous investigations have indicated that dissolved concentrations of TCE in the intermediate zone of the surficial aquifer exceeded its literature value of 1,100 mg/L, therefore, it is suspected that site-specific factors (such as chemical composition of groundwater) may be significantly affecting the solubility of TCE. The saturation test is a modification of ASTM E 1148-87.

Representative samples of groundwater from a background surficial aquifer at the site will be collected, temperature and pH will be measured and recorded, and the samples will be shipped to the selected laboratory in head-space free vials without preservative and maintained at 4°C. At the selected laboratory, the groundwater samples shall be maintained at 4°C until the saturation test and TCE analysis can be scheduled to be performed in immediate succession. Prior to the saturation test, the groundwater samples shall be warmed in a controlled-temperature bath until the final temperature is approximately within 1°C of the groundwater temperature as recorded at the site. A sample of industrial-grade TCE (similar to the type used during the operations at the site), weighing between 10 to 50 grams shall be taken in a head-space free glass container (100 mL maximum volume) and the remainder of the volume shall be filled with the warmed groundwater from the site. The container shall then be placed in the temperature-controlled bath, maintained at the same temperature (within 1°C accuracy) as the groundwater recorded at the site, and agitated using a magnetic stirrer or a similar apparatus while ensuring that no air entrainment occurs. After the TCE is visually observed to be completely dispersed in the water, agitation shall be continued for a duration of 30 minutes. The agitation shall then be stopped and the aqueous and non-aqueous phases allowed to separate by gravity. The aqueous phase shall be evaluated and immediately analyzed to determine the TCE concentration. The procedure shall be repeated twice more with two additional aliquots of the warmed groundwater stock with the exception of the duration of agitation, which shall be 2 hours and 6 hours, respectively, to ensure complete equilibrium. The TCE concentrations shall be reported as the solubility limit for TCE at 30 minutes, 2 hours and 6 hours, respectively.

Table 4-3 specifies the sampling protocol and analytic method for this study. During the preservation of the sample, the conduct of the saturation test, and the analysis of the samples, every attempt shall be

TABLE 4-3

ANALYTICAL AND SAMPLING PROTOCOL FOR TCE SOLUBILITY LIMIT STUDY
OPERABLE UNIT, 7 SITE 16
NAS CECIL FIELD, JACKSONVILLE, FLORIDA

Analysis	Analytical Method	Sample Volume	Bottleware	Preservation	Holding Time
TCE Solubility Limit	Modified ASTM E 1148-87 and SW 846 8260	25 x 40 mL	Glass, Teflon-lined cap/headspace free	None	14 days

made to avoid artificial conditions (other than agitation) that are not normally expected to occur in the aquifer.

4.7 LONG-TERM MONITORING REPORTS

Within 60 days of each sampling event, a report will be prepared. These long-term monitoring reports will describe sampling activities, present sampling analytical results, score the natural attenuation process and provide conclusions and recommendations for future actions, as may be required. Initially, scoring of the natural attenuation process will be performed in accordance to the Technical Protocol For Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater (Wiedemeier et al, 1996). The scoring protocol will be regularly updated based upon review of the most recent literature. If scoring shows limited evidence (6 to 14 points) or inadequate evidence (0 to 5 points) for natural attentuation of chlorinated organic compounds, a recommendation will be made that the selected remedy be reevaluated. Long-term monitoring reports will be submitted to the Cecil Field Partnering Team.

4.8 INSTITUTIONAL CONTROLS

Institutional controls will consist of administrative measures taken to prevent exposure of human receptors to the groundwater of the surficial aquifer. Use of this groundwater will be controlled through deed restrictions or land use plans. Annual reminders of these restrictions and plans will be sent to all owners or residents of properties affected by contaminated groundwater. A formal request will be made to the agency administrating the well installation permit program in Duval County to not issue permits for installation of drinking water wells which would pump water from the surficial aquifer.

4.9 FIVE-YEAR REVIEWS

Five-year reviews will be conducted at Site 16 in accordance with CERCLA, Section 121(c) and the NCP, Section 300.430(f)4(ii).

4.9.1 Background

Five-year reviews are conducted at sites where remedial action results in hazardous substances, pollutants, or contaminants (i.e., COCs) remaining on site. Remedial action at Site 16 does not consist of removal of contaminants, therefore these contaminants will remain on site until they are naturally attenuated.

Typically U.S. EPA conducts 5-year reviews. However, remedial action at NAS Cecil Field is being implemented under a Federal Facility Agreement (FFA) and, as such, the Navy is responsible for conducting these reviews.

4.9.2 Purpose

Five-year reviews are conducted to evaluate whether or not the remedies selected in the ROD remain protective of human health and the environment.

4.9.3 Execution

The 5-year review process will consist of the following:

- Review of background documents concerning Site 16, including long-term monitoring reports;
- Identification and review of new regulatory standards as may have been promulgated since the signing of the ROD or since the previous 5-year review;
- Site visit to conduct a visual inspection;
- Preparation of a 5-year review report, including conclusions and recommendations for future actions as may be required; and
- Public meeting to present the results of the review and any actions as may have been taken as a result of this review.

4.9.4 Reporting

A report will be prepared at the end of each 5-year review period. The 5-year review reports will include the following elements:

- An introduction, including a summary of site characteristics;
- A brief discussion of remedial action objectives (RAOs) and discussion of the applicable or relevant and appropriate requirements (ARARs);
- A description of monitoring and maintenance activities at the site;
- A presentation of monitoring results, including an evaluation of changes in monitoring parameters;
- An evaluation of how well the selected remedy has protected human health and the environment, including a formal statement of protectiveness of human health and the environment, a determination of remaining risks, and an analysis of potential deterioration of the remedy;
- A presentation of cost incurred;
- A summary description of the site visit;
- Documentation of areas of noncompliance, as may apply;
- Recommendations for future response actions, as may be required; and
- A statement as to when, if necessary, the next 5-year review shall be completed.

The 5-year review reports will be submitted to the Navy, U.S. EPA Region IV, and the FDEP.

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APPENDIX A

FIELD FORMS

DAILY ACTIVITIES RECORD

PROJECT NAME: _____ **PROJECT NUMBER:** _____

CLIENT: _____ **LOCATION:** _____

DATE: _____ **ARRIVAL TIME:** _____

B&RE PERSONNEL: _____ **DEPARTURE TIME:** _____

CONTRACTOR: _____ **DRILLER:** _____

ITEM	QUANTITY ESTIMATE	QUANTITY TODAY	PREVIOUS TOTAL QUANTITY	CUMULATIVE QUANTITY TO DATE

COMMENTS: _____

_____

_____

_____

APPROVED BY:

_____ _____

B&RE REPRESENTATIVE DRILLER

DATE: _____

DOCUMENTATION OF FIELD CALIBRATION

PROJECT NAME : ________________________________ PROJECT NUMBER : __________

Date of Calibration	Instrument Name and Model	Instrument I.D. Number	Person Performing Calibration	Instrument Settings		Instrument Readings		Calibration Standard (Lot No.)	Remarks and Comments
				Pre-calibration	Post-calibration	Pre-calibration	Post-calibration		

BORING LOG

Page ___ of ___

PROJECT NAME: _____ BORING NUMBER: _____
PROJECT NUMBER: _____ DATE: _____
DRILLING COMPANY: _____ GEOLOGIST: _____
DRILLING RIG: _____ DRILLER: _____

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	ID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): ____

Remarks: _____

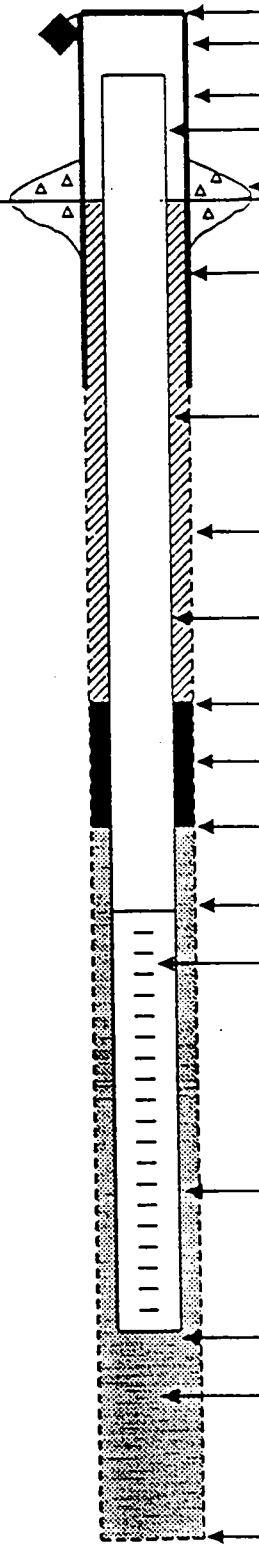
Converted to Well: Yes _____ No _____ Well I.D. #: _____

BORING NO.: _____

OVERBURDEN
MONITORING WELL SHEET

PROJECT _____ LOCATION _____
PROJECT NO. _____ BORING _____
ELEVATION _____ DATE _____
FIELD GEOLOGIST _____

DRILLER _____
DRILLING METHOD _____
DEVELOPMENT METHOD _____



ELEVATION OF TOP OF SURFACE CASING : _____
ELEVATION OF TOP OF RISER PIPE: _____

STICK - UP TOP OF SURFACE CASING: _____
STICK - UP RISER PIPE : _____

TYPE OF SURFACE SEAL: _____

I.D. OF SURFACE CASING: _____
TYPE OF SURFACE CASING: _____

RISER PIPE I.D. _____
TYPE OF RISER PIPE: _____

BOREHOLE DIAMETER: _____

TYPE OF BACKFILL: _____

ELEVATION / DEPTH TOP OF SEAL: ____/____

TYPE OF SEAL: _____

DEPTH TOP OF SAND PACK: _____

ELEVATION / DEPTH TOP OF SCREEN: ____/____

TYPE OF SCREEN: _____

SLOT SIZE x LENGTH: _____

I.D. OF SCREEN: _____

TYPE OF SAND PACK: _____

ELEVATION / DEPTH BOTTOM OF SCREEN: ____/____

ELEVATION / DEPTH BOTTOM OF SAND PACK: ____/____
TYPE OF BACKFILL BELOW OBSERVATION WELL: _____

ELEVATION / DEPTH OF HOLE: ____/____

WELL DEVELOPMENT SHEET

PROJECT SITE NAME: _____ SITE/LOCATION _____
PROJECT NUMBER: _____ WELL ID.: _____
WEATHER: _____ DATE: _____
STATIC WATER LEVEL: _____ PERSONNEL: _____
TOTAL WELL DEPTH: _____ WELL TYPE: [PVC], [S.S.], or
ONE CASING VOLUME: _____ OTHER _____
START TIME: _____ MEASURING DEVICE: _____
END TIME: _____ ADJUSTMENT FACTOR: _____

[ ] DOMESTIC WELL, [ ] MONITORING WELL, [ ] OTHER _____

METHOD & REMARKS _____

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)

NOTE: All measurements to nearest 0.01 foot measured from top of well riser pipe unless otherwise noted.

ADDITIONAL COMMENTS: _____

SIGNATURE(s): _____ PAGE___OF___

CHAIN OF CUSTODY RECORD

PROJECT NO.:	SITE NAME:
SAMPLERS (SIGNATURE):	

STATION NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CON-TAINERS							REMARKS

RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY(SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY(SIGNATURE):
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY(SIGNATURE):
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED FOR LABORATORY BY (SIGNATURE):	DATE / TIME:	REMARKS:	

APPENDIX B

HEALTH AND SAFETY PLAN

Health and Safety Plan

for

Pilot-Scale Air Sparging/Soil Vapor Extraction Treatability Study and Natural Attenuation Sampling

at

Operable Unit 7
Site 16

Naval Air Station Cecil Field

Jacksonville, Florida

Southern Division
Naval Facilities Engineering Command

Contract No. N62467-94-D-0888
Contract Task Order 0051

August 1998

HEALTH AND SAFETY PLAN
FOR
PILOT-SCALE AIR SPARGING/SOIL VAPOR EXTRACTION TREATABILITY STUDY
AND
NATURAL ATTENUATION SAMPLING
AT
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY CONTRACT

Submitted to:
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406

Submitted by:
Tetra Tech NUS, Inc.
661 Andersen Drive
Foster Plaza 7
Pittsburgh, Pennsylvania 15220

CONTRACT NO. N62467-94-D-0888
CONTRACT TASK ORDER 0051

August 1998

SUBMITTED BY:	APPROVED BY:
MARK P. SPERANZA, P.E. TASK ORDER MANAGER TETRA TECH NUS, INC. PITTSBURGH, PENNSYLVANIA	MATTHEW M. SOLTIS, CIH, CSP CLEAN HEALTH & SAFETY MANAGER TETRA TECH NUS, INC. PITTSBURGH, PENNSYLVANIA

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1.0 INTRODUCTION

This Health and Safety Plan (HASP) has been developed to provide the minimum safety and health practices and procedures for Tetra Tech NUS, Inc. (TtNUS) and subcontractor personnel engaged in the following activities at Operable Unit (OU) 7, Site 16 of the Naval Air Station Cecil Field (NAS Cecil Field), Jacksonville, Florida:

- Air Sparging/Soil Vapor Extraction (AS/SVE) pilot-scale treatability study
- Groundwater natural attenuation study

This HASP specifies personnel responsibilities, restrictions, and evaluation techniques, and establishes requirements to be incorporated into the planned activities for the purpose of protecting personnel from hazards present at the site or arising out of activities.

This HASP has been designed to be used in conjunction with the TtNUS Health and Safety Guidance Manual. The Guidance Manual provides detailed information pertaining to procedures to be performed on site as directed by the HASP, as well as TtNUS standard operating procedures. This HASP and the contents of the Guidance Manual were developed to comply with the requirements stipulated in 29 CFR 1910.120 (OSHA's Hazardous Waste Operations and Emergency Response Standard. Both documents must be present at the site to satisfy these requirements.

This HASP has been written to support proposed tasks and techniques associated with the scope of work as presented in Section 4.0. It has been developed using the latest available information regarding known or suspected chemical contaminants and potential physical hazards associated with the proposed work at the site. Should the proposed work site conditions and/or suspected hazards change, or if new information becomes available, this document will be modified. All changes to the HASP will be made with the approval of the TtNUS Site Safety Officer (SSO) and the TtNUS Health and Safety Manager (HSM). Requests for modifications to the HASP will be directed to the SSO who will determine whether to make the changes. The SSO will notify the Task Order Manager (TOM), who will notify all affected personnel of changes.

1.1 AUTHORITY

This work is authorized under the Comprehensive Long - Term Environmental Action Navy (CLEAN) contract, administered through the U.S. Navy Southern Division Naval Facilities Engineering Command, as defined under Contract No. N62467-94-D-0888; Contract Task Order Number 0051.

1.2 KEY PROJECT PERSONNEL AND ORGANIZATION

This section defines responsibilities for site safety and health for TtNUS and subcontractor employees conducting environmental sampling and other field activities. Personnel assigned to these positions shall exercise the primary responsibility for all on site health and safety. These persons will be the primary point of contact for any questions regarding the safety and health procedures and the selected control measures.

The TtNUS TOM is responsible for the overall direction and implementation of health and safety for this work.

The TtNUS Field Operations Leader (FOL) is responsible for implementation of this HASP. The FOL manages field activities, executes the work plan, and enforces safety procedures as applicable to the work plan. Specifically, the FOL will:

- Verify training and medical status of on-site personnel in relation to site activities.
- Assist and represent TtNUS with emergency services (if needed)
- Provide elements site-specific training for all on site personnel.

The TtNUS Site Safety Officer or their representative supports the FOL concerning all aspects of health and safety including, but not limited to:

- Coordinating all health and safety activities
- Selecting, applying, inspecting, and maintaining personal protective equipment
- Establishing work zones and control points
- Implementing air monitoring procedures
- Implementing hazard communication, respiratory protection, and other associated safety and health programs
- Coordinating emergency services
- Providing elements of site-specific training
- Compliance with these requirements is monitored by the Project Health and Safety Officer (PHSO) and is coordinated through the HSM.

1.3 SITE INFORMATION AND PERSONNEL ASSIGNMENTS

Site Name: Naval Air Station - Cecil Field
Jacksonville, Florida

Remedial Project Manager: Mr. Mark Davidson
Phone Number: (803) 820-5526

Site Contact: Mr. Dave Kruzicki
Phone Number: (904) 778-5620

Project Team:

TtNUS Personnel:	Discipline/Tasks Assigned:	Phone Number:
Mark Speranza, P.E.	Task Order Manager (TOM)	(412) 921-8401
TBD	Field Operations Leader (FOL)	( )
TBD	Site Safety Officer (SSO)	( )
Matthew M. Soltis, CIH, CSP	CLEAN Health and Safety Manager(HSM)	(412) 921-8912
Delwyn E. Kubeldis, CIH, CSP	Project Health and Safety Officer (PHSO)	(412) 921-8529
TBD	Field Geologist	( )
		( )

Non-TtNUS Personnel:	Affiliation/Discipline/Tasks Assigned:	Phone Number

Prepared by: Delwyn E. Kubeldis, CIH, CSP

2.0 EMERGENCY ACTION PLAN

2.1 INTRODUCTION

This section has been developed as part of a preplanning effort to direct and guide field personnel in the event of an emergency. However, given the nature of the work planned significant emergencies are not anticipated. Also, since a majority of potential emergency situations will require assistance from outside emergency responders, TtNUS personnel will not provide emergency response support for emergency events beyond the capabilities of on site personnel. In the event of emergencies that cannot be handled by personnel, an evacuation will be initiated. In an evacuation, site personnel will move to a safe place of refuge and the appropriate emergency response agencies will be notified. The emergency response agencies listed in this plan are capable of providing the most effective response, and as such, will be designated as the primary responders. These agencies are located within a reasonable distance from the area of operations, which ensures adequate emergency response time. This emergency action plan conforms to the requirements of OSHA Standard 29 CFR 1910.38(a), as allowed in OSHA 29 CFR 1910.120(l)(1)(ii).

TtNUS personnel will, through the necessary actions, provide incidental response measures for incidents such as:

- Incipient Fire and spill prevention and response
- Removal of personnel from emergency situations
- Provision of initial medical support for injury/illnesses requiring only first-aid level support
- Provision of site control and security measures, as necessary

2.2 PRE-EMERGENCY PLANNING

Through the initial hazard/risk assessment effort, there is very minor potential for injury or illnesses resulting from exposure to chemical, physical, or other hazards, and subsequently little likelihood of emergency situations. To further minimize or eliminate potential emergency situations, pre-emergency planning activities associated with this project shall be implemented. The FOL is responsible for:

- Coordinating response actions with NAS Cecil Field Emergency Services personnel to ensure that TtNUS emergency action activities are compatible with existing facility emergency response procedures.

- Identifying a chain of command for emergency action.
- Educating site workers to the hazards and control measures associated with planned activities at the site, and providing early recognition and prevention, where possible.

2.3 EMERGENCY RECOGNITION AND PREVENTION

2.3.1 Recognition

Foreseeable emergency situations that may be encountered during site activities will generally be recognizable by visual observation. Visual observation will be the principal method of identifying any hazards that may be associated with the proposed scope of work. These potential hazards, the activities with which they have been associated, and the recommended control methods are discussed in detail in Sections 5.0 and 6.0 of this document.

2.3.2 Prevention

TtNUS personnel will minimize the potential for emergencies by ensuring compliance with the HASP, the Health and Safety Guidance Manual, applicable OSHA regulations, and by following directions given by those persons responsible for the health, safety, and welfare of personnel.

2.4 SAFE DISTANCES AND PLACES OF REFUGE

In the event that the site must be evacuated, all personnel will immediately stop activities and report to a pre-determined safe place of refuge. The safe place of refuge may also serve as the telephone communication point, as communication with emergency response agencies may be necessary. Telephone communication points and safe places of refuge will be determined prior to the commencement of site activities and will be conveyed to personnel as part pre-site training. Upon reporting to the refuge location, personnel will remain there until directed otherwise by the TtNUS FOL or the On-Scene Incident Commander. The FOL will take a head count at this location to confirm the presence of all site personnel. Emergency response agencies will be notified of any unaccounted for personnel.

2.5 EVACUATION ROUTES AND PROCEDURES

Once an evacuation is initiated, personnel will terminate site activities and proceed immediately to the designated place of refuge, unless doing so would further jeopardize the welfare of workers. In such an event, personnel will proceed to a designated alternate location and remain there until further notification

from the FOL. The use of these locations as assembly points provides communication and a direction point for emergency services, should they be needed.

2.6 EMERGENCY ALERTING AND ACTION/RESPONSE PROCEDURES

Since TtNUS personnel will be working in close proximity to each other, voice commands will comprise the mechanisms to alert site personnel of an emergency. If an incident occurs, site personnel will initiate the following procedures:

- Initiate incident alerting procedures (if needed) verbally.
- Describe to the FOL (who will serve as the Incident Coordinator) what has occurred and provide as many details as possible.

If the FOL determines that the situation is beyond the capabilities of the site personnel emergency services will be contact using the emergency reference information listed in Table 2-1. Explain the situation and the appropriate emergency services will be dispatched. **Stay on the phone and follow the instructions of the emergency contact.**

2.7 EMERGENCY CONTACTS

Prior to performing work at the site, all personnel will be thoroughly briefed on the emergency procedures to be followed in the event of an accident. As indicated earlier, Table 2-1 provides a list of emergency contacts and their corresponding telephone numbers. This table will be made readily available to all site personnel.

2.8 EMERGENCY ROUTE TO HOSPITAL

Directions to St. Vincent's Hospital, 1800 Barrs Street, Jacksonville, Florida (904) 387-7300 are as follows:

From Cecil Field: Take SR 134 (Jacksonville Heights) approximately 10 miles to US 17. Turn left and go north on US 17 approximately 2.5 miles to SR 128 (San Juan Ave.). Turn right on San Juan. Go east approximately 1/4 mile to Herschell. Turn left onto Herschell. Herschell will then turn in to St. Johns Ave. Follow St. Johns Ave. which will turn into Riverside. Take Riverside approximately 1 mile to King St. Turn right. Hospital will be on the corner of King Street and Barrs.

A map indicating the travel route from the site to the hospital will be prepared and issued prior to commencing site activities.

TABLE 2-1

EMERGENCY CONTACTS
NAS - CECIL FIELD, JACKSONVILLE, FLORIDA

CONTACT	PHONE NUMBER
EMERGENCIES(1St Contact) NAS Cecil Field Emergency Dispatch	(904)778-5381
EMERGENCY(Outside Services) (Police, Fire, Ambulance Service)	911
Primary Hospital - St. Vincent Hospital	(904)387-7300
Chemtrec National Response Center	(800) 424-9300 (800) 424-8802
NAS Cecil Field (Point-of-Contact) Dave Kruzicki	(904) 778-5620 Ext. 114
NAS Cecil Field (Safety Office) John Kaczetow	(904) 778-5282
TtNUS, Pittsburgh Office	(412) 921-7090
Task Order Manager Mark Speranza	(412) 921-8916
Health and Safety Manager Matthew M. Soltis, CIH, CSP	(412) 921-8912
Project Health and Safety Officer Delwyn E. Kubeldis, CIH, ASP	(412) 921-8529
NAS Cecil Field Public Works Dept. Utilities Gas Water Sewage Telephone Fiber Optics	(904) 778-5441

NOTE: All emergency contacts to emergency services off-base require the notification of NAS Cecil Field Emergency Dispatch. Information to be provided will include the type and extent of the emergency and agencies notified.

Figure 2-1. Map to St. Vincents' Hospital

3.0 SITE BACKGROUND

3.1 SITE HISTORY

NAS Cecil Field is located in western Duval County, Florida, within the limits of the City of Jacksonville. In 1989, NAS Cecil Field was placed on the United States Environmental Protection Agency's (EPA's) Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) National Priorities List (NPL) as a result of pollution resulting from past waste disposal practices that predate CERCLA. In 1990, The United States Department of the Navy entered into a Federal Facilities Agreement (FFA) with EPA to define the overall extent of contamination. NAS Cecil Field has approximately 35 individual sites where hazardous wastes may have been handled, spilled, or buried. As a result, work at the various sites has been organized into eight Operable Units (OUs), as well as more than 100 other areas undergoing evaluation in the Base Alignment and Closure and Underground Storage Tank programs.

3.2 CURRENT STATUS

The official mission of NAS Cecil Field is to provide facilities, services, and material support for the operation and maintenance of naval weapons and aircraft, and other units of the operating forces as designated by the Chief of Naval Operations. Some of the tasks required to accomplish this mission include: (1) operation of fuel storage facilities (2) aircraft maintenance facilities (3) maintenance and operation of an engine repair facility and test cells (4) special weapons support.

3.3 SITE 16 DESCRIPTION

OU 7, Site 16, is located west of the North-South runways at NAS Cecil Field, Jacksonville, Florida, as shown on Figure 3-1. Building 313 houses jet engine maintenance shops and the Non-Destructive Inspection (NDI) Laboratory. The general area of the site is industrialized with buildings, concrete, and asphalt paved areas. The immediate area surrounding the location of the source of contamination is grass covered. From 1959 to 1980 liquid wastes (containing solvents such as trichloroethylene [TCE]) were generated from machine and engine parts cleaning in Building 313. These liquid wastes were discharged without treatment into a seepage pit that was located north of Building 313. The wastes subsequently infiltrated the vadose zone soil and the underlying aquifer. In 1994, the seepage pit was included in an Interim Removal Action (IRA). At that time, soil containing TCE at concentrations greater than 1 mg/kg was removed down to the groundwater table and disposed of off-site.

It has been determined from a variety of environmental investigation that VOCs (in particular TCE) are present in the groundwater in the vicinity of Site 16 in concentrations which exceed regulatory limits.

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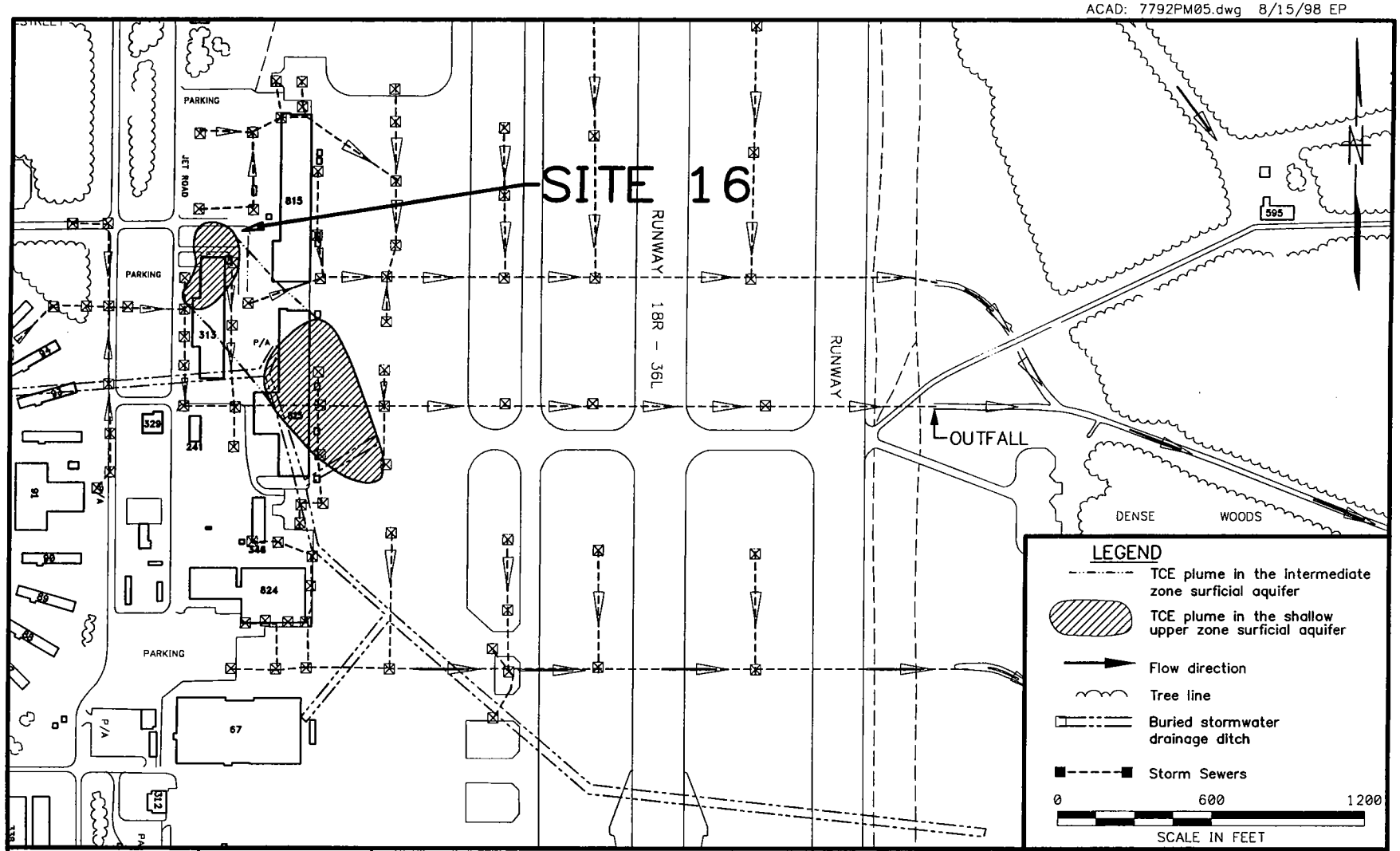

DRAWN BY TAD DATE 2/20/98	DEPARTMENT OF THE NAVY SOUTHERN DIV FACILITIES ENGINEERING COMD	SHALLOW AQUIFER PLUME SITE 16, OPERABLE UNIT 7 NAS CECIL FIELD JACKSONVILLE, FLORIDA	CONTRACT NO. 7792
CHECKED BY DATE			APPROVED BY DATE
COST/SCHED-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. Figure 3-1 REV. 0

FORM CADD NO. SDV_AH12.DWG - REV 0 - 1/20/98

4.0 SCOPE OF WORK

This section of the HASP addresses all proposed site activities that are to be conducted while performing the remedial design. The activities will be performed to determine the physical parameters needed to design a full-scale AS/SVE system, and to evaluate and monitor the effectiveness of natural attenuation at Site 16. The methods and activities to be conducted include, but may not be limited to:

- Mobilization/demobilization
- Installation, maintenance and operation of AS/SVE system (pilot and full-scale phases)
- Soil borings (using hollow stem augers)
- Monitoring well installation
- Multi-media sampling:
    - Groundwater
    - Subsurface soil
    - AS/SVE discharge air
    - Investigation derived waste (IDW), if necessary
- Decontamination of sampling and heavy equipment
- Site surveying

The above listing represents a summarization of the tasks as they apply to the scope and application of this HASP. For more detailed description of the associated tasks, refer to the Sampling and Analysis Plan (SAP) and/or the Work Plan (WP). Any tasks to be conducted outside of the elements listed here will be considered a change in scope requiring modification of this document. All requested modifications to this document will be submitted to the HSM by the TOM or a designated representative.

5.0 TASKS/HAZARDS/ASSOCIATED CONTROL MEASURES SUMMARIZATION

Table 5-1 of this section lists the anticipated hazards, recommended control measures, monitoring recommendations, required Personal Protective Equipment (PPE), and decontamination measures for each site task. Through using the table, the FOL and SSO can determine which hazards are associated with each task and what associated control measures are necessary to minimize exposure or injuries related to those hazards. This table also assists the FOL and SSO in determining which PPE and decontamination procedures to use based on proper air monitoring techniques and project-specific conditions. This information can then be transposed to the Safe Work Permit (Section 9.4) for directing field crews within those specific duties. This table and the associated control measures will be changed if the scope of work, contaminants of concern, or other conditions change.

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TABLE 5-1
TASKS/HAZARDS/CONTROL MEASURES COMPENDIUM
NAVAL AIR STATION - CECIL FIELD, JACKSONVILLE, FLORIDA

Tasks/ Operation Location	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring	Personal Protective Equipment	Decontamination Procedures
Soil boring activities associated with injection, vapor extraction, and monitoring well installation (using hollow-stem augers)	***Chemical hazards:*** 1) Previous analytical data identify various VOCs (primarily 1,1-DCE, TCE, and 1,2-Dichloroethene) as contaminants of concern. Table 6-1 provides additional information about each of the identified contaminants of concern. 2) Transfer of contamination into clean areas or onto persons ***Physical hazards:*** 3) Contact/entanglement with rotating equipment or machinery 4) Noise in excess of 85 dBA 5) Contact with underground or overhead utilities (electric lines, gas lines, water lines, etc.) 6) Strain/muscle pulls from heavy lifting 7) Slips, trips, and falls 8) Pinch/compression points 9) Vehicular and equipment traffic 10) Natural hazards (insect/animal bites or stings, poisonous plants, etc.) 11) Ambient temperature extremes (heat stress) 12) Inclement weather	***Chemical hazards:*** 1) Use real-time air monitoring instrumentation (PID) and established action levels to detect and identify exposures to potentially contaminated media. Use appropriate safe work practices and PPE to minimize the potential for exposure. Some of the potential contaminants of concern are likely to be present in the form of particulates or bound to particulates. Real-time air monitoring instruments are ineffective for detecting these contaminants. Therefore, generation of dusts should be minimized to the greatest extent possible. If airborne dusts are observed, area wetting methods will be used. If area wetting methods are not feasible or are ineffective, task activities will be terminated to minimize exposure to excessive airborne dusts 2) Decontaminate all equipment and supplies between drilling events as well as prior to leaving the site. ***Physical hazards:*** 3) All equipment used will be: - Inspected in accordance with Federal safety and transportation guidelines, OSHA (1926.600,.601,.602), and manufacturer's design. - Operated by knowledgeable operators and ground crew. - Only manufacturer approved equipment may be used in conjunction with equipment repair procedures (e.g., pins for auger flights). In addition to the equipment considerations, the following standard operating procedures will be used: - All personnel not directly supporting the drilling operation will remain at least 25 feet from the point of operation (drill point). - Drilling, drill masts, or other projecting devices shall be at least 20 feet from overhead power sources and a minimum of 3 feet from underground utilities. - All loose clothing/protective equipment will be secured to avoid possible entanglement. - Hand signals will be established prior to the commencement of drilling activities. - The driller and helper can simultaneously handle moving cores, augers, or flights only when there is a standby person to activate the emergency stop device. - The driller must never leave the controls while equipment is operating unless all personnel are clear of the equipment. - Keeps hands and feet away from pinch points. - A remote sampling device must be used to sample cuttings near rotating or moving tools. - Work areas will be kept clear of clutter. - All equipment shall be equipped with movement warning systems. - All personnel will be instructed in the location and operations of the emergency shut off device(s). This device will be tested initially (and then periodically) to ensure its operational status. - Areas will be inspected prior to the movement of site equipment and support vehicles to eliminate any physical hazards. This will be the responsibility of the FOL and/or SSO. - Drill rig and support vehicles will be moved no closer than 3 feet to banks, ditches, and other excavations unless the wall is supported with a sidewall retaining device. 4) Excessive noise levels will be mitigated through the use of hearing protection. 5) All utility clearances shall be obtained in writing prior to subsurface activities. The locations of all underground utilities will be identified and marked prior to all subsurface investigations. Where the clearance cannot be obtained in a reasonable period, or not located, soil boring shall proceed with extreme caution. - Projecting devices of site equipment shall be at least 20 feet from overhead power lines and a minimum of 3 feet from identified underground locations. 6) Use machinery or multiple personnel for heavy lifts. - Use proper lifting techniques. 7) Preview work location for uneven/unstable terrain. 8) Keep any machine guarding in place. Avoid moving parts. Secure loose clothing, jewelry, or long hair that could become entangled. 9) Traffic and equipment considerations are to include the following: - A traffic control plan will be developed prior to working in traffic areas and followed by all personnel. - All equipment shall be equipped with movement warning systems. - All personnel working in high equipment traffic areas are required to wear reflective vests for high visibility. - Use safety belts and follow the site traffic rules. 10) Wear appropriate clothing and PPE. Avoid potential nesting areas and suspicious vegetation (poison ivy, poison oak, etc.). When feasible and necessary, use commercially available insect repellents. Refer to the Health and Safety Guidance Manual for additional information regarding ticks and Lyme's disease. Tape ankle and wrist areas to prevent tick, chiggers, etc. from getting under clothing and attaching to skin. Wear light colored clothing so that ticks and other insects can be easily visible. 11) Observe site personnel for signs and symptoms of heat stress related disorders. Provide liquids (preferably containing electrolytes) for fluid replenishment. If necessary implement work/rest regimens in accordance with ACGIH recommendations (provided in the Health and Safety Guidance Manual). 12) Suspend or terminate operations until directed otherwise by SSO	**It is anticipated that potential contaminant concentrations at outdoor locations will be below levels that could present a health hazard.** A Photoionization Detector w/ 10.6 eV UV lamp source will be used to screen for VOCs. The following guidance applies: Source (e.g., borehole) monitoring will be conducted at regular intervals determined by the SSO. The SSO will also monitor the breathing zone (BZ) of all potentially affected employees. Workers must evacuate to a safe area if sustained BZ concentrations exceed background concentrations. Site contaminants may adhere to or be part of airborne dusts or particulates generated during site activities. Generation of dusts should be minimized to the greatest extent possible to avoid inhalation of contaminated dusts or particulates. Evaluation of dust concentrations will be qualitative by observing work conditions for visible dust clouds or accumulations. Potential exposure to contaminants attached to dust particles will be controlled by using water to suppress dusts or by avoiding dust plumes.	All soil boring installations are to be initiated in Level D protection, which includes the following minimum protection: - Standard field dress (long pants; sleeved shirts) - Steel toe/ safety shoes or boots - Nitrile gloves with a cotton liner or layered surgical style nitrile gloves, - Hardhat, safety glasses, and earplugs or muffs. - Tyvek coveralls and impermeable boot covers will be worn if there is a possibility of soiling work attire or if muddy conditions exist - PVC or PE coated Tyvek will be incorporated if there is a potential for saturation of work attire.	**Personnel Decontamination** - Will consist of a soap/water wash and rinse for outer protective equipment (boots, gloves, coveralls, etc.) as applicable. This function will take place at an area adjacent to the soil boring or well installation operations bordering the support zone. This decontamination procedure for will consist of - Equipment drop - Soap/water wash and rinse of outer gloves and outer boots, as applicable - Soap/water wash and rinse of the outer splash suit, as applicable - Outer suit, boot covers, outer glove removal and disposal, as applicable - Wash hands and face, leave contamination reduction zone

Task/Operation/ Location	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring	Personal Protective Equipment	Decontamination Procedures
Multi-media sampling including groundwater, soils, and air from the AS/SVE system. IDW sampling is included in this task.	***Chemical hazards:*** 1) Previous analytical data identify various VOCs (primarily 1,1-DCE, TCE, and 1,2-Dichloroethene) as contaminants of concern. Table 6-1 provides additional information about each of the identified contaminants of concern. 2) Transfer of contamination into clean areas or onto persons. ***Physical hazards:*** 3) Noise in excess of 85 dBA 4) Strain/muscle pulls from heavy lifting 5) Pinch/compression points 6) Slips, trips, and falls 7) Natural hazards (insect/animal bites and stings, poisonous plants, etc.) 8) Ambient temperature extremes (heat stress) 9) Vehicular and equipment traffic	***Chemical hazards:*** 1) Use real-time air monitoring instrumentation (PID) and established action levels to detect and identify exposures to potentially contaminated media. Use appropriate safe work practices and PPE to minimize the potential for exposure. Some of the potential contaminants of concern are likely to be present in the form of particulates or bound to particulates. Real-time air monitoring instruments are ineffective for detecting these contaminants. Therefore, generation of dusts should be minimized to the greatest extent possible. If airborne dusts are observed, area wetting methods will be used. If area wetting methods are not feasible or are ineffective, task activities will be terminated to minimize exposure to excessive airborne dusts 2) Restrict the cross use of equipment and supplies between sampling locations without first going through a suitable decontamination. ***Physical hazards:*** 3) Noise control will be accomplished through the use of hearing protection. As a general rule of thumb, any time you must raise your voice to speak to someone to be heard within 2 feet of where you are standing the potential exists that sound pressure levels may be excessive. Therefore, personnel will be required to use hearing protection in these situations. The SSO will implement a site-specific Hearing Conservation Program using Section 6 of the Tetra Tech NUS Health and Safety Guidance Manual. 4) Use machinery or multiple personnel for heavy lifts. Use proper lifting techniques. 5) Keep any machine guarding in place. Avoid moving parts. Secure loose clothing, jewelry, or long hair that could become entangled. 6) Preview work locations for unstable/uneven terrain. 7) Avoid insect / animal nesting areas. Report potential hazards to the SSO. Tape ankle and wrist areas to prevent ticks, chiggers, etc. from getting under clothing and attaching to your skin. Wear light colored clothing so that ticks and other biting insects can be easily visible. 8) Observe site personnel for signs and symptoms of heat stress related disorders. Provide liquids (preferably containing electrolytes) for fluid replenishment. If necessary implement work/rest regimens in accordance with ACGIH recommendations (provided in the Health and Safety Guidance Manual). 9) Traffic and equipment considerations are to include the following: - A traffic control plan will be developed prior to working in traffic areas and followed by all personnel. - All equipment shall be equipped with movement warning systems. - All personnel working in high equipment traffic areas are required to wear reflective vests for high visibility. - Use safety belts and follow the site traffic rules.	**It is anticipated that potential contaminant concentrations at outdoor locations will be below levels that could present a health hazard.** A Photoionization Detector w/ 10.6 eV UV lamp source will be used to screen for VOCs. The following guidance applies: Source (e.g., borehole) monitoring will be conducted at regular intervals determined by the SSO. The SSO will also monitor the breathing zone (BZ) of all potentially affected employees. Workers must evacuate to a safe area if sustained BZ concentrations exceed background concentrations. Site contaminants may adhere to or be part of airborne dusts or particulates generated during site activities. Generation of dusts should be minimized to the greatest extent possible to avoid inhalation of contaminated dusts or particulates. Evaluation of dust concentrations will be qualitative by observing work conditions for visible dust clouds or accumulations. Potential exposure to contaminants attached to dust particles will be controlled by using water to suppress dusts or by avoiding dust plumes.	All sampling activities are to be initiated in level D protection, which includes the following minimum protection: - Standard field dress (long pants sleeved shirts) - Steel toe/ safety shoes or boots - Layered surgical style nitrile gloves, or nitrile gloves with a cotton liner, - Hardhat, safety glasses, and earplugs or muffs. - Tyvek coveralls and impermeable boot covers will be worn if there is a possibility of soiling work attire or if muddy conditions exist - PVC or PE coated Tyvek will be incorporated if there is a potential for saturation of work attire.	**Personnel Decontamination** - Will consist of a soap/water wash and rinse for outer protective equipment (boots, gloves, coveralls, etc.). The decontamination procedure for Level D protection will consist of - Equipment drop - Soap/water wash, rinse, removal and disposal of outer gloves and outer boots, as applicable - Soap/water wash, rinse, removal and disposal of the outer splash suit, as applicable - Wash hands and face, leave contamination reduction zone

Tasks/ Operation Location	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring	Personal Protective Equipment	Decontamination Procedures
Mobilization/ Demobilization	*Physical Hazards* 1) Strain/muscle pulls from heavy lifting 2) Pinch/compression points 3) Slips, trips, and falls 4) Contact/entanglement with rotating equipment or machinery 5) Natural hazards (Insect/animal bites and stings) 6) Vehicular and equipment traffic	1) Use machinery or multiple personnel for heavy lifts. Use proper lifting techniques. 2) Keep any machine guarding in place. Avoid moving parts. Secure loose clothing, jewelry, or long hair that could become entangled. 3) Preview work locations for unstable/uneven terrain. 4) All equipment will be - Inspected in accordance with OSHA, and manufacturers design. - Operated by knowledgeable operators and ground crew. 5) Avoid nesting areas, use repellents. Report potential hazards to the SSO. 6) Traffic and equipment considerations are to include the following: - A traffic control plan will be developed prior to working in traffic areas and followed by all personnel. - All equipment shall be equipped with movement warning systems. - All personnel working in high equipment traffic areas are required to wear reflective vests for high visibility. - Use safety belts and follow the site traffic rules.	Not required	Level D - (Minimum Requirements) - Standard field attire (sleeved shirt; long pants) - Safety shoes (Steel toe/shank) - *Safety glasses* - *Hardhat (when overhead hazards exists, or identified as a operation requirement)* - *Reflective vest for high traffic areas* - *Hearing protection for high noise areas, or as directed on an operation by operation scenario.* *(Items in italics are deemed optional as conditions or the FOL or SSO dictate.)*	Not required
Site Surveying	*Physical Hazards* 1) Slip, trips, and falls 2) Natural hazards (Insect/animal bites and stings) 3) Ambient temperature extremes (heat stress)	1) Preview work locations for unstable/uneven terrain. 2) Avoid nesting areas, use repellents. Report potential hazards to the SSO. 3) Wear appropriate clothing for weather conditions. Provide acceptable shelter and liquids for field crews. Additional information regarding cold/heat stress concerns is provided in section 4 of the Brown & Root Environmental Health and Safety Guidance Manual.	Not required	Level D - (Minimum Requirements) - Standard field attire (sleeved shirt; long pants). Tuck pants into boots/socks and apply tape in grassy areas. - Safety shoes (Steel toe/shank) - *Snake chaps in grass areas* - *Safety glasses* - *Hardhat (when overhead hazards exists, or identified as a operation requirement)* - *Reflective vest for high traffic areas* *(Items in italics are deemed optional as conditions or the FOL or SSO dictate.)*	Not anticipated given nature of task
Installation, maintenance and operation of the AS/SVE System. These tasks include both the pilot test and full scale operation.	*Chemical Hazards* 1) Previous analytical data identify various VOCs (primarily 1,1-DCE, TCE, and 1,2-Dichloroethene) as contaminants of concern. Table 6-1 provides additional information about each of the identified contaminants of concern. *Physical Hazards* 2) Energized systems including pneumatic, electrical, hydraulic, kinetic, and compressed gas	1) Use real-time monitoring instrumentation, action levels, and identified PPE to control exposures to potentially contaminated media (e.g. air, water, soils). 2) Utilize accepted energy control methods as defined in 29 CFR 1910.147 to control potential energy sources during maintenance operations. NOTE: Review entire process before and after construction to the requirements established in 29 CFR 1910.119 (OSHA's Process Safety Management standard). The intent of this standard is to prevent or minimize the consequences of a release through system failure, fire, or explosion. Although the site contaminants may not be subject to this standard, this review process is recommended to establish a Best Management Practice for process control. This review process is recommended prior to initiation, then periodically once the operation is progress.	Screening for VOCs will be performed using real-time monitoring instrumentation. Instrument action levels and personal protective equipment will be used to control potential exposures to site contaminants. Depending on the results of this screening, personal sampling of worker(s) may be conducted to quantitatively and/or qualitatively determine exposures.	Selections for PPE should be made in accordance with the results of the contaminant screening, personal sampling and/or the process safety review findings. At a minimum, Level D protection must be worn to include the following: - Standard field dress (long pants sleeved shirts) - Steel toe/ safety shoes or boots - Nitrile gloves with a cotton liner or layered surgical style nitrile gloves, - safety glasses - Hardhat when overhead hazards exist - earplugs (or muffs) when excessive noise exposures/sources are encountered. - Tyvek coveralls and impermeable boot covers will be worn if there is a possibility of soiling work attire or if muddy conditions exist - PVC or PE coated Tyvek will be incorporated if there is a potential for saturation of work attire.	When personnel may encounter potential contaminants, PPE decontamination procedures such as those described for multi-media sampling will be used.

Tasks/ Operation Location	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring	Personal Protective Equipment	Decontamination Procedures
Decontamination of Sampling and Heavy Equipment	1) Previous analytical data identify various VOCs (primarily 1,1-DCE, TCE, and 1,2-Dichloroethene) as contaminants of concern. Table 6-1 provides additional information about each of the identified contaminants of concern. 2) Transfer of contamination into clean areas or onto persons *Physical Hazards* 3) Strain/muscle pulls from heavy lifting 4) Inclement weather 5) Noise in excess of 85 dBA 6) Flying projectiles	1) and 2) Use protective equipment to minimize contact with site contaminants and hazardous decontamination fluids. Obtain manufacturer's MSDS for any decontamination solvents used onsite. Use appropriate PPE as identified on MSDS. 3) Use multiple persons where necessary for lifting and handling sampling equipment for decontamination purposes. 4) Suspend or terminate operations until directed otherwise by SSO 5) Use hearing protection when operating high pressure washer for extended periods of time (e.g., 30 minutes or longer). 6) Wear appropriate PPE (i.e., splash shield & safety glasses)	Use visual observation, and real-time monitoring instrumentation to ensure all equipment has been properly cleaned of contamination and dried.	*For Heavy Equipment* This applies to high pressure soap/water, steam cleaning wash and rinse procedures. Level D Minimum requirements - - Standard field attire (sleeved shirt; long pants) - Safety shoes (Steel toe/shank) - Chemical resistant boot covers - Nitrile outer gloves, cotton liners - PVC Rainsuits or PE or PVC coated Tyvek - Safety glasses underneath a splash shield - Ear plugs or ear muffs *For sampling equipment (trowels, MacroCore Samplers, bailers, etc.)*, the following PPE is required Level D Minimum requirements - - Standard field attire (sleeved shirt; long pants) - Safety shoes (Steel toe/shank) - Nitrile outer gloves, cotton liners - Safety glasses underneath a splash shield In the event of overspray of chemical decontamination fluids employ PVC Rainsuits or PE or PVC coated Tyvek as necessary.	This decontamination procedure for **Level D** protection will consist of - Soap/water wash and rinse of outer reusable gloves - Soap/water wash and rinse of the outer reusable splash suit, as applicable - Removal/disposable of non-reusable PPE (e.g, gloves) - Wash hands and face, leave contamination reduction zone **Heavy equipment Decontamination** - All heavy equipment decontamination will take place at a centralized decontamination pad utilizing steam or pressure washers. Heavy equipment, such as the drill rig, will have the wheels/tires cleaned along with any loose debris removed prior to transporting to the central decontamination area. Roadways shall be cleared of any debris resulting from the onsite activity. All equipment used in the exclusion zone will require a complete decontamination between locations and prior to removal from the site. The FOL or the SSO will be responsible for evaluating equipment arriving onsite and that which is to leave the site. No equipment will be authorized access or exit without this authorization. Evaluation will consist of - Visual inspection - Scanning equipment with monitoring instruments **Sampling Equipment Decontamination** - All chemical decontamination will proceed in accordance with the other site documents such as QA/QC, Work Plan, and/or the Sampling Analysis Plan. Prior to leaving the site, all sampling equipment will undergo a soap/water wash and rinse utilizing a suitable potable water source until visibly clean. Sampling equipment may also be cleaned using a high pressure soap/water wash and rinse or steam. MSDS for any decon solutions (Alconox, isopropanol, etc.) will be obtained and used to determine proper handling / disposal methods and protective measures (PPE, first-aid, etc.).

6.0 HAZARD ASSESSMENT AND CONTROLS

This section provides reference information regarding the chemical and physical hazards which may be associated with activities to be conducted as part of the scope of work. Table 6-1 provides specific information related to the various chemical hazards that may be present or generated at the planned project areas within NAS Cecil Field. Specifically, toxicological information, exposure limits, symptoms of exposure, physical properties, and air monitoring and sampling data are discussed in the table.

6.1 CHEMICAL HAZARDS

Analytical data obtained during previous investigations indicates the presence of various volatile organic compounds (VOCs). Based on these data and historical information about the site, the primary contaminants of concern are 1,1-Dichloroethene (1,1-DCE), 1,2-Dichloroethene, and trichloroethene (TCE). It is anticipated that the greatest potential for exposure to site contaminants is during intrusive activities (soil borings, groundwater sampling, etc.). Personnel exposure is most likely to occur through inhalation of airborne particulate matter containing these compounds, or through ingestion of contaminated soil or water by hand-to-mouth contact during soil disturbance activities. Potential exposures will be minimized through the use of applicable controls (e.g., area wetting of dusts), personal protective equipment (PPE), decontamination procedures, and/or site control measures. Additional information on these contaminants is presented in Table 6-1.

6.2 PHYSICAL HAZARDS

The following is a list of physical hazards that may be encountered at the site or may be present during the performance of site activities.

- Contact/entanglement with rotating equipment
- Slip, trips, and falls
- Contact with underground or overhead utilities (electric lines, gas lines, water lines, etc.)
- Strain/muscle pulls from heavy lifting
- Noise in excess of 85 dBA

- Ambient temperature extremes (heat stress)
- Pinch/compression points
- Natural hazards (snakes, ticks, poisonous plants, etc.)
- Vehicular and equipment traffic
- Inclement weather
- Flying projectiles

These hazards are discussed further below, and are presented relative to each task in Table 5-1.

6.2.1 Contact/Entanglement with Rotating Equipment

As part of the site-specific training, site personnel shall be advised of the hazards associated with working in close proximity to moving machinery. Safety measures used to prevent hazards of this nature include: using only properly fitting PPE to avoid possible entanglement in moving parts; using lockout/tagout procedures prior to performing maintenance functions on equipment; and performing periodic inspections on all equipment to ensure all guards, protective cages, and emergency shut-off devices are in place and functioning properly. All equipment on site will be properly maintained. Maintenance performed on equipment shall be conducted in accordance with the manufacturer's specifications.

6.2.2 Slips, Trips, and Falls

During various site activities there is a potential for slip, trip, and fall hazards associated with wet, steep, or unstable work surfaces. To minimize hazards of this nature, personnel required to work in and along areas prone to these types of hazards will be required to exercise caution, and use appropriate precautions (restrict access, guardrails, life lines and/or safety harnesses) and other means suitable for the task at hand. All activities will be performed using the buddy system.

6.2.3 Contact with Underground or Overhead Utilities

Underground utilities such as pressurized lines, water lines, telephone lines, buried utility lines, and high voltage power lines are known to be present throughout the facility. Clearance of underground and overhead

utilities for each sample location will be coordinated with NAS Cecil Field Public Works personnel. Additionally, drilling operations will be conducted at a safe distance (>20 feet) from overhead power lines unless they are shielded. Spotters will be used if equipment such as the drill rig is to be moved in or around any overhead utility lines. Whenever underground utilities are suspected within close proximity to subsurface sampling locations, the borehole will be advanced to a minimum of 5.0 feet with a hand auger prior to drilling. As built drawings may also be utilized for additional clarification. In certain cases, NAS Cecil Field Public Works personnel may need to de-energize electrical cables using facility lockout/tagout procedures to insure electrical hazards are controlled.

6.2.4 Strain/Muscle Pulls from Heavy Lifting

During execution of planned activities there is some potential for strains, sprains, and/or muscle pulls due to the physical demands and nature of this site work. To avoid injury during lifting tasks personnel are to lift with the force of the load carried by their legs and not their backs. When lifting or handling heavy material or equipment use an appropriate number of personnel. Keep the work area free from ground clutter to avoid unnecessary twisting or sudden movements while handling loads.

6.2.5 Noise in Excess of 85 dBA

Various site activities, particularly those utilizing machinery and tools, have the potential to create noise levels that exceed 85 dBA. Hearing protection will be available on site and required for use by personnel adjacent to drilling operations. Hearing protection will also be used during other tasks identified by the SSO as producing excessive noise levels.

6.2.6 Ambient Temperature Extremes (Heat Stress)

Given the geographic location of the site and the project schedule, overexposure to high ambient temperatures (heat stress) may exist during performance of this work depending on the project schedule. Work performed when ambient temperatures exceed 70 °F may result in varying levels of heat stress (heat rash, heat cramps, heat exhaustion, and/or heat stroke) depending on variables such as wind speed, humidity, and percent sunshine, as well as physiological factors such as metabolic rate and skin moisture content. Additionally, work load and level of protective equipment will affect the degree of exposure. Site personnel will be encouraged to drink plenty of fluids to replace those lost through perspiration. Additional information such as Work-Rest Regimens and personnel monitoring may be found in section 4.0 of the Health & Safety Guidance Manual.

6.2.7 Pinch/Compression Points

Handling of tools, machinery, and other equipment on site may expose personnel to pinch/compression point hazards during normal work activities. Where applicable, equipment will have intact and functional guarding to prevent personnel contact with hazards. Personnel will exercise caution when working around pinch/compression points, avoiding moving parts and using additional tools or devices as necessary to avoid hazards.

6.2.8 Natural Hazards

Natural hazards such as poisonous plants or bites from poisonous, disease carrying, or otherwise dangerous animals or insects (snakes, ticks, etc.) are often prevalent at sites that are being investigated as part of hazardous waste site operations. During warm months (spring through early fall), tick-borne Lyme Disease may pose a potential health hazard. The longer a disease carrying tick remains attached to the body, the greater the potential for contracting the disease. Wearing long sleeved shirts and long pants (tucked into boots and taped) will prevent initial tick attachment, while performing frequent body checks will help prevent long term attachment. Site first aid kits should be equipped with medical forceps and rubbing alcohol to assist in tick removal. For information regarding tick removal procedures and symptoms of exposure, consult Section 4.0 of the Health and Safety Guidance Manual.

Contact with poisonous plants and bites or stings from poisonous insects are other potential natural hazards. Long sleeved shirts and long pants (tucked into boots), and avoiding potential nesting areas, will minimize the potential for exposure. Additionally, insect repellents may be used by site personnel. Personnel who are allergic to stinging insects (such as bees, wasps and hornets) must be particularly careful since severe illness and death may result from allergic reactions. As with any medical condition or allergy, information regarding the condition must be listed on the Medical Data Sheet (see Section 7 of the Health and Safety Guidance Manual), and the FOL or SSO notified.

6.2.9 Vehicular and Equipment Traffic

Hazards associated with vehicular and equipment traffic are likely to exist during various site activities and whenever site personnel perform work near roadways. To minimize the potential for injuries associated with these hazards, site personnel will maintain awareness of traffic and moving equipment. When working near roadways, site personnel will wear high visibility vests. During movement of machinery, spotters will be used and site personnel will maintain visibility with equipment operators. Additionally, all

site equipment will be subject to routine equipment inspections to ensure a guards, emergency stops, and safety devices are present and operational.

6.2.10 Inclement Weather

Project tasks under this Scope of Work will be performed outdoors. As a result, inclement weather may be encountered. In the event that adverse weather conditions (electrical storms, hurricanes, etc.) arise, the FOL and/or the SSO will be responsible for temporarily suspending or terminating activities until hazardous conditions no longer exist.

6.2.11 Flying Projectiles

During decontamination activities using powered equipment (e.g., pressure washers), projectiles in the form of liquids and solids may be present and present an eye and/or face hazard. Recognition of this possible hazard and the wearing of appropriate PPE is recommended to control exposures.

TABLE 6-1
CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
NAS CECIL FIELD, JACKSONVILLE, FLORIDA
PAGE 1 OF 1

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
1,1 Dichloroethene See also vinylidene chloride	75-34-4	PID: I.P. 10.00 eV, relative response ratio is 80%. FID: Relative response ratio for detection with the FID is 40%.	Air sample using a charcoal filter tube; carbon disulfide desorption; GC/FID detection in accordance with NIOSH Method #1015.	ACGIH: 5 ppm, STEL 20 ppm NIOSH & OSHA have not established exposure limits.	Odor threshold - 190 ppm. An air purifying respirator equipped with a organic vapors filter is acceptable for escape purposes only. For exposures greater than the recommended exposures limits should employ supplied air respirators. **Recommended glove:** Butyl, nitrile, or neoprene.	**Boiling Pt:** 89°F; 32°C **Melting Pt:** -188°F;-122°C **Solubility:** Slight (0.04%) **Flash Pt:** -2°F; -19°C **LEL/LFL:** 6.5% **UEL/UFL:** 15.5% **Vapor Density:** 3.25 **Vapor Pressure:** 500 mmHg @ 68°F; 20 °C **Specific Gravity:** 1.21 @ 20°F; 4°C **Incompatibilities:** Aluminum, air, copper, and heat. Polymerization may occur if exposed to oxidizers. **Appearance and Odor:** Colorless liquid with a slight sweet chloroform odor.	Overexposure to this substance may result in irritation to the eyes, nose, throat, and respiratory system. Dermal contact with concentrated solutions may cause slight irritation, redness and inflammation. Systemically, headaches, dizziness, nausea, and difficulty in breathing. Chronic effects may include kidney and liver dysfunction, and pneumonitis. This material has expressed cancer causing potential in laboratory animals including liver and kidney tumors.
1,2-Dichloroethylene	540-59-0	PID: I.P. 9.65 eV, high response with PID and 10.2 eV lamp. FID: 50% response with FID.	Air sample using charcoal tube; and carbon disulfide desorption; Sampling and analytical protocol in accordance with OSHA Method #07; and NIOSH Method #1003.	OSHA; NIOSH; ACGIH: 200 ppm IDLH: 1000 ppm	Adequate- odor threshold 0.085-17 ppm. Use organic vapor/acid gas cartridges for exceedances above the TWA up to 1,000 ppm. >1,000 ppm should use pressure-demand supplied air respirator above exposure limits. **Recommended glove:** nitrile - 0.12 hrs; viton - 0.95 hrs	**Boiling Pt:** 117°F; 47°C **Melting Pt:** 7°F; -13.8°C **Solubility:** 0.4% **Flash Pt:** 36°F; 2.2°C **LEL/LFL:** 5.6% **UEL/UFL:** 12.8% **Vapor Density:** 2.0 **Vapor Pressure:** 180-260 mmHg **Specific Gravity:** 1.27 @ 90°F; 32°C **Incompatibilities:** Strong oxidizers, alkalis, potassium hydroxide, and copper. When heated to decomposition temperatures will emit toxic fumes of phosgene. **Appearance and Odor:** Colorless liquid with an acrid odor.	Overexposure may result in CNS depression with potential to cause sleepiness, hallucinations, distorted perceptions, and stupor (narcosis). Systemically, symptoms may result in nausea, vomiting, weakness, tremors, and cramps. May also irritate the eyes, skin, and mucous membranes. Chronic exposures may result in dermatitis, liver, kidney, and lung damage.
Trichloroethylene	79-01-6	PID: I.P. 9.45 eV, High response with PID and 10.2 eV lamp. FID: 70% Response with FID.	Air sample using charcoal tube; carbon disulfide desorption; Sampling and analytical protocol shall proceed in accordance with OSHA Method #07, or NIOSH Method #1022 or #1003.	OSHA: 50 ppm 200 ppm (Ceiling) ACGIH: 50 ppm 100 ppm STEL NIOSH: 25 ppm IDLH: 1000 ppm	Inadequate - Odor threshold 82 ppm. APRs with organic vapor/acid gas cartridges may be used for escape purposes. Exceedances over the exposure limits require the use of positive pressure-demand supplied air respirator. **Recommended gloves:** PV Alcohol unsupported >16.00 hrs; Silver shield >6.00 hrs; Teflon >24.00 hrs; or Viton >24.00 hrs; Nitrile (Useable time limit 0.5 hr, complete submersion for the nitrile selection)	**Boiling Pt:** 188°F; 86.7°C **Melting Pt:** -99°F; -73°C **Solubility:** 0.1% @ 77°F; 25°C **Flash Pt:** 90°F; 32°C **LEL/LFL:** 8% @ 77°F; 25°C **UEL/UFL:** 10.5 @ 77°F; 25°C **Vapor Density:** 4.53 **Vapor Pressure:** 100 mmHg @ 90°F; 32 °C **Specific Gravity:** 1.46 **Incompatibilities:** Strong caustics and alkalis, chemically active metals (barium, lithium, sodium, magnesium, titanium, and beryllium) **Appearance and Odor:** Colorless liquid with a chloroform type odor. Combustible liquid, however, burns with difficulty.	Central nervous system effects including euphoria, analgesia, anesthesia, paresthesia, headaches, tremors, vertigo, and somnolence. Damage to the liver, kidneys, heart, lungs, and skin have also been reported. Contact may result in irritation to the eyes, skin, and mucous membranes. Ingestion may result in GI disturbances including nausea, and vomiting NIOSH lists this substance a potential human carcinogen.

7.0 AIR MONITORING

Monitoring devices such as Direct Reading Instruments (DRIs) will be used at the site to detect and evaluate the presence of site contaminants and other potentially harmful agents. The specific type of monitoring and the associated instruments, frequency of use, and applicable action levels are dependent upon the specific scope of work and the contaminants of concern. As a result, specific air monitoring measures and requirements will be established in Table 5-1 of this site specific HASP. Section 1.0 of the TtNUS Health and Safety Guidance Manual contains detailed information regarding direct reading instrumentation, personal and area air sampling procedures, as well as general calibration procedures of various instruments.

7.1 INSTRUMENTS AND USE

Instruments will be used primarily to monitor source points and worker breathing zone areas, while observing instrument action levels. Action levels are discussed in Table 5-1 as they may apply to a specific task or location.

7.1.1 Photoionization Detector

A Photoionization Detector (PID) with a 10.6 eV (or equivalent) lamp will be used to monitor potential sources areas and to screen collected samples and breathing zones of employees during sampling and other intrusive activities. The PID has been selected because it is capable of better detecting organic gases and vapors present at the site than a Flame Ionization Detector (FID). When calibrated with isobutylene the PID has a one to one correspondence with benzene. Prior to the commencement of any field activities, the background level of the site must be determined and noted. Daily background readings must be taken away from areas of potential contamination to obtain accurate results. These readings, and any influencing conditions (i.e., weather, temperature, humidity) and location will also be documented in the Health and Safety Logbook as a matter of reference.

7.1.2 Hazard Monitoring Frequency

Table 5-1 presents the frequencies that hazard monitoring will be performed as well as the action levels which will initiate the use of personnel retreat or the need for elevated levels of protection. The SSO may decide to increase these frequencies based on instrument responses and site observations. The frequency at which monitoring is performed will not be reduced without the prior consent of the PHSO or HSM.

7.2 INSTRUMENT MAINTENANCE AND CALIBRATION

Hazard monitoring instruments will be maintained and pre-field calibrated by the TtNUS Equipment Manager. Operational checks and field calibration will be performed on all instruments each day prior to their use. Field calibration will be performed on instruments according to manufacturer's recommendations (for example, the PID must be field calibrated daily and an additional field calibration must be performed at the end of each day to determine any significant instrument drift). These operational checks and calibration efforts will be performed in a manner that complies with the employees health and safety training, the manufacturer's recommendations, and with the applicable manufacturer standard operating procedure (copies of which can be found in the Health & Safety Guidance Manual which will be maintained on site for reference). All calibration efforts must be documented. Figure 7-1 is provided for documenting these calibration efforts. This information may instead be recorded in a field operations logbook, provided that all of the information specified in Figure 7-1 is recorded. This required information includes the following:

- Date calibration was performed
- Individual calibrating the instrument
- Instrument name, model, and serial number
- Any relevant instrument settings and resultant readings (before and after) calibration
- Identification of the calibration standard (lot no., source concentration, supplier)
- Any relevant comments or remarks

FIGURE 7-1

DOCUMENTATION OF FIELD CALIBRATION

SITE NAME: _____ PROJECT NO.:_____

Date of Calibration	Instrument Name and Model	Instrument I.D. Number	Person Performing Calibration	Instrument Settings		Instrument Readings		Calibration Standard (Lot Number)	Remarks/ Comments
				Pre-Calibration	Post-Calibration	Pre-Calibration	Post-Calibration		

8.0 TRAINING/MEDICAL SURVEILLANCE REQUIREMENTS

8.1 INTRODUCTORY/REFRESHER/SUPERVISORY TRAINING

This section is included to specify health and safety training and medical surveillance requirements for TtNUS personnel participating in on site activities. All TtNUS personnel must complete 40 hours of introductory hazardous waste site training prior to performing work at the NAS Cecil Field. TtNUS personnel who have had introductory training more than 12 months prior to site work must have completed 8 hours of refresher training within the past 12 months before being cleared for site work. In addition, 8-hour supervisory training in accordance with 29 CFR 1910.120(e)(4) will be required for site supervisory personnel.

Documentation of TtNUS introductory, supervisory, and refresher training as well as site-specific training will be maintained at the site. Copies of certificates or other official documentation will be used to fulfill this requirement.

8.1.1 Requirements for Subcontractors

Identified TtNUS subcontractor personnel must have completed introductory hazardous waste site training or equivalent work experience as defined in OSHA Standard 29 CFR 1910.120(e) and 8 hours of refresher training meeting the requirements of 29 CFR 1910.120(e)(8) prior to performing field work at the NAS Cecil Field. TtNUS subcontractors must certify that each employee has had such training by sending TtNUS a letter, on company letterhead, containing the information in the example letter provided in Figure 8-1. This letter will be accompanied by training certificates or some other form of official documentation for all subcontractor personnel participating in site activities.

8.2 SITE-SPECIFIC TRAINING

TtNUS will provide site-specific training to all TtNUS personnel who will perform work on this project. Site-specific training will include:

- Names of designated personnel and alternates responsible for site safety and health
- Safety, health, and other hazards present on site
- Use of personal protective equipment

FIGURE 8-1

TRAINING LETTER

The following statements must be typed on company letterhead and signed by an officer of the company and accompanied by copies of personnel training certificates:

LOGO
XYZ CORPORATION
555 E. 5th Street
Nowheresville, Kansas 55555

Month, day, year

Mr. Mark Speranza
Task Order Manager
TtNUS, Inc.
Foster Plaza 7, 661 Andersen Drive
Pittsburgh, Pennsylvania 15220

Subject: HAZWOPER Training for Naval Air Station Cecil Field, Jacksonville, Florida

Dear Mr. Speranza:

As an officer of XYZ Corporation, I hereby state that I am aware of the potential hazardous nature of the subject project. I also understand that it is our responsibility to comply with all applicable occupational safety and health regulations, including those stipulated in Title 29 of the Code of Federal Regulations (CFR), Parts 1900 through 1910 and Part 126.

I also understand that Title 29 CFR 1910.120, entitled "Hazardous Waste Operations and Emergency Response," requires an appropriate level of training for certain employees engaged in hazardous waste operations. In this regard, I hereby state that the following employees have had 40 hours of introductory hazardous waste site training or equivalent work experience as requested by 29 CFR 1910.120(e) and have had 8 hours of refresher training as applicable and as required by 29 CFR 1910.120(e)(8) and that site supervisory personnel have had training in accordance with 29 CFR 1910.120(e)(4).

LIST FULL NAMES OF EMPLOYEES AND THEIR SOCIAL SECURITY NUMBERS HERE.

Should you have any questions, please contact me at (555) 555-5555.

Sincerely,

(Name and Title of Company Officer)

- Work practices to minimize risks from hazards
- Medical surveillance requirements
- Contents of the Health and Safety Plan
- Signs and symptoms of overexposure to site contaminants
- Contents of the Health and Safety Plan
- Emergency response procedures (evacuation and assembly points)
- Spill response procedures
- Review of the contents of relevant Material Safety Data Sheets
- Emergency response procedures (evacuation and assembly points)
- Associated hazards and restricted areas within the NAS Cecil Field.

Site-specific training documentation will be established through the use of Figure 8-2.

8.3 MEDICAL SURVEILLANCE

All TtNUS personnel participating in project field activities will have had a physical examination meeting the requirements of TtNUS's medical surveillance program. Documentation for medical clearances will be maintained in the TtNUS Pittsburgh office and made available, as necessary.

8.3.1 Medical Surveillance Requirements for Subcontractors

Identified subcontractors are required to obtain a certificate of their ability to perform hazardous waste site work and to wear respiratory protection. The "Subcontractor Medical Approval Form" provided in Figure 8-3 shall be used to satisfy this requirement, providing it is properly completed and signed by a licensed physician.

Subcontractors who have a company medical surveillance program meeting the requirements of paragraph (f) of OSHA 29 CFR 1910.120 can substitute "Subcontractor Medical Approval Form" with a letter, on company letterhead, containing all of the information in the example letter presented in Figure 8-4 of this HASP.

FIGURE 8-2

SITE-SPECIFIC TRAINING DOCUMENTATION

My signature below indicates that I am aware of the potential hazardous nature of performing remedial investigation activities at NAS Cecil Field, Jacksonville, Florida, and that I have received site-specific training which included the elements presented below:

- Names of designated personnel and alternates responsible for site safety and health
- Safety, health, and other hazards present on site
- Use of personal protective equipment
- Work practices to minimize risks from hazards
- Safe use of engineering controls and equipment
- Medical surveillance requirements
- Signs and symptoms of overexposure
- Contents of the Health and Safety Plan
- Emergency response procedures (evacuation and assembly points)
- Spill response procedures
- Review of contents of relevant Material Safety Data Sheets

I further state that I have been given the opportunity to ask questions and that all of my questions have been answered to my satisfaction.

I further state, by the presence of my signature below, that the date of my training (introductory, refresher, and supervisory, as applicable) and my medical surveillance requirements are accurate and correct to the best of my knowledge.

Name	40-Hour General Site Worker Training (Date)	8-Hour Refresher Training (Date)	8-Hour Supervisory Training (Date)	Date of Medical Surveillance	SIGNATURE

FIGURE 8-3
SUBCONTRACTOR MEDICAL APPROVAL FORM

For employees of _____
Company Name

Participant Name: _____ Date of Exam: _____

Part A

The above-named individual has:

1. Undergone a physical examination in accordance with OSHA Standard 29 CFR 1910.120, paragraph (f), and was found to be medically -

   ( ) qualified to perform work at the NAS Cecil Field work site
   ( ) not qualified to perform work at the NAS Cecil Field work site

   and,

2. Undergone a physical examination in accordance with OSHA 29 CFR 1910.134(b)(10) and was found to be medically -

   ( ) qualified to wear respiratory protection
   ( ) not qualified to wear respiratory protection

My evaluation has been based on the following information, as provided to me by the employer.

( ) A copy of OSHA Standard 29 CFR 1910.120 and appendices.
( ) A description of the employee's duties as they relate to the employee's exposures.
( ) A list of known/suspected contaminants and their concentrations (if known).
( ) A description of any personal protective equipment used or to be used.
( ) Information from previous medical examinations of the employee that is not readily available to the examining physician.

Part B

I, _____, have examined _____
Physician's Name (print) Participant's Name (print)

and have determined the following information:

FIGURE 8-3
SUBCONTRACTOR MEDICAL APPROVAL FORM
PAGE TWO

1. Results of the medical examination and tests (excluding finding or diagnoses unrelated to occupational exposure):

   _____
   _____
   _____

2. Any detected medical conditions which would place the employee at increased risk of material impairment of the employee's health:

   _____
   _____
   _____

3. Recommended limitations upon the employee's assigned work:

   _____
   _____
   _____

I have informed this participant of the results of this medical examination and any medical conditions which require further examination of treatment.

Based on the information provided to me, and in view of the activities and hazard potentials involved at the NAS Cecil Field work site, this participant

( ) may
( ) not

perform his/her assigned task.

Physician's Signature _____

Address _____

Phone Number _____

NOTE: Copies of test results are maintained and available at:

_____
Address

FIGURE 8-4

MEDICAL SURVEILLANCE LETTER

The following statements must be typed on company letterhead and signed by an officer of the company:

LOGO
XYZ CORPORATION
555 E. 5th Street
Nowheresville, Kansas 55555

Month, day, year

Mr. Mark Speranza
Task Order Manager
Tetra Tech NUS, Inc.
Foster Plaza 7, 661 Andersen Drive
Pittsburgh, Pennsylvania 15220

Subject: Medical Surveillance for NAS Cecil Field, Jacksonville, Florida

Dear Mr. Speranza:

As an officer of XYZ Corporation, I hereby state that the persons listed below participate in a medical surveillance program meeting the requirements contained in paragraph (f) of Title 29 of the Code of Federal Regulations (CFR), Part 1910.120, entitled "Hazardous Waste Operations and Emergency Response: Final Rule." I further state that the persons listed below have had physical examinations under this program within the past 12 months and that they have been cleared, by a licensed physician, to perform hazardous waste site work and to wear positive- and negative-pressure respiratory protection. I also state that, to my knowledge, no person listed below has any medical restriction that would preclude him/her from working at the NAS Cecil Field site.

LIST FULL NAMES OF EMPLOYEES AND THEIR SOCIAL SECURITY NUMBERS HERE.

Should you have any questions, please contact me at (555) 555-5555.

Sincerely,

(Name and Title of Company Officer)

8.3.2 Requirements for All Field Personnel

Each field team member, including subcontractors and visitors, entering the exclusion zone(s) shall be required to complete and submit a copy of the Medical Data Sheet found in Section 7 of the TtNUS Health and Safety Guidance Manual. This shall be provided to the SSO, prior to participating in site activities. The purpose of this document is to provide site personnel and emergency responders with additional information that may be necessary in order to administer medical attention.

8.4 SUBCONTRACTOR EXCEPTIONS

In situations in which the exclusion zone is not entered or when there is no potential for exposure to site contaminants, subcontractor personnel may be exempt from some of the training and medical surveillance requirements. All subcontractors and visiting personnel are required to receive site-specific training (as discussed in Section 8.2) regarding information provided in this HASP. Examples of subcontractors who may be exempt from training and medical surveillance requirements may include surveyors who perform surveying activities at the site perimeters or in areas were there is no potential for exposure to site contaminants, and in this case the subcontractor providing concrete coring services.

The use of the subcontractor exception is strictly limited to the authority of the CLEAN Health and Safety Manager.

9.0 SITE CONTROL

This section outlines the means by which TtNUS will delineate work zones and use these work zones in conjunction with decontamination procedures to prevent the spread of contaminants into previously unaffected areas of the site. It is anticipated that a fractured three-zone approach will be used during work at this site. This three zone approach will utilize an exclusion zone, a contamination reduction zone, and a support zone. It is also anticipated that this control measure will be used to control access to site work areas. Use of such controls will restrict the general public, minimize the potential for the spread of contaminants, and protect individuals who are not cleared to enter work areas.

9.1 EXCLUSION ZONE

The exclusion zone will be considered those areas of the site of known or suspected contamination. It is not anticipated that significant amounts of surface contamination are present in the proposed work areas of this site. It is anticipated that this will remain so unless contaminants are brought to the surface by intrusive activities, such as when conducting the soil boring and sampling as slated for this statement of work. Furthermore, once intrusive activities have been completed and surface contamination has been removed, the potential for exposure is again diminished and the area can then be reclassified as part of the contamination reduction zone. Therefore, the exclusion zones for this project will be limited to those areas of the site where active work is being performed plus a designated area surrounding the point of operation (see Table 5-1 for a list of specific operations). The exclusion zone for most site activities will be fragmented to represent the areas where the soils are disturbed through soil boring or sampling activities. All exclusion zones will be delineated using barrier tape, cones, and postings to inform and direct facility personnel.

9.1.1 Exclusion Zone Clearance

A pre-startup site visit will be conducted by members of the identified field team in an effort to identify proposed subsurface investigation locations, conduct utility clearances, and provide up-front notices concerning scheduled activities within the facility.

In all cases, no subsurface activities will proceed without utility clearance. In the event that a utility is struck during a subsurface investigative activity, the emergency numbers provided in Section 2.7, Table 2-1, will be notified.

When base personnel are working within the proximity of this investigation, they will be moved or their operation temporarily discontinued to remove them from potential hazards associated with this operation.

9.2 CONTAMINATION REDUCTION ZONE

The contamination reduction zone (CRZ) will be a buffer area between the exclusion zone and any area of the site where contamination is not suspected. This area will also serve as a focal point in supporting exclusion zone activities. This area will be delineated using barrier tape, cones, and postings to inform and direct facility personnel. Decontamination will be conducted at a central location. All equipment potentially contaminated will be bagged and taken to that location for decontamination. Given this consideration, equipment required to complete this operation may include hand augers and stainless steel bowls and spatulas for each location.

9.3 SUPPORT ZONE

The support zone for this project will include a staging area where site vehicles will be parked, equipment will be unloaded, and where food and drink containers will be maintained. In all cases, the support zones will be established at areas of the site where exposure to site contaminants would not be expected during normal working conditions or foreseeable emergencies.

9.4 SAFE WORK PERMITS

All exclusion zone activities conducted in support of this project will be done using this HASP as a reference guide and Safe Work Permits to incorporate site-specific information to guide and direct field crews on a task by task basis. An example of the Safe Work Permit to be used during site activities is illustrated in Figure 9-1. All permits will be issued by the SSO or his/her on site representative in the morning prior to the commencement of on site activities.

Safe Work Permits are to be completed in accordance with the specifications contained in Table 5-1, and the other sections of the HASP as appropriate.

All personnel identified on the permit as participating in the task will be made aware of its contents by the supervisor accepting the permit. Any problems which occurred throughout the task will be documented by the supervisor on the permit.

All permits will be returned to the FOL or the SSO at the end of the day.

FIGURE 9-1
SAFE WORK PERMIT

Permit No. _____ Date: _____ Time: From _____ to _____

SECTION I: General Job Scope (To be filled in by person performing work)

I. Work limited to the following (description, area, equipment used): _____

II. Names: _____

III. Onsite Inspection conducted ☐ Yes ☐ No Initials of Inspector _____ (TtNUS) _____ (NAS Cecil)

SECTION II: General Safety Requirements (To be filled in by permit issuer)

IV. Protective equipment required

Level D ☐ Level B ☐
Level C ☐ Level A ☐
Detailed on Reverse

Respiratory equipment required

Full face APR	☐	Escape Pack	☐
Half face APR	☐	SCBA	☐
SKA-PAC SAR	☐	Bottle Trailer	☐
Skid Rig	☐	None	☐

Modifications/Exceptions: _____

V. Chemicals of Concern | Action Level(s) | Response Measures

_____ _____ _____

VI. Additional Safety Equipment/Procedures

Hardhat	☐ Yes	☐ No	Hearing Protection (Plugs/Muffs)	☐ Yes	☐ No
Safety Glasses	☐ Yes	☐ No	Safety belt/harness	☐ Yes	☐ No
Chemical/splash goggles	☐ Yes	☐ No	Radio	☐ Yes	☐ No
Splash Shield	☐ Yes	☐ No	Barricades	☐ Yes	☐ No
Splash suits/coveralls	☐ Yes	☐ No	Gloves (Type)	☐ Yes	☐ No
Steel toe/shank Workboots	☐ Yes	☐ No	Work/rest regimen	☐ Yes	☐ No

Modifications/Exceptions: _____

VII. Procedure review with permit acceptors

	Yes	NA		Yes	NA
Safety shower/eyewash (Location & Use)	☐	☐	Emergency alarms	☐	☐
Procedure for safe job completion	☐	☐	Evacuation routes	☐	☐
Contractor tools/equipment inspected	☐	☐	Assembly points	☐	☐

VIII. Equipment Preparation

	Yes	NA
Equipment drained/depressured	☐	☐
Equipment purged/cleaned	☐	☐
Isolation checklist completed	☐	☐
Electrical lockout required/field switch tested	☐	☐
Blinds/misalignments/blocks & bleeds in place	☐	☐
Hazardous materials on walls/behind liners considered	☐	☐

IX. Additional Permits required (Hot work, confined space entry, excavation etc.) ☐ Yes ☐ No
If yes, fill out appropriate section(s) on safety work permit addendum

X. Special instructions, precautions: _____

Permit Issued by: _____ Permit Accepted by: _____
Job Completed by: _____ Date: _____

9.5 SITE VISITORS

Site visitors for the purpose of this document are identified as representing the following groups of individuals:

- Personnel invited to observe or participate in operations by TtNUS
- Regulatory personnel (i.e., DOD, EPA, OSHA)
- Southern Division Navy Personnel
- Other authorized visitors
- All non-DOD personnel working on this project are required to gain initial access to the base by coordinating with the TtNUS FOL or designee and following established base access procedures.

Once access to the base is obtained, all personnel who require site access into areas of ongoing operations will be required to obtain permission from the FOL and the Base Contact. Upon gaining access to the site, **all site visitors wishing to observe operations in progress will be escorted by a TtNUS representative** and shall be required to meet the minimum requirements discussed below:

All site visitors will be routed to the FOL, who will sign them into the field logbook. Information to be recorded in the logbook will include the individual's name (proper identification required), the entity which they represent, and the purpose of the visit.

All site visitors will be required to produce the necessary information supporting clearance to the site. This shall include information attesting to applicable training and medical surveillance as stipulated in Section 8.0 of this document. In addition, to enter the site operational zones during planned activities, all visitors will be required to first go through site-specific training covering the topics stipulated in Section 8.2 of this HASP.

Once the site visitors have completed the above items, they will be permitted to enter the operational zone. All visitors are required to observe the protective equipment and site restrictions in effect at the site at the time of their visit. All visitors entering the exclusion zones during ongoing operations will be accompanied by a TtNUS representative. Any and all visitors not meeting the requirements, as stipulated in this plan, for site clearance will not be permitted to enter the site operational zones during planned activities. Any incidence of unauthorized site visitation will cause the termination of all on site activities until the unauthorized visitor is removed from the premises. Removal of unauthorized visitors will be

accomplished with support from the Base Contact. If necessary, the Base Contact will be notified of any unauthorized visitors.

9.6 SITE SECURITY

Site security will be accomplished using TtNUS field personnel. TtNUS will retain complete control over active operational areas. As this activity takes place at a Navy facility open to public access, the first line of security will take place using exclusive zone barriers, site work permits, and any existing barriers at the sites to restrict the general public. The second line of security will take place at the work site referring interested parties to the Base Contact. The Base Contact will serve as a focal point for base personnel, interested parties, and serve as the final line of security and the primary enforcement contact.

9.7 SITE MAP

Once the areas of contamination, access routes, topography, and dispersion routes are determined, a site map will be generated and adjusted as site conditions change. These maps will be posted to illustrate up-to-date collection of contaminants and adjustment of zones and access points.

9.8 BUDDY SYSTEM

Personnel engaged in on site activities will practice the "buddy system" to ensure the safety of all personnel involved in this operation.

9.9 MATERIAL SAFETY DATA SHEET (MSDS) REQUIREMENTS

TtNUS and subcontractor personnel will provide MSDSs for all chemicals brought on site. The contents of these documents will be reviewed by the SSO with the user(s) of the chemical substances prior to any actual use or application of the substances on site. A chemical inventory of all chemicals used on site will be developed using the Health and Safety Guidance Manual. The MSDSs will then be maintained in a central location (i.e., temporary office) and will be available for anyone to review upon request.

9.10 COMMUNICATION

As personnel will be working in proximity to one another during field activities, a supported means of communication between field crews members will not be necessary.

External communication will be accomplished by using the telephones at predetermined and approved locations. External communication will primarily be used for the purpose of resource and emergency resource communications. Prior to the commencement of activities at the NAS Cecil Field, the FOL will determine and arrange for telephone communications.

10.0 SPILL CONTAINMENT PROGRAM

10.1 SCOPE AND APPLICATION

It is not anticipated that bulk hazardous materials (over 55-gallons) will be handles at any given time as part of this scope of work. It is also not anticipated that such spillage would constitute a danger to human health or the environment. However, as the job progresses, the potential may exist for accumulating Investigative Derived Wastes (IDW) such as decontamination fluids, soil cuttings, and purge and well development waters, in a central staging area. Once these fluids and other materials have been characterized, they can be removed from this area and properly disposed.

10.2 POTENTIAL SPILL AREAS

Potential spill areas will be periodically monitored in an ongoing attempt to prevent and control further potential contamination of the environment. Currently, limited areas are vulnerable to this hazard including:

- Resource deployment
- Waste transfer
- Central staging

It is anticipated that all IDW generated as a result of this scope of work will be containerized, labeled, and staged to await further analyses. The results of these analyses will determine the method of disposal.

10.3 LEAK AND SPILL DETECTION

To establish an early detection of potential spills or leaks, a periodic walk-around by the personnel staging or disposing of drums area will be conducted during working hours to visually determine that storage vessels are not leaking. If a leak is detected, the contents will be transferred, using a hand pump, into a new vessel. The leak will be collected and contained using absorbents such as Oil-Dry, vermiculite, or sand, which are stored at the vulnerable areas in a conspicuously marked drum. This used material, too, will be containerized for disposal pending analysis. All inspections will be documented in the project logbook.

10.4 PERSONNEL TRAINING AND SPILL PREVENTION

All personnel will be instructed in the procedures for incipient spill prevention, containment, and collection of hazardous materials in the site-specific training. The FOL and the SSO will serve as the Spill Response Coordinators for this operation, should the need arise.

10.5 SPILL PREVENTION AND CONTAINMENT EQUIPMENT

The following represents the minimum equipment that will be maintained at the staging areas at all times for the purpose of supporting this Spill Prevention/Containment Program.

- Sand, clean fill, vermiculite, or other non combustible absorbent (Oil-dry)
- Drums (55-gallon U.S. DOT 17-E or 17-H)
- Shovels, rakes, and brooms
- Container labels

10.6 SPILL CONTROL PLAN

his section describes the procedures the TtNUS field crew members will employ upon the detection of a spill or leak.

1. Notify the SSO or FOL immediately upon detection of a leak or spill. Activate emergency alerting procedures for that area to remove all non-essential personnel.
2. Employ the personal protective equipment stored at the staging area. Take immediate actions to stop the leak or spill by plugging or patching the container or raising the leak to the highest point in the vessel. Spread the absorbent material in the area of the spill, covering it completely.
3. Transfer the material to a new vessel; collect and containerize the absorbent material. Label the new container appropriately. Await analyses for treatment and disposal options.
4. Re-containerize spills, including 2-inch of top cover impacted by the spill. Await test results for treatment or disposal options.

It is not anticipated that a spill will occur that the field crew cannot handle. Should this occur, notification of the appropriate Emergency Response agencies will be carried out by the FOL or SSO in accordance with the procedures discussed in Section 2.0 of this HASP.

11.0 CONFINED-SPACE ENTRY

It is not anticipated, under the proposed scope of work, that confined space and permit-required confined space activities will be conducted. **Therefore, personnel under the provisions of this HASP are not allowed, under any circumstances, to enter confined spaces**. A confined space is defined as an area which has one or more of the following characteristics:

- Is large enough and so configured that an employee can bodily enter and perform assigned work.
- Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry).
- Is not designed for continuous employee occupancy.

A Permit-Required Confined Space is one that:

- Contains or has a potential to contain a hazardous atmosphere.
- Contains a material that has the potential to engulf an entrant.
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section.
- Contains any other recognized, serious, safety or health hazard.

For further information on confined space, consult the Health and Safety Guidance Manual or call the PHSO. If confined space operations are to be performed as part of the scope of work, detailed procedures and training requirements will have to be addressed.

12.0 MATERIALS AND DOCUMENTATION

The TtNUS Field Operations Leader (FOL) shall ensure the following materials/documents are taken to the project site and used when required.

- A complete copy of this HASP
- Health and Safety Guidance Manual
- Incident Reports
- Medical Data Sheets
- Material Safety Data Sheets for all chemicals brought on site, including decontamination solutions, fuels, sample preservatives, calibration gases, etc.
- Follow-up Reports (to be completed by the FOL)
- A full-size OSHA Job Safety and Health Poster (posted in the site trailer)
- Training/Medical Surveillance Documentation Form (Blank)
- First-Aid Supply Usage Form
- Emergency Reference Form (Section 2.0, extra copy for posting)
- Soil Boring Log Forms for logging the soil borings
- Directions to the Hospital

12.1 MATERIALS TO BE POSTED AT THE SITE

The following documentation is to be posted at the site for quick reference purposes. In situations where posting of these documents is not feasible (such as no office trailer), these documents should be separated and be immediately accessible to site personnel.

Chemical Inventory Listing - This list represents all chemicals brought on site, including decontamination solutions, sample preservatives, fuel, calibration gases, etc.. This list should be posted in a central area.

Material Safety Data Sheets (MSDSs) - The MSDSs should also be in a central area accessible to all site personnel. These documents should match all the listings on the chemical inventory list for all substances employed on site. It is acceptable to have these documents within a central folder and the chemical inventory as the table of contents.

The OSHA Job Safety & Health Protection Poster - This poster, as directed by 29 CFR 1903.2 (a)(1), should be conspicuously posted in places where notices to employees are normally posted. Each FOL shall ensure that this poster is not defaced, altered, or covered by other material.

Site Clearance Posting - This listing is found within the training section of the HASP (See Figure 8-1). This list identifies all site personnel, dates of training (including site-specific training), and medical surveillance. This lists indicates not only clearance but also status. If personnel do not meet these requirements, they do not enter the site while site personnel are engaged in activities.

Emergency Phone Numbers and Directions to the Hospital(s) - This list of numbers and the directions will be maintained at all phone communications points and in each site vehicle.

Medical Data Sheets/Cards - Medical Data Sheets will be filled out by all on site personnel and filed in a central location. The Medical Data Sheet will accompany any injury or illness requiring medical attention to the medical facility. A copy of this sheet or a wallet card will be given to all personnel to be carried on their person.

Hearing Conservation Standard (29 CFR 1910.95) - This standard will be posted anytime hearing protection or other noise abatement procedures are employed.

Personnel Monitoring - All results generated through personnel sampling (levels of airborne toxins, noise levels, etc.) will be posted to inform individuals of the results of that effort.

Placards and Labels - Where chemical inventories have been separated, because of quantities and incompatibilities, these areas will be conspicuously marked using Department of Transportation (DOT) placards and acceptable [Hazard Communication 29 CFR 1910.1200 (f)] labels.

13.0 ACRONYMS / ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
APR	Air Purifying Respirators
CFR	Code of Federal Regulations
CNS	Central Nervous System
CRZ	Contamination Reduction Zone
DOD	Department of Defense
DOT	Department of Transportation
EPA	Environmental Protection Agency
eV	electron Volts
FID	Flame Ionization Detector
FOL	Field Operations Leader
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	High Efficiency Particulate Air
N/A	Not Available
NIOSH	National Institute Occupational Safety and Health
OSHA	Occupational Safety and Health Administration (U.S. Department of Labor)
PEL	Permissible Exposure Limit
PHSO	Project Health and Safety Officer
PID	Photo Ionization Detector
PM	Project Manager
PPE	Personal Protective Equipment
PVC	Poly Vinyl Chloride
SAP	Sampling and Analysis Plan
SCBA	Self Contained Breathing Apparatus
SSO	Site Safety Officer
STEL	Short Term Exposure Limit
SVOCs	Semi-Volatile Organic Compounds
TOM	Task Order Manager
TPH	Total Petroleum Hydrocarbons
VOCs	Volatile Organic Compounds