NBN-00076 - 3.03 - 9/17/90

FINAL WORK PLAN, SAMPLING AND ANALYSIS PLAN, SITE-SPECIFIC HEALTH AND SAFETY PLAN

SITE-SPECIFIC ENVIRONMENTAL ASSESSMENT
Q AREA DRUM STORAGE
NORFOLK NAVAL BASE
Norfolk, Virginia

Prepared for:

ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
Norfolk, Virginia

Contract No. N62470-90-R-7661

Prepared by:

ENVIRONMENTAL SCIENCE AND ENGINEERING, INC. (ESE)
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ESE Project No. 4901107

17 September 1990

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1.0 WORK PLAN

1.1 INTRODUCTION

The objective of this site-specific environmental assessment is to perform a remedial investigation/feasibility study (RI/FS) and an environmental risk assessment at the Q Area Drum Storage Yard at the Norfolk Naval Base, Norfolk, Virginia (Figure 1-1). The risk assessment and RI/FS will build on data collected in the Initial Assessment Study (IAS) and Interim Report and will determine if the site is releasing hazardous substances, pollutants, or contaminants into the environment that may require a Removal Action. The final purpose of these investigations is to ascertain remedial actions that will be necessary to allow for construction of a cold storage warehouse or a parking lot at the site. The RI/FS will include identification and quantification of pollutant concentrations, and the extent of contamination in soil and groundwater samples. The environmental risk assessment of hazardous constituents (toxic metals, petroleum hydrocarbons, and organic solvents) in the soils to be excavated during construction will address the health risks to workers involved with excavation of the site, as well as to develop any additional exposure scenarios.

1.2 INVESTIGATION PROCEDURES

The investigation will include the efforts outlined in the following sections.

1.2.1 PRESITE ACTIVITIES

1. Development of Work Plan: Review existing records and discuss project with EIC. Prepare Draft Work Plan and forward copies to the EIC and the Navy Project Manager.
2. Development of a Sampling and Analysis Plan: Prepare a sampling and Analysis Plan, including field operations (sequence of field activities, functions of project personnel), sampling locations and

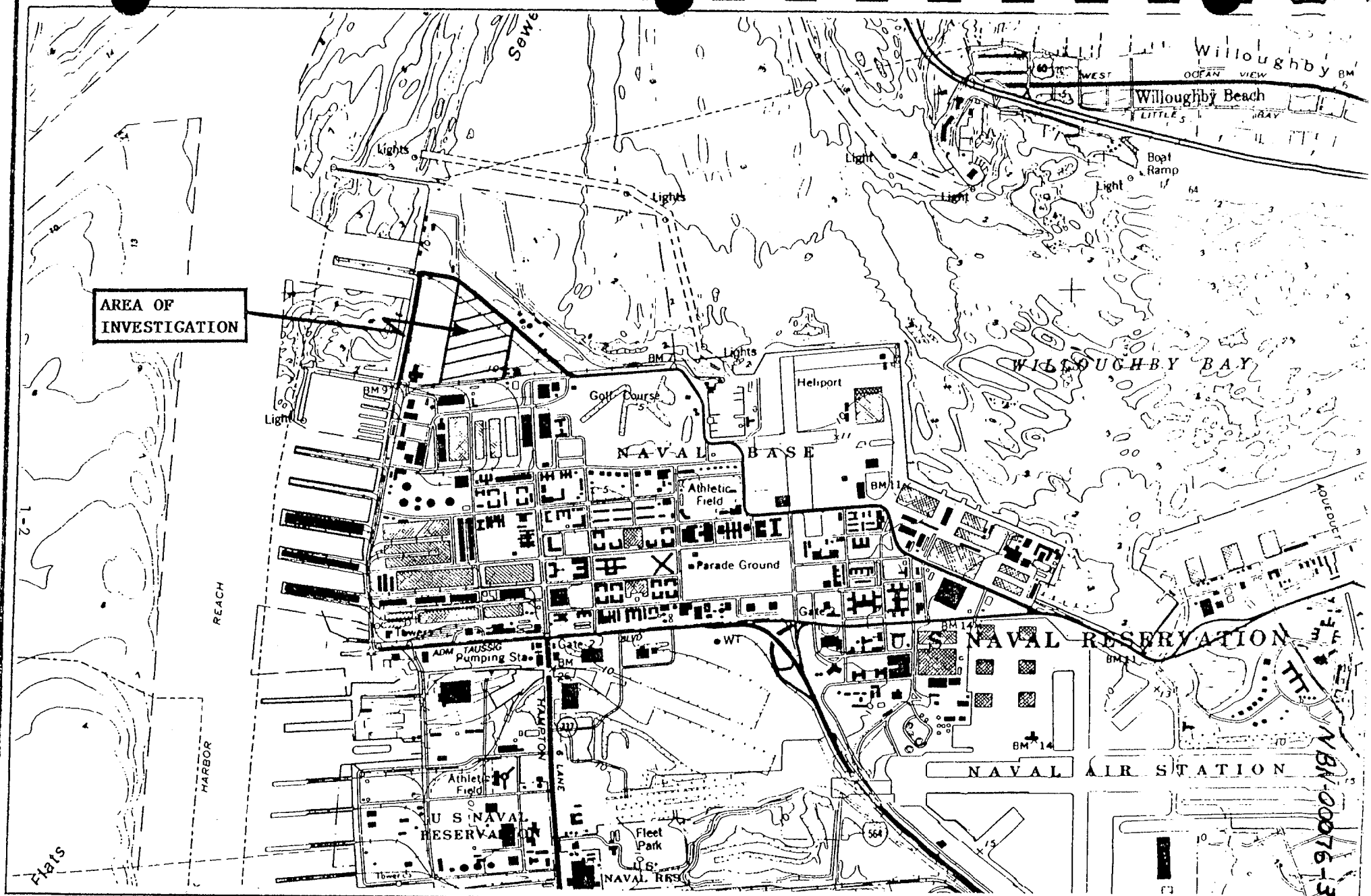

Figure 1-1. Site Location Map
Q Area Drum Storage Yard
Norfolk Naval Base
Norfolk, Virginia

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rationale, laboratory identification, analytical requirements and sample handling, and schedule. Copies of the Draft Sampling and Analysis Plan will be provided to the EIC and the Navy Project Manager.

3. Development of a Site-Specific Health and Safety Plan: Assess potential risks associated with field investigations and laboratory analyses, and coordinate with Navy personnel to establish a Site-Specific Health and Safety Plan. The plan will address activity-specific precautions and governs all aspects of the project, both in the field and in the laboratory, in order that all contractor and subcontractor personnel are adequately trained and protected at all times. Copies of the Draft Site-Specific Health and Safety Plan will be provided to the EIC and the Navy Project Manager.
4. Development of a Laboratory QA/QC Plan: Before field sampling begins, the laboratory must fulfill the requirements of the Navy's Quality Assurance Program (QAP). The Plan Laboratory QA/QC Plan must be in accordance with the requirements of NEESA 20.2-047B, Sampling and Chemical Analysis Quality Assurance Requirements, June 1988. These requirements include approval of a laboratory work plan, proficiency testing, submitting to a laboratory inspection, and approval of a laboratory QA/QC plan to Martin Marietta Energy Systems, Inc. (MMESI). Copies of the Draft Laboratory QA/QC Plan will be provided to MMESI and the EIC.
5. Develop a Site Environmental Risk Assessment: An exposure assessment will be conducted to determine the potential health effects to workers from exposure during facility construction. The Draft Environmental Risk Assessment will be submitted with the Draft RI/FS Report, following the onsite investigation, as outlined in Section 1.2.3.

1.2.2 ONSITE INVESTIGATION

1. Verification of Sampling Locations: Specific locations for the soil borings and monitoring wells will be established and verified by the EIC and ESE personnel.
2. Soil Borings/Sampling: Soil sampling and analyses will be conducted through 36 soil borings and two background sample borings within the outlined areas of the proposed construction site. Drilling will be performed using hollow-stem auger methods, and sampling will be conducted using split-spoon samplers. The sampling locations are shown in Figure 1-2. Composite samples will be taken in 24 of the borings between 0 and 18 inches and between 18 and 36 inches (one sample each interval). Most samples will be analyzed for volatile organics, TCLP metals, base/neutral extractable acids, total petroleum hydrocarbons (TPH), pH, total organic halogens (TOX) and percent moisture. Composite samples will be taken in the 12 remaining borings between 0 and 36 inches (one sample per boring); these will be analyzed for TCLP characteristics. All of the samples will be sent to CEIMIC's laboratory in Narragansett, Rhode Island.
3. Backfilling Boreholes: After soil sampling is complete at each of the 36 locations, the boreholes will be backfilled with cuttings.
4. Groundwater Monitoring well Installation: Ten monitoring wells will be installed (Figure 1-2) to determine the extent of contamination present in the groundwater. Four of those wells will be installed as nested well systems consisting of two distinct wells. Each nested well system will include one approximately 25 foot deep shallow well with a 10 foot screened interval. The top of the screen will be installed approximately 2 to 8 feet below the water

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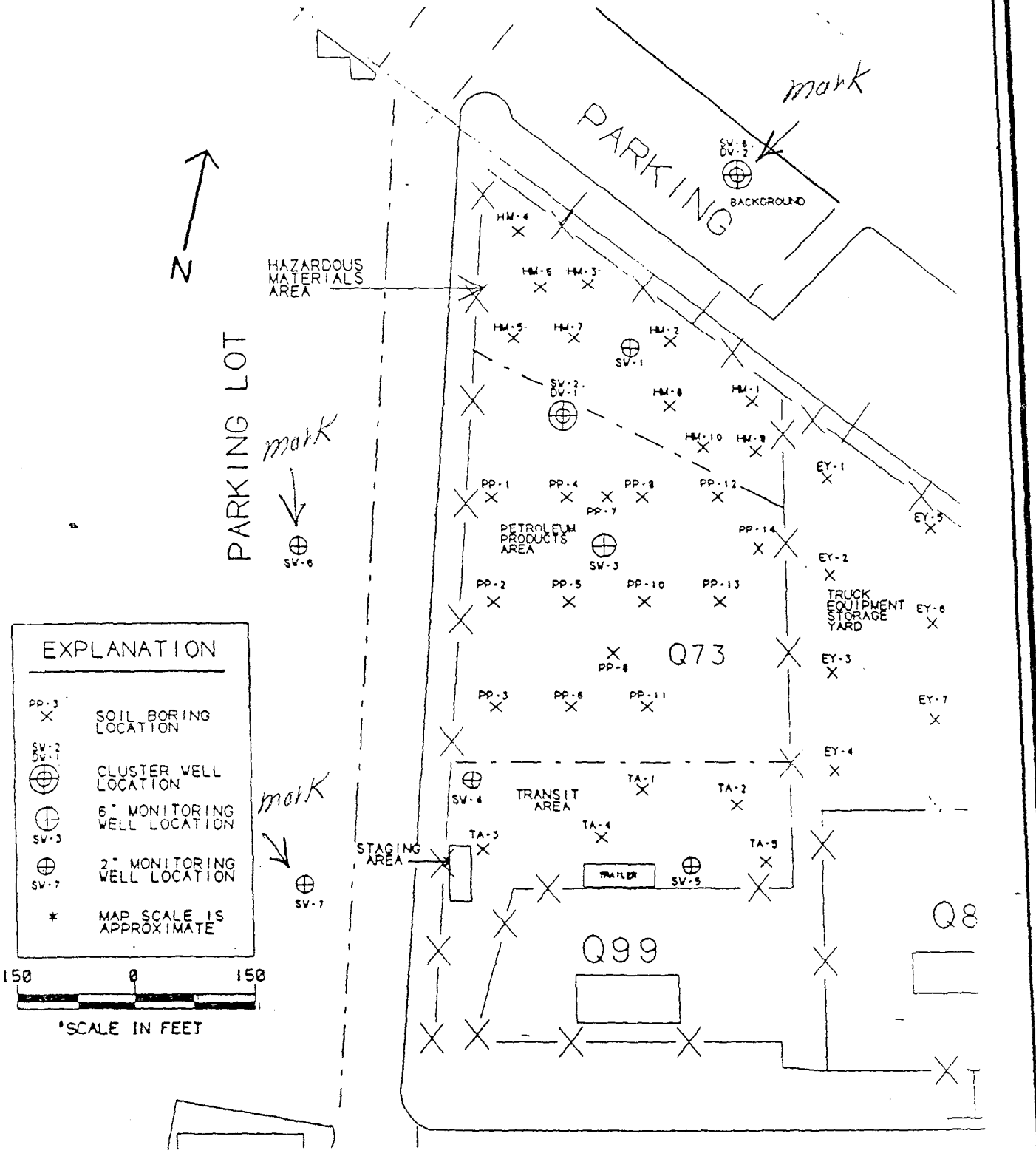

Figure 1-2
Soil Boring and Monitoring Well Locations, Q Area
Drum Storage Yard, Norfolk Naval Base, Norfolk, VA

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table. The second, deeper well in the system will be approximately 45 feet deep, and the top of the screen will be located ten feet below the shallower well's screen bottom. The remaining eight wells will be installed similarly to the shallow, 25-foot wells in the nested systems, including one well that will be drilled upgradient of the expected contamination. One of the shallow wells will be 6-inches inner diameter (ID), and the remaining seven wells will be 2-inch ID wells. One of the deep wells will be a 6-inch ID well; the other will be a 2-inch ID well. All shallow wells will be installed using the hollow stem auger method of drilling; the two deep wells will require mud rotary drilling.

5. Soil Sampling in Monitoring well Boreholes: Soil from six of the shallow wells will be sampled using split-spoon methods. One composite soil sample from each of six boreholes will be collected from 0 to 10 feet or to the water table, whichever is shallower, and sent to CEIMIC's laboratory in Narragansett, Rhode Island. Samples from two of the wells will be analyzed for volatile organics, TCLP metals, TPH, and percent moisture; the remaining three will be analyzed for TCLP characteristics.
6. Groundwater Monitoring well Sampling: Two groundwater samples will be collected from each of the eight shallow monitoring wells: one from the top of the water table and another from the bottom of the well. One sample will be collected from each of the two deep monitoring wells. All samples will be sent to CEIMIC's laboratory in Narragansett, Rhode Island for volatile organics and pH analysis. The shallow well samples will also be analyzed for TPH and priority pollutant metals.
7. Shallow Groundwater Pump Test: If the shallow groundwater wells are determined to be contaminated, an optional 72-hour pump test will be run. The pump test will be performed using the shallow 6 inch ID well and monitored with the other shallow 2 inch ID wells.

The transmissivity and other hydrogeologic characteristics will be determined as needed to evaluate the effects of dewatering during construction. The contaminant plume, hydraulic gradients, and groundwater profiles will also be determined.

Drilling and sampling equipment will be decontaminated between borings according to the decontamination procedures listed in Section 3.3.2.4 of the Safety/Contingency Plan. All sampling procedures are discussed in detail in the Sampling Plan. A complete list of the analytical parameters is shown in Section 2.4 of the Sampling Plan.

1.2.3 EVALUATION AND REPORTS

The results of the sampling and analysis will be evaluated for environmental risk and potential employee health risk during construction. ESE will evaluate all data generated and discuss qualitatively whether contamination has the potential to or is currently affecting the environment or human health. The results will be presented in a draft and final report, including:

- description of all sampling and chemical analytical methods used,
- presentation and evaluation of the analytical data,
- site maps with sampling locations,
- boring logs, and
- table of potential ARARs.

As part of the risk assessment for the RI/FS, the following will be provided:

- contaminant evaluation,
- development of exposure scenarios,
- toxicity assessment, and
- risk characterization.

If additional data must be collected to complete the risk assessment, a summary of the additional data required will be provided.

Three copies of the draft report will be submitted to the Navy EIC for review. Government comments and recommendations will be made via the EIC within 30 calendar days after receipt of the draft report. Five copies of the final report, incorporating the Government comments and recommendations, will be submitted to the EIC within 30 days after receipt of those comments.

1.2.4 PROJECT SCHEDULE

The project schedule for the environmental assessment at the Q Area Drum Storage Yard was developed to meet the needs of the Navy in preparation for construction of a cold storage warehouse and/or parking lot at the site. The proposed schedule, with 30-day laboratory turnaround on samples, is as follows:

Milestone	Days	Approximate Date
Contract Award	0	27 August 1990
Submit Work Plan, Sampling Plan, Health and Safety Plan	21	17 September 1990
Government Approval of Work Plan, Sampling Plan, Health and Safety Plan	28	24 September 1990
Initiate Sampling	28	24 September 1990
Submit Draft Report	85	20 November 1990
Receive Government Comments on Draft Report	115	20 December 1990
Submit Final Report	145	19 January 1991

Throughout the course of the project, the ESE Project Manager will routinely contact the EIC to report on project status, problems, and adjustments to the proposed schedule.

1.3 PERSONNEL REQUIREMENTS

1.3.1 ENVIRONMENTAL SCIENCE AND ENGINEERING, INC. (ESE)

ESE will be responsible for providing all personnel, subcontractors, materials, and equipment necessary to complete the study. Naval personnel will provide items listed in Section 1.4. Persons in responsible positions of the project staff have extensive experience and expertise in their area(s) of involvement, which include hydrogeologic investigations, contamination assessments, remedial engineering, and site safety for hazardous waste disposal sites. ESE's responsibilities include the development and adherence to an appropriate health and safety plan to protect contractor, subcontractor, and Naval personnel. Key ESE project personnel are listed below, along with pertinent identification information:

Name	Title	Medical Examination* (within the last year)	OSHA-Approved Safety Training
C.W. Bowers, CPG	Project Manager	Yes	Yes
N.C. Davis, CIH	Safety Manager	Yes	Yes
M.E. Skrobacz	Geologist/Site Safety Officer	Yes	Yes
G.A. Valenzuela	Field Technician	Yes	Yes
J.D. Shamis	Laboratory Coordinator/ Quality Assurance	Yes	Yes

*Verification of medical records is on file with: Human Resources Office, ESE, P.O. Box 1703, Gainesville, Florida 32602-1703, (904) 332-3318.

1.3.2 NAVAL PERSONNEL

A list of primary contacts at LANTNAVFACENGCOM involved in this project is as follows:

NAME	PROJECT FUNCTION	TELEPHONE
Daniel Boucher	Project Manager	(804) 444-9700
Ken Walker	Engineer-in-Charge	(804) 445-4385
Otto Naumann	Activity Point of Contact	(804) 444-7455

1.4 EQUIPMENT REQUIREMENTS

The equipment and resource requirements to complete this project are as follows:

ESE EQUIPMENT/RESOURCES

Sampling Equipment:

Towable Power Auger	Field Notebooks
Stainless Steel Bucket Auger	Stainless Steel Bowls
Duct Tape Trash Bags	
Waterproof Markers	Deionized/Distilled Water
Stainless Steel Spatulas/Spoons	Organic Vapor Meter
Sample Containers	Marking Tape
Topographic Map	Aluminum Foil
Stainless Steel Bailer	Pump (Develop & Purge)
Drums (Development Water)	Survey Equipment
Shipping Coolers	Measuring Tape
Detergent	Nitric Acid (10%)
Isopropanol	Spray Bottles

Safety Equipment:

Steel-toed Boots	Tyvek Suits
Decontamination Buckets/Brushes	Rubber Gloves
Respirator Cartridges	Respirators
Safety Glasses	Hard Hats

Equipment for Option:

Water/Tank Truck	Pump (Pump Test)
Datalogger	

NAVY EQUIPMENT/RESOURCES

Approved tap wash and rinsewater for decontamination	Utility maps and/or previously cleared/marked utility lines

1.5 CONTRACTUAL SERVICES

1.5.1 HARDIN-HUBER, INC. (HHI)

HHI, under subcontract to ESE, will provide all drilling, coring, split-spoon sampling, and monitoring well installation for the project. The project manager for HHI will be Don McClary at (301) 789-5020.

1.5.2 CEIMIC CORPORATION

CEIMIC Corporation, under subcontract to ESE, will provide all the analytical laboratory services for this project. The project coordinator for CEIMIC will be Bill Callanan at (404) 955-9663.

2.0 SAMPLING PLAN

This section details the field operations, sampling locations, rationale, laboratory identification, analytical requirements, and schedule necessary to complete the scope of work for the environmental risk assessment and remedial investigation (RI/FS) at the Q Area Drum Storage Yard, Norfolk, Virginia.

2.1 FIELD OPERATIONS

The following list details the sequence of activities that will be enacted to conduct soil borings, monitoring well installation, and collect composite soil samples and water samples at the locations shown on Figure 1-2.

1. ESE personnel will meet with Naval personnel to discuss the project safety requirements and to verify sample locations.

2. Each of the 36 proposed boring locations and the 10 monitoring well locations will be cleared before any boring commences. Prior to and during soil boring activities, the air and borehole at each location will be monitored for volatile organic vapors using an organic vapor meter (OVM). If OVM readings in the breathing zone are above background OVM readings, air-purifying respirators will be worn by the sampling team. The OVM will be zeroed and calibrated in an ambient environment each day prior to field use and at the end of each day. If any erratic readings are observed during daily use, the OVM will be recalibrated immediately.

3. At the 36 soil boring locations, composite soil samples will be taken as described in Table 2-1. Each boring will be backfilled with the auger cuttings. Soil samples will be collected using a

split-spoon sampler, classified, composited in stainless-steel containers, placed in prelabeled sample containers, and placed on ice in coolers. A total of three background samples will be collected from monitoring well borings SW-8 and DW-2. Five duplicate soil samples will also be collected from five random boreholes.

4. Ten groundwater monitoring wells will be installed at various depths and locations to determine the degree and extent of contamination present on and dissolved in the groundwater. Locations and rationale are described in Section 2.2. Eight shallow 25-foot wells will be augered by conventional hollow stem methods. The two deeper wells will be initially advanced using conventional hollow stem methods down to 25 feet, and completed with mud rotary methods to 45 feet.

5. Two sets of groundwater well clusters will be installed. Each cluster will contain two wells, one completed to a shallow depth of 25 feet and the second to 45 feet. The shallow well will be screened from 2 to 8 feet below the static groundwater level (10-foot screen interval) to the recommended well depth. The deeper well will be screened to approximately 45 feet; the top of the first screened interval will be located 10 feet below the bottom of the shallow well screened interval.

6. The drill cuttings from the monitoring well borings will be stored onsite in a DOT-approved 55 gallon storage drum.

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TABLE 2-1 SAMPLE MATRIX

Sample Number	Depth	Analyses
HAZARDOUS MATERIALS AREA:		
SOIL BORING SAMPLES		
HM-1	0 to 36"	TCLP
HM-2 #1	0 to 18"	VOAs, BNAs, TPH, TCLP (metals), pH
HM-2 #2	18 to 36"	VOAs, BNAs, TPH, pH
HM-3 #1	0 to 18"	VOAs, TPH, TCLP (metals)
HM-3 #2	18 to 36"	VOAs, TPH, TCLP (metals)
HM-4 #1	0 to 18"	VOAs, TPH, TCLP (metals)
HM-4 #2	18 to 36"	VOAs, TPH, TCLP (metals)
HM-5 #1	0 to 18"	VOAs, BNAs, TPH, TCLP (metals), pH
HM-5 #2	18 to 36"	VOAs, BNAs, TPH, pH
HM-6	0 to 36"	TCLP, TOX
HM-7 #1	0 to 18"	VOAs, TPH, TCLP (metals)
HM-7 #2	18 to 36"	VOAs, TPH, TCLP (metals)
HM-8	0 to 36"	TCLP, % moisture
HM-9 #1	0 to 18"	VOAs, BNAs, TPH, TCLP (metals), pH
HM-9 #2	18 to 36"	VOAs, BNAs, TPH, TCLP (metals), pH
HM-10 #1	0 to 18"	VOAs, TPH, TCLP (metals)
HM-10 #2	18 to 36"	VOAs, TPH
MONITORING WELL SAMPLES		
SW-1 Soil	0 to ~10'	TCLP
SW-1 #1 Water	~15'	VOAs, TPH, pH
SW-1 #2 Water	~25'	VOAs, TPH, pH, priority pollutant metals
SW-2 Soil	0 to ~10'	VOAs, TPH, TCLP (metals)
SW-2 #1 Water	~15'	VOAs, TPH, pH
SW-2 #2 Water	~25'	VOAs, TPH, pH, priority pollutant metals
DW-1 Water	~35'	VOAs, pH
PETROLEUM PRODUCTS AREA:		
SOIL BORING SAMPLES		
PP-1	0 to 36"	TCLP
PP-2 #1	0 to 18"	VOAs, TPH, TCLP (metals)
PP-2 #2	18 to 36"	VOAs, TPH, TCLP (metals)
PP-3 #1	0 to 18"	VOAs, BNAs, TPH, TCLP (metals), pH
PP-3 #2	18 to 36"	VOAs, BNAs, TPH, pH
PP-4	0 to 36"	TCLP, TOX
PP-5 #1	0 to 18"	VOAs, TPH, TCLP (metals)
PP-5 #2	18 to 36"	VOAs, TPH
PP-6 #1	0 to 18"	VOAs, BNAs, TPH, TCLP (metals), pH
PP-6 #2	18 to 36"	VOAs, BNAs, TPH, TCLP (metals), pH
PP-7	0 to 36"	TCLP
PP-8 #1	0 to 18"	VOAs, TPH, TCLP (metals)
PP-8 #2	18 to 36"	VOAs, TPH, TCLP (metals)
PP-9 #1	0 to 18"	VOAs, BNAs, TPH, TCLP (metals), pH
PP-9 #2	18 to 36"	VOAs, BNAs, TPH, pH
PP-10	0 to 36"	TCLP, TOX, % moisture
PP-11 #1	0 to 18"	VOAs, TPH, TCLP (metals)
PP-11 #2	18 to 36"	VOAs, TPH, TCLP (metals)
PP-12 #1	0 to 18"	VOAs, BNAs, TPH, TCLP (metals), pH
PP-12 #2	18 to 36"	VOAs, BNAs, TPH, TCLP (metals), pH
PP-13	0 to 36"	TCLP
PP-14 #1	0 to 18"	VOAs, TPH, TCLP (metals)
PP-14 #2	18 to 36"	VOAs, TPH, TCLP (metals)
MONITORING WELL SAMPLES		
SW-3 (6") Soil	0 to ~10'	VOAs, TPH, TCLP (metals)
SW-3 #1 Water	~15'	VOAs, TPH, pH
SW-3 #2 Water	~25'	VOAs, TPH, pH, priority pollutant metals
SW-4 Soil	0 to ~10'	TCLP
SW-4 #1 Water	~15'	VOAs, TPH, pH
SW-4 #2 Water	~25'	VOAs, TPH, pH, priority pollutant metals

TABLE 2-1 SAMPLE MATRIX (continued)

Sample Number	Depth	Analyses
TRANSIT AREA		
SOIL BORING SAMPLES		
TA-1 #1	0 to 18"	VOAs, BNAs, TPH, TCLP (metals), pH
TA-1 #2	18 to 36"	VOAs, BNAs, TPH, TCLP (metals), pH
TA-2	0 to 36"	TCLP
TA-3 #1	0 to 18"	VOAs, TPH, TCLP (metals)
TA-3 #2	18 to 36"	VOAs, TPH, TCLP (metals)
TA-4	0 to 36"	TCLP, TOX, % moisture
TA-5 #1	0 to 18"	VOAs, BNAs, TPH, TCLP (metals), pH
TA-5 #2	18 to 36"	VOAs, BNAs, TPH, TCLP (metals), pH
MONITORING WELL SAMPLES		
SW-5 Soil	0 to ~10'	TCLP
SW-5 #1 Water	~15'	VOAs, TPH, pH
SW-5 #2 water	~25'	VOAs, TPH, pH, priority pollutant metals
PARKING LOT:		
MONITORING WELL SAMPLES		
SW-6 #1 Water	~15'	VOAs, TPH, pH
SW-6 #2 Water	~25'	VOAs, TPH, pH
SW-7 #1 Water	~15'	VOAs, TPH, pH
SW-7 #2 Water	~25'	VOAs, TPH, pH
TRUCK/EQUIPMENT YARD:		
SOIL BORING SAMPLES		
EY-1	0 to 36"	TCLP, TOX
EY-2 #1	0 to 18"	VOAs, TPH, TCLP (metals)
EY-2 #2	18 to 36"	VOAs, TPH, TCLP (metals)
EY-3 #1	0 to 18"	VOAs, TPH, TCLP (metals)
EY-3 #2	18 to 36"	VOAs, TPH
EY-4 #1	0 to 18"	VOAs, TPH, TCLP (metals)
EY-4 #2	18 to 36"	VOAs, TPH, TCLP (metals)
EY-5 #1	0 to 18"	VOAs, TPH, TCLP (metals)
EY-5 #2	18 to 36"	VOAs, TPH, TCLP (metals)
EY-6	0 to 36"	TCLP, % moisture
EY-7 #1	0 to 18"	VOAs, TPH, TCLP (metals)
EY-7 #2	18 to 36"	VOAs, TPH, TCLP (metals)
BACKGROUND:		
SOIL SAMPLES		
BGSS-1 #1	0 to 18"	VOAs, TPH, TCLP (metals)
BGSS-1 #2	18 to 36"	VOAs, TPH, TCLP (metals)
BGSS-2 #1	0 to 36"	BNAs, pH, TOX, % moisture
MONITORING WELL SAMPLES		
BGSW-8 Water	~15 to ~25'	VOAs, TPH, pH, priority pollutant metals
BGDW-2 Water	~35'	VOAs, pH
DRILLING MUD:		
MUD SAMPLE	N/A	VOAs, BNAs, TPH, TCLP (metals), pH, TOX

7. Groundwater samples will be collected from each well at the proposed 10 monitoring well locations. Prior to sampling, all wells will be developed as discussed in Section 2.1.3.

8. Decontamination procedures will be followed as detailed in the Safety Plan, Section 3.0. A very thorough decontamination procedure will be used to decontaminate the sampling equipment to be used in the investigation. The decontamination procedure is as follows: 1) wash and scrub with detergent, 2) tap water rinse, 3) 10% nitric acid rinse (HNO_3), 4) deionized/distilled water rinse, 5) isopropyl alcohol rinse, and 6) air dry. Sampling equipment will be wrapped in aluminum foil, shiny side out, for transport. All potentially contaminated drilling equipment will be steam-cleaned with tap water between auger borings to prevent possible cross-contamination.

9. Chain of custody records will be maintained for all samples. The original will be placed in a waterproof container, sealed inside the cooler, and will accompany the samples to the laboratory. The laboratory will return the completed form documenting receipt of the undisturbed samples.

10. All field activities will be conducted during daylight hours.

11. If the groundwater is determined to be contaminated, an optional 72-hour pump test may be conducted onsite. The drawdown test will be performed with a 6-inch ID shallow monitoring well. During the test, an area of influence will be monitored in several nearby shallow monitoring wells.

2.1.1 SOIL SAMPLING

Soil samples of subsurface materials will be collected as described in Table 2-1. Split-spoon sampling procedures will be in accordance with ASTM method D-1586. Soil samples will be screened in the field using an organic vapor meter (OVM) to provide a preliminary indication of the vertical and horizontal existence/extent of volatile contamination.

With the exception of discrete volatile organic samples, the soil samples will be collected from the split-spoons and placed into stainless-steel containers for compositing before placement into prelabeled, clean glass jars. Five duplicate soil samples will be collected and analyzed for quality control purposes.

2.1.2 MONITORING WELL INSTALLATION

A drill rig mounted on a mobile unit will be used to perform all soil borings and monitoring well installations. Each rig will use necessary tools, supplies, and equipment supplied by the contractor to drill each location. Drilling crews will consist of an experienced driller and a driller's assistant for work on each rig. An experienced geologist in hazardous waste site investigations will be onsite to monitor the driller's efforts and for air monitoring/safety control. Additional contractor personnel may be needed to transport water to the rigs, decontaminate tools, and construct the concrete aprons/collars.

Eight monitoring wells will be constructed of 2-inch ID, flush joint, threaded PVC well screen, riser, and casing. The other two wells will be constructed of a 6-inch ID, flush joint, threaded PVC well screen, riser, and casing. Well heads will be constructed approximately 2 inches above ground surface to prevent surface water from entering. Figure 2-1 illustrates a typical monitoring well construction detail. A sand pack (#2 Morie sand or

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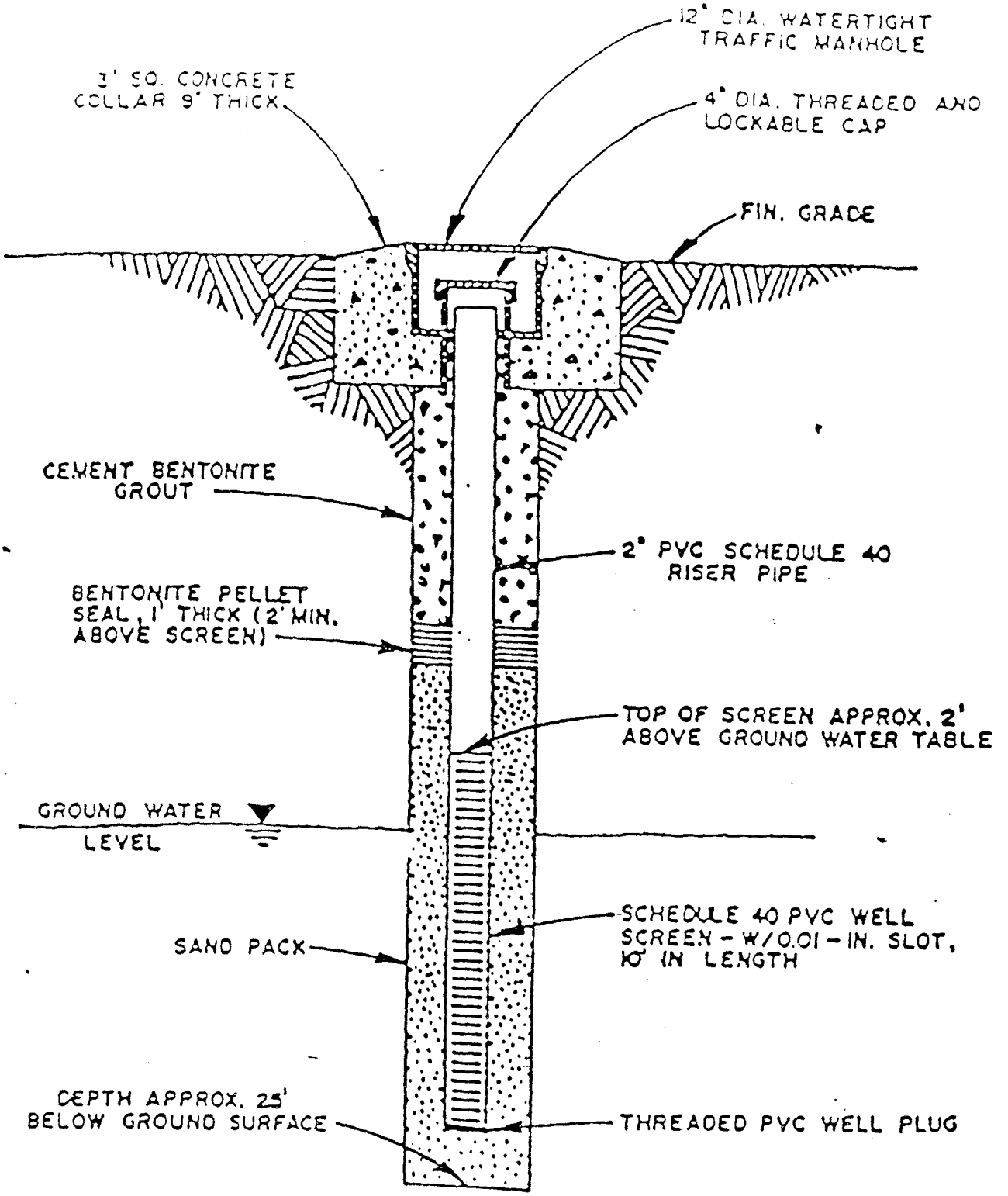

FIGURE 2-1

MONITORING WELL CONSTRUCTION DETAIL

ESE

A DIVISION OF

equivalent) will be placed around the slotted well screen and extend to 2 feet above the top of the screen. A 0.01 inch slotted PVC well screen will be used in each well. A bentonite seal (minimum thickness of 1 foot) will be placed on top of the sand pack using a tremie pipe. Finally, a grout mixture of two parts sand and one part cement, thoroughly mixed with the specified amount of potable water, will be placed in the borehole and rodded to ensure a proper seal. A two-inch diameter (or larger) threaded, lockable cap will be installed on the well casing top. A "flush" manhole type cover will be built into a concrete pad.

A 3-foot square, 9-inch thick concrete collar will be constructed around each well. This apron/collar will be constructed of 3000 psi ready-mixed concrete. The concrete will be crowned to provide and to meet the finished grade of surrounding pavement and the 12-inch watertight traffic manhole cover, as required. The concrete pads will be constructed within five days after all the wells are installed. Each manhole cover will be appropriately labeled with a number specific to each well. A sign reading "NOT FOR POTABLE USE OR DISPOSAL" will be firmly attached to each well.

Well permits required by state agencies are the responsibility of the drilling subcontractor.

All drilling will be conducted under the supervision of an ESE geologist. Water for drilling test borings and installing wells will be obtained from an uncontaminated, nonchlorinated source furnished by the Navy. When water quality has not been predetermined, a sample of the drilling water or mud must be taken for analysis prior to drilling to ensure freedom from contaminants of interest.

2.1.3 WELL DEVELOPMENT

All wells will be developed following installation to remove fine ground materials that may have entered during construction. This will be accomplished by removing the well volume three to five times by either bailing or continuous low yield pumping. Equipment used for well installation that may have come in contact with potentially contaminated materials will be decontaminated with a high pressure steam clean wash followed by a potable supply water rinse. All fluid generated from well development will be contained in DOT-approved 55-gallon drums, pending analysis. Contaminated fluids disposal is not within the scope of this project.

2.1.4 GROUNDWATER SAMPLING

The following procedures will be used to collect groundwater samples:

1. Groundwater samples will not be collected until at least five days have elapsed since the wells were developed (wells must be allowed to reach equilibrium).
2. Immediately prior to collecting a sample, the static water level below the top of the well PVC casing will be measured and recorded in the field notebook.
3. Whenever feasible, wells expected to be uncontaminated will be sampled first, followed by wells with increasing levels of contamination.
4. Prior to collecting a sample, the volume of water in the screen and well casing will be purged three to five times. If well yield is sufficient, additional well volumes may be removed until well temperature, specific conductance, and pH have stabilized. Wells that recharge extremely slowly will be purged dry, allowed to recharge, and purged again. If excessive time is required to purge three volumes, the client (and/or applicable regulatory agency)

will be notified, and it may be agreed to purge a lesser volume. The amount of fluid purged will be measured and recorded.

5. The standard ESE well sampling technique is by a dedicated, precleaned Teflon bailer or a precleaned stainless steal sampler.

6. All sampling equipment will be kept off contaminated soil to prevent cross contamination of the samples (e.g., equipment may be placed on disposable polyethylene plastic sheeting).

7. The bailer will be rinsed once with well water (first bail is discarded) prior to collecting a sample.

2.1.5 PUMP TEST PROCEDURES

If the groundwater is considered contaminated onsite, an optional 72-hour continuous pump test will be conducted. A Teel submersible pump, Model 3P689, will be lowered into the shallow (25 feet) 6-inch well onsite to withdraw and create a cone of depression within the studied area. A discharge line, connected to the pump, will withdraw the effluent during the testing period. The discharge line will be equipped with a valve gate and an accumulator meter to enable the flow rate and the amount of effluent discharged to be determined. To eliminate artificial recharge and in case of contaminated groundwater, the water will be contained onsite and discharged to the Navy water treatment plant.

A water table fluctuation of four surrounding wells, in addition to the 6-inch well, will be monitored with pressure transducer. Each transducer will be lowered approximately 10 feet below the initial water level. The individual probes will be connected to a data logger, Model DL-120, to record the drawdown/recharge rate.

2.1.6 RESPONSIBILITY AND ORGANIZATION

It is the responsibility of each member of the sampling team to observe all aspects of the Safety Plan. The sampling team members, organization, and specific functions during the sampling effort are provided in the following listing:

C. W. Bowers

- Field Team Leader (FTL)
- Collect samples from soil borings and monitoring wells

M. E. Skrobacz

- Site Safety Officer
- Maintain field notebook including field observations
- Assist in collecting soil and water samples
- Classify subsoils

G. A. Valenzuela

- Assist in collecting soil and water samples
- Develop monitoring wells for sampling
- Monitor air at the site during drilling
- Decontaminate sampling equipment

2.2 SAMPLING LOCATIONS AND RATIONALE

For the purpose of the RI/FS, the Q Area has been divided into four areas:

1. Hazardous Materials Area: contains hazardous materials such as toluene, methyl isobutylketone, 1,1,1-trichloroethane, and various solvents.
2. Petroleum Products Area: contains hydraulic fluid, engine oil lubricant, and other petroleum products.
3. Transit Area: contains various products at different times; used as a staging area for drums to be loaded and unloaded from ships.

4. Truck and Equipment Storage Yard: contains trucks and heavy motorized equipment. Outside of the Q Area Drum Storage Yard fence; however, the footprint of the proposed construction extends into the area.

Soil boring locations were chosen to randomly cover several typical scenarios found in the Q Area: obvious spill locations, apparently clean locations, areas proximate to the cement footings on which the drums are stored, locations in the middle of the rows of drums, and areas with little to no evidence of traffic. Figure 1-2 shows the proposed locations of the 36 soil borings and the 10 monitoring wells selected to determine the extent of contamination in the Q Area.

Borings HM-1 through HM-10 are located between the rows of drums in the hazardous materials area. Borings HM-1 and HM-9 are located in close proximity to damaged drums. Borings PP-1 through PP-14 are located between the rows of petroleum product drums. Borings TA-1 through TA-5 are randomly located in the transit area. Borings TA-3 and TA-5 are in topographically low areas. Borings EY-1 through EY-7 are located in the truck and equipment yard adjacent to the Q Area Drum Storage Yard, in the vicinity of the footprint of the proposed construction.

Monitoring well locations were chosen to detect potential groundwater contamination and contaminant migration offsite. According to the data collected previously in the IAS and Interim Report, the groundwater flow direction is to the southwest. Shallow monitoring wells SW-1, SW-2, and SW-6 were selected to monitor potential migration of contaminants from the hazardous materials area. Shallow monitoring wells SW-3, SW-4, and SW-7 were selected to monitor potential migration of contaminants from the petroleum products area. Shallow monitoring well SW-5 is located in the transit area in

a topographically low position so that any runoff percolating through the soil might be detected. Shallow monitoring well SW-8 is located in a parking lot offsite and was selected for background samples of both soil and groundwater.

Deep monitoring well DW-1 was selected as a worst case scenario for deep groundwater contamination; it is located in the central portion of the hazardous materials area. Deep monitoring well DW-2 is part of a well cluster with SW-8; it was selected for background samples of deep groundwater.

The proposed sampling locations may be adjusted during field operations. Background sample locations may also be adjusted during site activities to better ensure that a "true" background location is found.

2.3 LABORATORY IDENTIFICATION

The CEIMIC Corporation laboratory will provide the analytical services for this sampling effort. CEIMIC's mailing and shipping address is:

CEIMIC Corporation
100 Dean Knauss Drive
South Ferry Industrial Park
Narragansett, RI 02882
(401) 982-8900
Telecopy: (401) 782-8905

Bill Callahan (Beeper)
(800) 443-7243
Access Code: 055017

2.4 ANALYTICAL REQUIREMENTS

The number of samples and required QA/AC samples are listed in Table 2-2. The number of samples, required analyses, and analytical methods are outlined in Table 2-3.

2.4.1 TYPE, NUMBER, AND VOLUME OF SAMPLE

The type, number, and volume of samples that will be collected during the site investigation at the Q Area Drum Storage Yard are listed in Tables 2-2 and 2-3. Each water sample will be approximately one (1) liter (L) in volume. The soil sample volumes will be approximately 16 ounces per composite sample. The samples will be numbered sequentially according to the sample type:

Soil boring composites: HM-1 through HM-10
PP-1 through PP-14
TA-1 through TA-5
EY-1 through EY-7

Monitoring well samples (water and soil): SW-1 through SW-10
DW-1 and DW-2

The field blanks, equipment blanks, and field duplicates will be designated and numbered sequentially. A site map showing the final location of each sample will be provided in the Draft RI/FS Report.

2.4.2 SAMPLE HANDLING, CONTAINERS, PRESERVATION, AND HOLDING TIMES

The Field Team Leader is responsible for the proper sampling, labeling, preservation, and shipment of samples to the laboratory to meet required holding times. Table 2-3 lists all holding times, preservations, and containers. All soil and water samples will be shipped under ice, and stored at 4 degrees Celsius (°C). There is no holding time for the soil samples until the extraction methods are performed. After the extraction is completed, there is a 28-day holding time for mercury analysis and 180 days for all other metals.

TABLE 2-2. QA/QC SAMPLES, ACCORDING TO NEESA LEVEL C PROTOCOL.

	ANALYSIS	# SAMPLES	BACK-GROUND	FIELD DUPES (10%)	EQPT BLANKS (1/DAY)	MS AND MSD (20% EA.)\	TRIP BLANKS (1/COOLER)	FIELD BLANKS (1/EVENT)	SOIL TOTALS	WATER TOTALS
1. 36 SOIL BORINGS										
1A. 12 BORINGS, 1 SAMPLE/BORING	FULL TCLP	12	1	1	2	0	2	1	14	5 ****
1B. 24 BORINGS, 2 SAMPLES/BORING	VOAS	48	2	5	4	6	4	1	55	15
	TCLP (metals)	41	2	4	4	6	0	1	47	11
	% MOISTURE	4	1	0	0	0	0	0	5	0
	TPH	48	2	5	4	6	0	1	55	11
	BNAS	18	2	2	2	2	0	1	22	5
	pH	18	2	0	0	0	0	0	20	0
	TOX	5	1	1	1	2	0	1	7	4
2. WELLS - SOIL										
2A. 3 SOIL SAMPLES	FULL TCLP	3	0 *	0 *	0 *	0 *	0 *	0 *	3	0
2B. 2 SOIL SAMPLES	VOAS	2	0 *	0 *	0 *	0 *	0 *	0 *	2	0
	TPH	2	0 *	0 *	0 *	0 *	0 *	0 *	2	0
	TCLP (metals)	2	0 *	0 *	0 *	0 *	0 *	0 *	2	0
	% MOISTURE	0	0 *	0 *	0 *	0 *	0 *	0 *	0	0
3. WELLS - WATER										
3A. SHALLOW WELLS, 2 SAMPLES/WELL	VOAS	14	2	2	2	2	2	0 *	0	24
	TPH	14	2	2	2	2	0	0 *	0	22
	pH	14	2	0	0	0	0	0 *	0	16
	P.P. METALS	5	1 **	1	1	2	0	0 *	0	10
3B. DEEP WELLS, 1 SAMPLE PER WELL	VOAS	1	1	0 ***	0 ***	0 ***	0 ***	0 *	0	2
	pH	1	1	0 ***	0 ***	0 ***	0 ***	0 *	0	2
4. DRILLING MUD	VOAS	1	0	0 *	0 *	0 *	0 *	0 *	1	0
	BNAS	1	0	0 *	0 *	0 *	0 *	0 *	1	0
	TPH	1	0	0 *	0 *	0 *	0 *	0 *	1	0
	P.P METALS	1	0	0 *	0 *	0 *	0 *	0 *	1	0
	% MOISTURE	0	0	0 *	0 *	0 *	0 *	0 *	0	0
	pH	1	0	0 *	0 *	0 *	0 *	0 *	1	0
	TOX	1	0	0 *	0 *	0 *	0 *	0 *	1	0

* BACKGROUND AND/OR QA/QC SAMPLES INCLUDED UNDER ITEM #1

** BACKGROUND SAMPLE TO BE TAKEN AT 25'

*** QA/QC SAMPLES INCLUDED UNDER ITEM #3A

**** 3 FULL TCLP, 2 TCLP VOAS ONLY (TRIP BLANKS FOR VOAS ONLY)

NOTE: EQUIPMENT BLANKS, MATRIX SPIKE, MATRIX SPIKE DUPES, TRIP BLANKS, AND FIELD BLANKS FOR SOIL SAMPLES ARE ACTUALLY WATER SAMPLES

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Table 2-3

Sample and Analysis Parameters

Parameter (Method)	No. of Samples (includes QA/QC)	*Volume/ Container	Preservation (degrees Celsius)	Holding Time (To Extraction)
Soils				
Full TCLP (EPA 1311)	17	500ml/glass	n/a	7 days
VOA (EPA 8240)	17	500ml/glass	n/a	14 days
Metals (EPA 6010 /7000's)	17	500ml/glass	n/a	28 days
BNA (EPA 8270)	17	500ml/glass	n/a	7 days
Pest./Herb (EPA 8080/8150)	17	500ml/glass	n/a	7 days
VOA (EPA 8240)	58	100ml/glass	4	14 days
TCLP Metals (EPA 6010)	49	100ml/glass	4	28 days
TPH (EPA 9071 & 9073)	58	100ml/glass	4 ,H2SO4**	28 days
BNA (EPA 8270)	23	100ml/glass	4	14 days
PH (EPA 9040)	21	100ml/glass	4	24 hours
% Moisture (EPA 160.3)	5	100ml/glass	4	28 days
TOX (EPA 9020)	8	60ml/glass	4	7 days
Prior. Pollut. Metals (EPA 6010/7000 series)	1	500ml/glass	4	6 months
Water				
Full TCLP (EPA 1311)	5	1L/glass	4	7 days
VOA (EPA 8240)	5	3x40ml/glass	4 ,HCL**	14 days
Metals (EPA 6010 /7000's)	5	1L/glass	4 ,HNO3**	28 days
BNA (EPA 8270)	5	1L/glass	4	7 days
Pest./Herb (EPA 8080/8150)	5	2x1L/glass	4	7 days
VOA (EPA 8240)	39	3x60ml/glass	4 ,HCL**	14 days
TPH (EPA 418.1)	33	1L/glass	4 ,H2SO4**	28 days
PH (EPA 150.1)	18	1L/glass	4	24 hours
TCLP Metals (EPA 6010)	11	1L/glass	4 ,HNO3**	7 days
Prior. Pollut. Metals (EPA 200 series)	10	1L/glass	4	6 months
BNA (EPA 8270)	5	1L/glass	4	7 days
TOX (EPA 9020)	4	2x250ml/glass	4 ,H2SO4**	7 days

* All glass containers have Teflon-Lined Lid
** pH less than 2
n/a Not Applicable

2.5 SAMPLING SCHEDULE

The field effort will commence when the Work Plan, Sampling Plan, Safety/Contingency Plan, and Laboratory QA/QC Plan are reviewed and accepted by the EIC, and authorization is given by the Navy Project Manager. The startup date for sampling activities is currently scheduled to begin 24 September 1990. Milestone dates are included in Section 1.2.4, pending plan approval. The soil augering, monitoring well installation, and all sampling activities will take approximately three weeks to complete. All samples will be shipped overnight to the laboratory at the end of the field effort day; the analyses should be completed in approximately 30 days.

3.0 SITE SAFETY PLAN

3.1 RESPONSIBILITY AND ORGANIZATION

The purpose of the Site Safety/Contingency Plan is to protect all personnel and the surrounding environment during the RI/FS activities at the Q Area Drum Storage Yard and to satisfy Occupational Safety and Health Administration (OSHA) requirements. The plan, which follows the Safety and Health Guidelines for the Navy Assessment and Control of Installation Pollutants (NACIP) Confirmation Studies (February 1986), includes procedures and preventive measures that will protect human health and the environment from any possible hazardous waste exposure and from fire, explosion, and mechanical hazards which may exist during field and laboratory activities.

The corporate safety policy of ESE also requires that a Site Safety/Contingency Plan be implemented at the Q Area Drum Storage Yard to protect all individuals and the environment. An OSHA-approved (29 CFR Part 1910). 40-hour Hazardous Materials and Site Investigation Course is given by a Certified Industrial Hygienist (CIH) to all ESE employees who work in hazardous environments. An 8-hour refresher course is also given annually to those same employees. It is the responsibility of each member of the investigative team, including all subcontractor personnel, to conform to and comply with all aspects of this safety program. All personnel must regard and conduct themselves as members of the "safety team" and adhere to the prescribed Site Safety/Contingency Plan. The senior ESE person onsite is responsible for enforcing strict adherence to the plan.

The "buddy system" is a key element of this plan and requires that all activities at the site be conducted using a minimum of 2-person teams. Overall responsibility for safety during the site investigation and laboratory

activities rests with the Project Manager, C.W. Bowers. Her responsibilities include:

1. Ensuring that adequate and appropriate safety training and equipment are available for project personnel;
2. Arranging for medical examinations for specified project personnel; and
3. Designating a Site Safety Officer.

The responsibilities of the Safety Manager, N.C. Davis, include:

1. Preparing an effective Site Safety Plan for the project, that satisfies OSHA requirements;
2. Categorizing and identifying the project staff as to the levels of potential exposure to dangerous levels of hazardous materials;

The responsibilities of the Site Safety Officer, M. Skrobacz, include:

1. Implementing all safety procedures and operations onsite;
2. Updating equipment or procedures based upon new information gathered during site inspections and monitoring;
3. Upgrading and downgrading (with approval of the Project Manager) the levels of personnel protection based onsite observations;
4. Determining and posting locations and routes to medical facilities, including poison control centers, and arranging emergency transportation to medical facilities (as required);
5. Notifying (as required) local public emergency officers (i.e., police and fire departments) of the nature of the team's operations, and making emergency telephone numbers available to all team members;
6. Observing work party members for symptoms of exposure or stress; and

7. Arranging for the availability of emergency medical care and first aid onsite, as necessary.

The Site Safety Officer has the ultimate responsibility to stop any operation that threatens the health and safety of the team or surrounding populace or causes significant adverse impact to the environment.

It is the responsibility of all other onsite personnel to:

1. Comply with all aspects of the Site Safety Plan, including strict adherence to the "buddy system";
2. Obey the orders of the Site Safety Officer (or his designee); and
3. Notify the Site Safety Officer of hazardous or potentially hazardous incidents or working situations.

3.2 GENERAL SAFETY RULES

3.2.1 ONSITE SAFETY

In addition to the specific requirements of the Site Safety Plan, common sense should prevail at all times. The following general safety rules will be in effect at the site.

1. Each sample must be treated as though it were toxic and hazardous;
2. Unauthorized personnel are not permitted at the work sites or within 50 feet of any equipment operation, and Base Security will be asked to remove violators upon failure to heed a verbal request to vacate the site;
3. To reduce contact between the hands and mouth, all smoking, eating, and drinking will be strictly prohibited in the work area; -
4. Smoking is also prohibited because of the proximity of flammable material and fuels and a potential for explosion and fire;

5. Persons with beards or other facial hair that interferes with respirator fit are not permitted within the site boundaries when conditions require respiratory protection;
6. Persons with long hair and/or loose-fitting clothing which could become entangled in drilling equipment are not permitted in the work area;
7. All personnel should avoid unnecessary contact with contaminated soil and water;
8. All personnel should avoid any hand to mouth contact until they are thoroughly decontaminated;
9. Horseplay is prohibited;
10. Use of alcohol, narcotics, or controlled substances while working is prohibited;
11. Firearms, ammunition, fireworks, and explosives are prohibited; and
12. Approved and appropriate safety equipment, as specified in the Site Safety Plan, such as eye protection, hardhats, foot protection, and respirators, must be worn in areas where required by the Site Safety Plan. In addition, eye protection must be worn when handling acidic, caustic, or other hazardous liquids, such as analytical preservatives.

The Site Safety Officer will have the authority to modify the Site Safety Rules when necessitated by onsite conditions.

3.2.2 LABORATORY SAFETY

Certain samples, collected from the site and shipped to the CEIMIC laboratory for analysis, may present a potential for exposure of laboratory personnel to dangerous levels of metals, petroleum hydrocarbons, or organic solvents. Potentially hazardous samples will be identified as such by the Field Team Leader and appropriately labeled prior to shipment to the laboratory. It is

important that the laboratory implement an effective Site Safety Plan for handling these materials.

Handling procedures must protect personnel from skin contact with the hazardous materials and offer respiratory protection from airborne concentrations of hazardous samples. At a minimum, all laboratory personnel having direct contact with the hazardous samples must be equipped with:

1. Safety glasses or a face shield to protect from splashes;
2. Impervious gloves; and
3. Rubberized aprons and other chemical protective garments.

Respiratory protection in the form of organic vapor cartridge respirators may be required by the Laboratory Safety Manager if exposure to hazardous vapors is likely. All operations conducted with the raw hazardous waste samples will be performed in an adequate fume hood. Once the samples have been extracted or processed such that they are present in sealed bottles and vials, respiratory protection may be discontinued; however, the following safety precautions should continue to be observed:

1. Use of safety glasses; and
2. Use of Latex and/or rubber gloves.

All appropriate safety precautions described in the ESE Laboratory Safety Manual must be followed during laboratory work.

3.3 SITE SAFETY/CONTINGENCY PLAN

The Site Safety/Contingency Plan outlines procedures to be used during investigations at uncontrolled hazardous waste sites to minimize the risk of injury or illness resulting from onsite activities. The specific health and safety concerns in this plan deal with the following:

- Explosion and fire hazards, and
- Potential exposure to toxic chemical dust and vapors.

3.3.1 EXPLOSION AND FIRE HAZARD

Potentially flammable materials are actively used or stored at this site. All attempts will be made to minimize spark production or use of exposed flames. The following procedures will be used:

- Smoking is prohibited, including the staging area; and
- Open flames will only be used with prior approval of Site Safety Officer.

3.3.2 TOXIC CHEMICAL PROTECTION

Toxic chemical protection procedures are presented in the following major sections:

1. Personal Protective Clothing and Equipment,
2. Medical Monitoring,
3. Staging Area and Decontamination Corridors,
4. Decontamination Procedures, and
5. Investigation-Derived Material Disposal.

3.3.2.1 Personal Protective Clothing and Equipment

Personnel must wear protective equipment when response activities involve known or suspected atmospheric contamination; when vapors, gases, or particulates may be generated; or when direct contact with skin-affecting substances may occur. Respirators can protect lungs, gastrointestinal tract, and eyes against air toxicants. Chemical-resistant clothing can protect the skin from contact with skin-destructive and absorbable chemicals. Good personal hygiene limits or prevents ingestion of material and spread of contamination.

Equipment to protect the body against contact with known or anticipated chemical hazards has been divided into four categories according to the degree of protection afforded:

Level A: Worn when the highest level of respirator, skin, and eye protection is needed.

Level B: Selected when the highest level of respiratory protection, but a lesser level of skin protection, is needed.

Level C: Selected when the types of airborne substances are known, the concentrations are known, the concentrations measured, and the criteria for using air-purifying respirators are met.

Level D: Not to be worn on any site with respiratory or eye hazards. Is primarily a work uniform providing minimal skin protection.

The level of protection selected should be based primarily on:

1. Types and measured concentrations of chemical substances in the ambient atmosphere and their toxicity.
2. Potential or measured exposure to substances in air, splashes of liquids, or other direct contact with material due to work being performed.

In situations where the types of chemicals, their concentrations, and possibilities of contact are not known, the appropriate level of protection must be selected based on professional experience and judgment until the hazards can be better characterized.

The specifications of protective clothing and equipment associated with each level of protection are identified as follows:

Level A Protection

1. Personal Protective Equipment:
   a. Pressure-demand, self-contained breathing apparatus approved by the Mine Safety and Health Administration (MSHA) and National Institute of Occupational Safety and Health (NIOSH)
   b. Fully encapsulating chemical-resistant suit
   c. Coveralls*
   d. Long cotton underwear*
   e. Gloves (outer), chemical resistant
   f. Gloves (inner), chemical-resistant
   g. Boots, chemical-resistant, steel toe and shank (depending on suit construction, worn over or under suit boot)
   h. Hardhat* (under suit)
   i. Disposable protective suit, gloves, and boots* (worn over fully encapsulating suit)
   j. 2-way radio communications

   *Optional

2. Criteria for Selection: Meeting any of these criteria warrants use of Level A protection:
   a. The chemical substances have been identified and require the highest level of protection for skin, eyes, and the respiratory system based on:
      (1) Measured (or potential for) high concentrations of atmospheric vapors, gases, or particulates; or
      (2) Site operations and work functions involving high potential for splash immersion or exposure to unexpected vapors, gases, or particulates.

b. Extremely hazardous substances (for example: dioxin, cyanide compounds, concentrated pesticides, Department of Transportation (DOT) Poison "A" materials, suspected carcinogens, and infectious substances) are known or suspected to be present, and skin contact is possible.

c. The potential exists for contact with substances that destroy skin.

d. Operations conducted in confined and poorly ventilated until the absence of hazards requiring Level A protection is demonstrated.

e. Total atmospheric readings on the Century OVA System, HNU Photoionizer, and similar instruments indicate 500 to 1,000 ppm of unidentified substances.

Level B Protection

1. Personal Protective Equipment:

   a. Pressure-demand, self-contained breathing apparatus, (MSHA/NIOSH-approved)

   b. Chemical-resistant clothing (overalls and long-sleeved jacket; coveralls; hooded, 1- or 2-piece chemical-splash suit; disposable chemical-resistant coveralls)

   c. Coveralls*

   d. Gloves (outer), chemical-resistant

   e. Gloves (inner), chemical resistant

   f. Boots (outer), chemical-resistant, steel toe and shank

   g. Boots (outer), chemical-resistant (disposable*)

   h. Hardhat (face shield*)

   i. 2-way radio communications

   *Optional

2. Criteria for Selection: Meeting any of these criteria warrants use of Level B protection:
   a. The types and atmospheric concentrations of toxic substances have been identified and require the highest level of respiratory protection, but a lower level of skin and eye protection. Exposure to the following atmospheres would be included:
      (1) Concentrations considered immediately dangerous to life and health (IDLH)
      (2) Exceeding limits for protection by a full-face, air-purifying mask
      (3) Areas where substances for which air-purifying canisters do not exist or have low removal efficiency
      (4) Areas where substances require air-supplied equipment, but substances and/or concentrations do not represent a serious skin hazard
   b. The atmosphere contains less than 19.5 percent oxygen.
   c. Site operations make it highly unlikely that the small, unprotected areas of the head or neck will be contacted by splashes of extremely hazardous substances.
   d. Total atmospheric concentrations of unidentified vapors or gases range from 5 to 500 ppm on instruments such as the Century OVA or HNU Photoionizer, and vapors are not suspected of containing high levels of chemicals toxic to skin.

Level C Protection

1. Personal Protective Equipment:
   a. Full-face, air-purifying, canister-equipped respirator (MSHA/NIOSH-approved)

b. Chemical-resistant (coveralls, hooded, 2-piece chemical splash suit; chemical resistant hood and apron; disposable chemical-resistant coveralls)
c. Coveralls*
d. Gloves (outer), chemical-resistant
e. Gloves (inner), chemical resistant*
f. Boots (outer), chemical-resistant, steel toe and shank*
g. Boots (inner), chemical-resistant (disposable*)
h. Hardhat (face shield*)
i. 2-way radio communications

*Optional

2. Criteria for Selection: Meeting all of these criteria permits use of Level C protection:
   a. Measured air concentrations of identified substances will be reached by the respirator at or below the substance's exposure limit, and the concentration is within the service limit of the canister.
   b. Atmospheric contaminant concentrations do not exceed IDLH levels.
   c. Atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect the small area of skin left unprotected by chemical-resistant clothing.
   d. Job functions have been determined not to require self-contained breathing apparatus.
   e. Total vapor readings register between background and 5 ppm above background and instruments such as the HNU Photoionizer and Century OVA.
   f. Air will be monitored periodically.

Level D Protection

1. Personal Protective Equipment:
   a. Coveralls
   b. Gloves*
   c. Boots/shoes, leather or outer, chemical-resistant, steel toe and shank
   d. Safety glasses or chemical splash goggles*
   e. Hardhat (face shield*)
   f. Escape mask*

   *Optional

2. Criteria for Selection: Meeting any of these criteria allows use of Level D protection:
   a. No hazardous air pollutants have been measured.
   b. Work functions preclude splashes, immersion, or potential for unexpected inhalation of any chemicals.

3. Guidance on Selection Criteria: Level D protection is primarily a work uniform. It can be worn in areas where:
   a. Only boots can be contaminated, or
   b. There are no inhalable toxic substances.

Based on the characterization of the site, personnel involved with soil and core sampling during the investigation will wear modified Level D protection, with provisions to upgrade to Level C, which will include:

- Uncoated Tyvek coveralls (based on site history).
- Hardhat
- Safety glasses or face shield
- Boots, chemical resistant, steel toe and shank or neoprene boots with steel toe

- Disposable gloves, and
- Respirators (full-face, with organic vapor/dust cartridges)*
  *Not regularly worn but available for use if air monitoring readings are above background.

Air monitoring will be conducted during soil sampling operations to assess the need for upgrading personal protection. A modification of the criteria described previously for each level for protection will be used in decision-making regarding the appropriate level of personal protection. The ESE Site Safety Officer will be responsible for air monitoring and assessment of the need for upgrading the level of personal protection. Air monitoring will be performed at each soil sampling location using an OVM, with a 10.2-electron volt (eV) lamp. Full-face, air-purifying respirators with dust and organic vapor cartridges will be available and will be used if air monitoring instruments show readings above background levels. Attempts should be made to periodically monitor within boreholes to determine ambient conditions within the hole.

3.3.2.2 Medical Monitoring

All onsite ESE personnel for this project will be required to have the medical examination outlined below. All site visitors and subcontractors will be required to participate in an equivalent medical surveillance program, which will include monitoring for site contaminants prior to entering the exclusion zone. This examination is given annually and more often if specified by the attending physician. All medical examinations include certification by the physician of the employee's ability to wear a negative-pressure respirator and to perform strenuous work. If a person sustains an injury or contracts an illness related to work onsite that results in lost work time, he must obtain written approval from a physician to regain access to the site. The ESE Medical Monitoring Program includes the following tests:

Medical Examination - Monitoring Program

Basic physical exam

Heart status and functions (EKG)

Chest X-ray (Roentgenogram posterior-anterior)

Pulmonary function - forced vital capacity, forced expiratory volume at 1 second and reserve volume

Blood - full SMAC Series

- Hemoglobin - cell counts, protein levels
- Acetylcholinesterase activity
- Heavy metals
- PCB in serum

Liver function - full enzyme profile

Renal function - BUN, Creatinine, Creatine/Creatinine ratio, lipoprotein count and differential, uric acid

Urinalysis

Audiometry - audio spectrum response of ear

Eye - physical condition, visual acuity

3.3.2.3 Staging Area and Decontamination Corridor

Field personnel will enter the site from a designated staging area, shown in Figure 1-2. There will be a separate personnel and equipment decontamination area, which will be marked onsite. These areas will be designated during the first day of onsite activities.

3.3.2.4 Decontamination Procedures

A very thorough decontamination procedure will be used to decontaminate the hand augers, corers, split-spoons, and any sampling equipment to be used in the investigation. The decontamination procedure is as follows: 1) wash and scrub with detergent, (such as Liquinox) 2) tap water rinse, 3) 10% nitric acid rinse, 4) deionized/distilled water rinse, 5) double pesticide-grade

isopropanol rinse, and 6) air dry. Sampling equipment should be wrapped in aluminum foil, shiny side out, for transport. Any potentially contaminated equipment will also be decontaminated between borings to prevent possible cross-contamination. Waste rinse water will not need to be contained. Personal decontamination procedures will consist of washing and rinsing gloves at each sampling area. The personnel decontamination corridor will consist of the following area:

- Boot rinse;
- Glove rinse;
- Protective clothing and respirator (if any) removal; and
- Glove removal.

Decontamination procedures will be followed prior to going to staging area.

3.3.2.5 Investigation-Derived Material Disposal

Potentially contaminated disposable clothing must be labeled and stored onsite in a large plastic bag or a 55-gallon cardboard or metal drum. Disposition of this contaminated material and any decontamination wastewater will be the responsibility of the U.S. Navy.

3.3.5 EMERGENCY COMMUNICATION

If any of the following emergency situations occur, the following information is provided on outside services:

Emergency	Response	Telephone No.
Fire or Explosion	Navy Fire Department	(804) 444-3333
Serious Injury	Navy Ambulance	(804) 444-3333
Security Problem	Navy Police	(804) 444-3333

In addition, the following emergency contacts are available to lend information and support:

1. Kenneth Walker, Navy EIC, (804) 445-4385
2. Daniel Boucher, Navy Project Manager, (804) 444-9700
3. Bill Conner, Navy Supply Center Environmental Coordinator (804) 444-5446
4. Neil Davis, ESE (Industrial Hygiene Manager), (703) 876-1600

All field team members should acquaint themselves with the location of the nearest telephone prior to initiation of work. This will help minimize response time in the event of an emergency.