Remedial Action Verification Field Sampling and Analysis Plan

for

Sites 1 and 2, Phase I Naval Weapons Industrial Reserve Plant (NWIRP)

Bethpage, New York

Northern Division

Naval Facilities Engineering Command

Contract Number N62472-90-D-1298

Contract Task Order 0212

December 1995

C F BRAUN ENGINEERING CORPORATION

DRAFT POST-REMOVAL ACTION VERIFICATION
FIELD SAMPLING AND ANALYSIS PLAN
CONTRACT TASK ORDER 0212
NWIRP-BETHPAGE, SITES 1 AND 2
RESPONSE TO COMMENTS

Department of the Navy, Naval Facilities Engineering Command, Remedial Technical Manager

Comment 1

Comment:
Why is the author of this report C.F. Braun Engineering Corporation? It is the Navy's understanding that the C.F. Braun name is used for engineering documentation. A Sampling and Analysis Plan is not an engineering document. Also, Appendix A of the report (page 3 of 8) indicates that "B&R Env." will be performing sampling. What work is being completed by Brown & Root Environmental and what is the role of C.F. Braun?

Response:
C F Braun is a division of Brown & Root Environmental authorized and registered to perform work in New York State. The work is performed under C.F. Braun, however Brown & Root employees (also identified as C F Braun personnel) are used to perform work on the project. It has become company policy to use C F Braun for all new work conducted in New York. No change in text is anticipated based on this comment.

Comment 2

Comment:
This report and other reports from CF Braun contains extraneous "boiler plate" information that was taken verbatim from previous reports. In fact, the useful information in this particular report could be reduced to a two page letter. As a minimum, most of sections 2 and 3 and sections 4 through 12 are not needed and should be deleted.

Response:
A standard format which follows EPA Guidance for field sampling and analysis plans, including QA/QC requirements, are used in order to produce a document which can "stand alone" in the field. Although this information can be obtained from other documents submitted it proves useful in many cases to repeat information which is pertinent to the task being performed. No change in document format is anticipated based on this comment.

Comment 3

Comment:
The report is titled "Post Removal Action Sampling and Analysis Plan". This is not a removal action, it is a final remedial action.

Response:
Report has been retitled to read "Remedial Action Verification Field Sampling and Analysis Plan" based on this comment.

Comment 4

__Comment:__
Is the RAC going to backfill before the results of the confirmatory samples are known? Keep in mind that HNUS is proposing a 7 day turnaround for laboratory results.

__Response:__
Verification sampling will occur as the remedial action is performed. The results of the verification sampling will be obtained while the RAC is still on-site, therefore the RAC will not backfill prior to obtaining the results of the confirmatory sampling.

Comment 5

__Comment:__
The report states, in several places, that "if any sample has concentrations above the established action levels, then additional excavation will be performed". Is this really true? 60 PCB samples are proposed - what if only a single sample is slightly above the action level? What if only 2 or 3 are above action levels? The report should not make such a definitive statement with respect to remobilization of the RAC. If the results of the sampling effort show concentrations above the action levels, a decision will need to be made. That decision will be made by the Navy, in consultation with regulators.

__Response:__
Results of the confirmation samples will be obtained while the RAC is still mobilized, therefore remobilization for a confirmation sample above the action level would not be required. Additionally, the RAC intends to utilize PCB test kits to ensure all contamination is removed prior to C F Braun performing verification sampling which would minimize the chances of a verification sample having results greater than the action levels. All results will be provided to the Navy who will direct the RAC to conduct additional excavation. C F Braun will not direct the RAC. Text will be modified as necessary.

Comment 6

__Comment:__
Provide a rationale for estimating 60 as the number of samples needed to confirm this action. Also on Page 2-2 elaborate on the method that will be used to determine the final number of samples (based on pre excavation sampling).

__Response:__
This section has been revised. A grid has been developed which samples the corners, side walls, and bottom of the excavation as shown in Figures 2-1 and 2-2 of the FSAP. This grid layout will be adjusted to fit the final excavated area as determined in the field. Pre-excavation samples collected by the Remedial Action Contractor (RAC) which identify a significant hot spot (i.e., >500 ppm) will be resampled after excavation. In addition, areas which are determined in the field to have a potential of PCB contamination, after remediation (i.e., staining) will be sampled at the discretion of the field engineer.

Comment 7

Comment:
Page 1-3, Section 1.3 - It is stated that "the FSAP is designed to assure that the precision, accuracy, representativeness, comparability, and completeness of the data are known, documented and adequate to satisfy project data quality objectives". Please define what is meant by "adequate" in this case.

Response:
The QA/QC procedures for this project are standard for conducting verification sampling and therefore will satisfy the data quality objectives.

Comment 8

Comment:
Page 2-1, Section 2.1 - Why is C F Braun mobilizing to the site *before* the removal action?

Response:
This statement was made to imply that C F Braun will be on site throughout the excavation not after excavation was complete. This sentence has been changed to "C F Braun will mobilize to the site at the same time as the RAC."

Comment 9

Comment:
Page 2-1, Section 2.2 - This section states that a false positive occurs when samples indicate that the area is free of contaminants when it really is not. This is the description of a false negative.

Response:
Section 2.2 has been revised and this section no longer exists.

109515/P

REMEDIAL ACTION
VERIFICATION FIELD SAMPLING AND ANALYSIS PLAN
FOR
SITES 1 AND 2, PHASE I
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT (NWIRP)
BETHPAGE, NEW YORK

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Northern Division
Environmental Branch Code 18
Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop #82
Lester, Pennsylvania 19087-1710

Submitted by:
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CONTRACT NUMBER N62472-90-D-1298
CONTRACT TASK ORDER 0212

DECEMBER 1995

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1.0 PROJECT DESCRIPTION

1.1 INTRODUCTION

C F Braun Engineering Corporation (C F Braun) has prepared this Remedial Action Verification Field Sampling and Analysis Plan (FSAP) as part of the Remedial Design, Phase I, for Sites 1 and 2 at the Naval Weapons Industrial Reserve Plant (NWIRP), located in Bethpage, New York. This FSAP was prepared under the Comprehensive Long-term Environmental Action Navy (CLEAN) Contract No. N62472-90-D-1298, Contract Task Order (CTO) 0212. This FSAP specifies requirements and details the specific procedures for field work to be conducted to support post-remediation activities.

The Bethpage NWIRP which was established in 1933 is located on Long Island, Nassau County, New York. Since its inception, the primary mission at the facility has been the research, prototyping, testing, design engineering, fabrication, and primary assembly of military aircraft. The NWIRP is a Government-Owned Contractor Operated (GOCO) facility operated by Northrup-Grumman Corporation. Field activities will be conducted in the eastern portion of the NWIRP in the areas identified as Sites 1 and 2 as shown on Figure 1-1.

A Remedial Design to address elevated levels of PCBs and arsenic in soils located within the NWIRP was prepared by C F Braun (C F Braun, May 1995). The Remedial Action Contractor (RAC), Foster Wheeler Environmental Corporation, will implement the design in accordance with their Work Plan for Remedial Action (Foster Wheeler, October 1995). The objective of this FSAP is to provide guidelines to conduct sampling and analysis in order to verify that the soil containing concentrations of PCB or Arsenic above the established action levels are excavated in accordance with the Remedial Design.

1.2 SAMPLING STRATEGY

The work described in this Sampling and Analysis Plan is designed to obtain sufficient data to confirm that soil with concentrations of PCBs above the established action levels of 10 mg/kg have been removed. The data will be used to identify that no further remedial action is required and/or identify the areas which require additional remediation.

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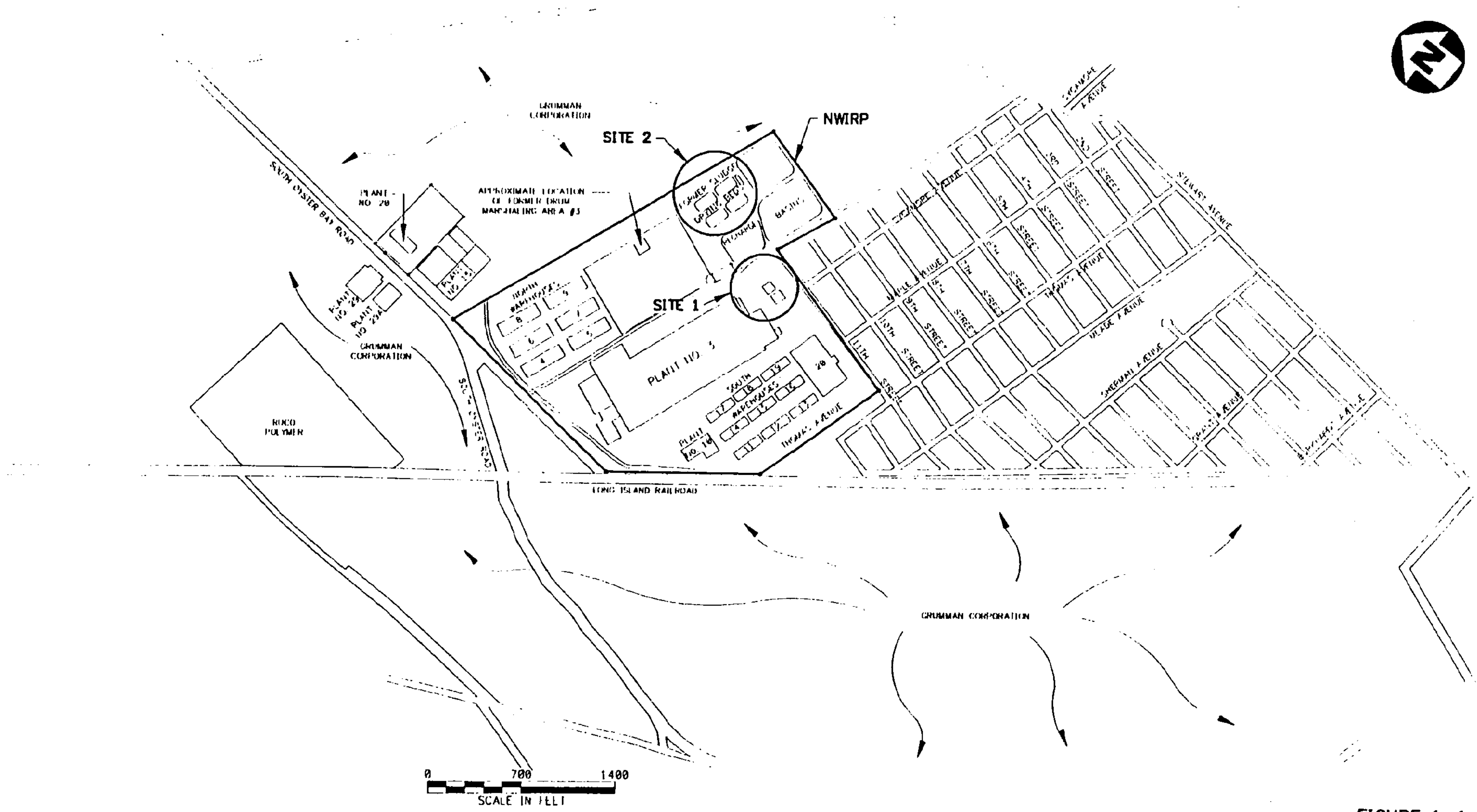

FIGURE 1-1

C.F. BRAUN

SITE LAYOUT MAP
NWIRP, BETHPAGE, NEW YORK

If it is determined by the Navy, based on the analytical results, that additional soil removal is required, then additional excavation will be performed and another sampling event will be performed to confirm that the soil action levels have been achieved.

1.3 QUALITY ASSURANCE OVERVIEW

C F Braun has established Quality Assurance/Quality Control (QA/QC) measures and a program to ensure that these measures are applied to the collection and interpretation of environmental quality data at the NWIRP facility. The FSAP is designed to assure that the precision, accuracy, representativeness, comparability, and completeness (the PARCC parameters) of the data are known, documented, and satisfies the project data quality objectives.

This FSAP presents the policies, organization, objectives, data-collection activities, and QA/QC activities that will be utilized to ensure that all data collected are representative of existing conditions. Chemical testing will be conducted by a laboratory subcontractor. QA/QC procedures for the chemical analysis will conform to or exceed the requirements of the NYSDEC Analytical Services Protocols (ASP) and will satisfy Naval Energy and Environmental Support Activity (NEESA) requirements for Level D.

1.4 PLAN FORMAT

Section 1.0 of this verification FSAP contains an introduction which identifies the location and authorization of the work to be conducted. It also contains the sampling strategy and a quality assurance overview. Section 2.0 describes the field operations and environmental sampling procedures that will be used to implement the field work. Section 3.0 contains the Quality Assurance/Quality Control information. The project organization and responsibility is provided in Section 4.0. Section 5.0 through Section 14.0 provide additional guidance to conduct the work. Additional support information is also included in the appendices.

2.0 FIELD OPERATIONS

Field sampling operations to be performed at the NWIRP as part of this Remedial Action Verification Field Sampling and Analysis Plan (FSAP) will consist of collecting soil samples to verify the removal of impacted soils above the established action levels of 10 ppm for PCBs.

2.1 MOBILIZATION/DEMOBILIZATION

C F Braun will mobilize to the site when the RAC mobilizes. All C F Braun field personnel on site will review this FSAP.

The C F Braun Field Engineer will coordinate the field activities with the RAC upon arrival at NWIRP. The Field Engineer will also obtain equipment and make any equipment purchases required to conduct the field activities. It is anticipated that the equipment required for the field activities will be obtained from the Halliburton NUS warehouse in Pittsburgh and delivered to the site. After field activities are completed, the Field Engineer will demobilize the equipment and ship the equipment back to the warehouse.

2.2 REMOVAL VERIFICATION SOIL SAMPLING

A grid has been established which samples the corners, sidewalls, and bottom of the excavated area in order to verify the Remedial Action has been successful. Figures 2-1 and 2-2 show the proposed grid in the areas that are anticipated to require remediation. This grid will be adjusted as required to match the actual excavated area as determined in the field when the RAC has completed the remediation. The RAC will use field kits to conduct real-time analysis of PCBs to determine the limits of remediation. (Additional detail provided in RAC Remediation Plan). Verification samples will also be collected in the sample locations identified as significant hot spots (i.e., > 500 ppm PCB) by the RAC's pre-excavation sampling. The field personnel will also collect samples at any area which appears to be a potential area of PCB contamination (i.e., stained soil) if such areas exist. An estimate of the number of samples to be collected and the analytical program proposed is provided in Table 2-1.

These samples shall be surface samples which constitute a representative sample of the soils in the areas identified. The soil will be placed in glass jars and submitted to the laboratory and analyzed for PCBs on a 7-day turnaround basis. If any sample has concentrations above the established action levels, then additional excavation will be performed as directed by the Navy. The extent of the additional excavation will

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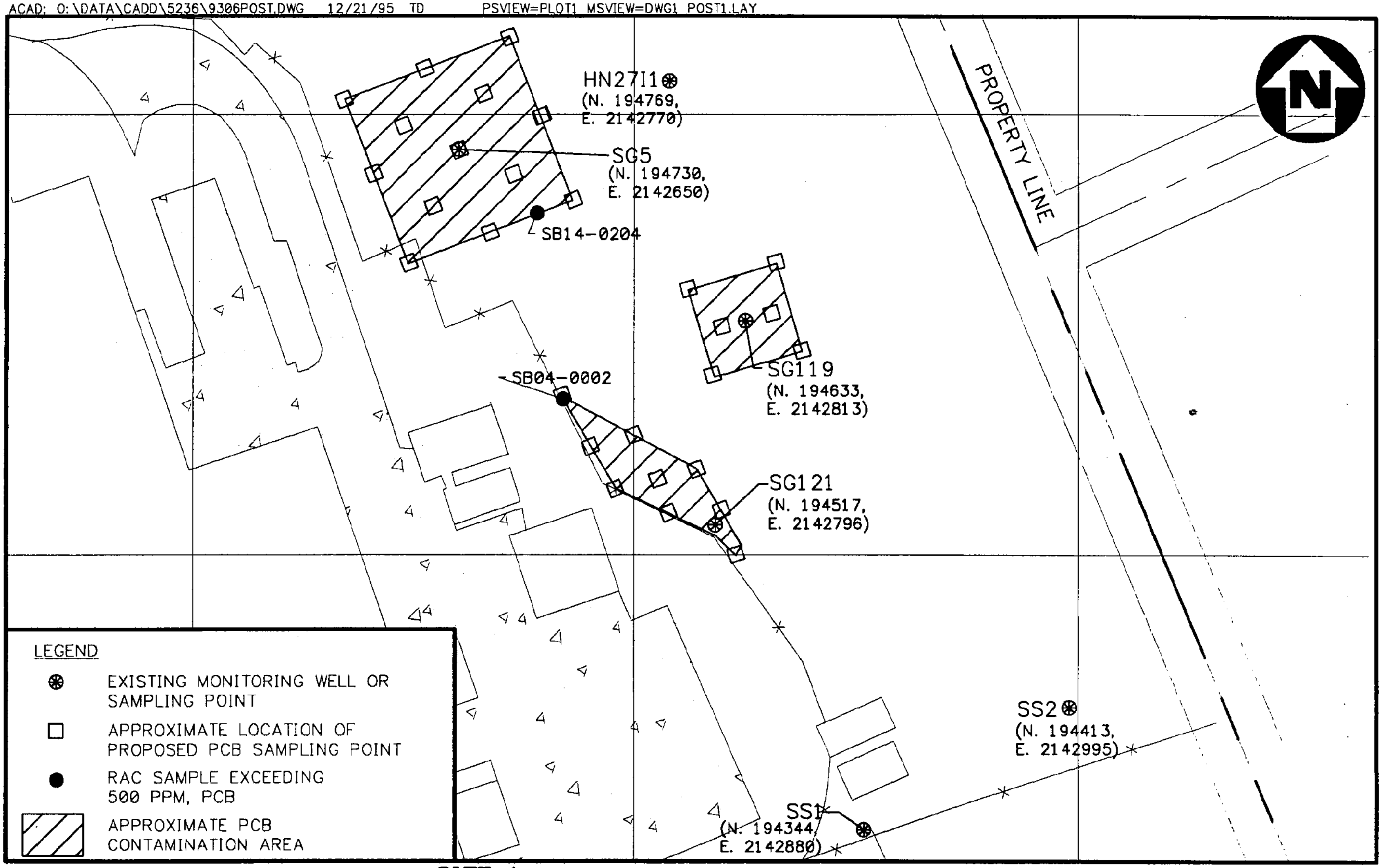

SITE 1
REMEDIAL ACTION VERIFICATION SAMPLING PLAN LAYOUT
NWIRP, BETHPAGE, NY

0 80 160
SCALE IN FEET

FIGURE 2-1

C.F. BRAUN

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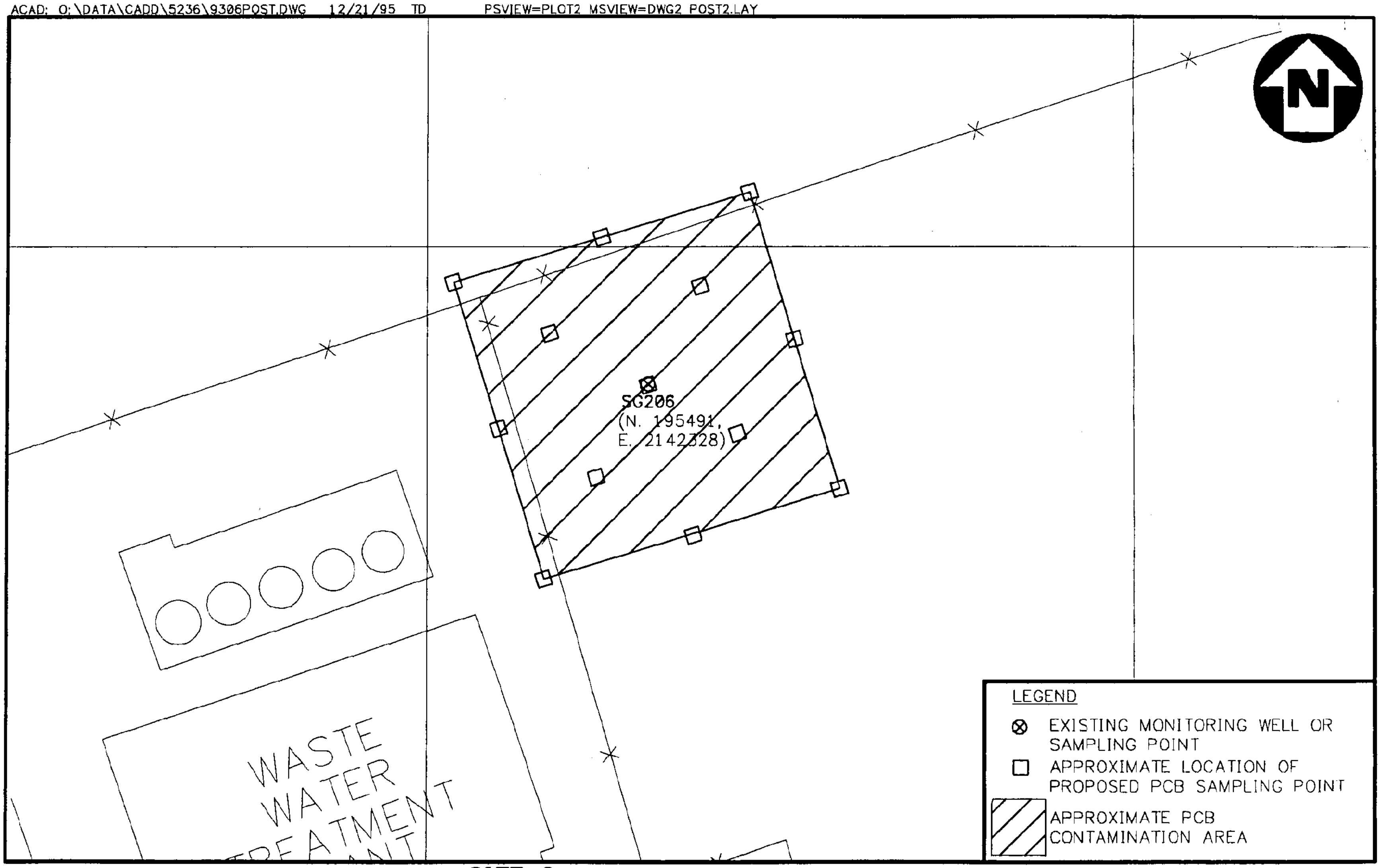


SITE 2
REMEDIAL ACTION VERIFICATION SAMPLING PLAN LAYOUT
NWIRP, BETHPAGE, NY

0 50 100
SCALE IN FEET

FIGURE 2-2

C.F. BRAUN

TABLE 2-1

ANALYTICAL PROGRAM
NWIRP BETHPAGE, NEW YORK

Parameter	Method	Detection Limit	Sample Matrix	Estimated No. Samples	Duplicates[1]	Total Samples
PCB's	CLP SOW OLM03.1	0.1 mg/kg (ppm)	Soil	51[2]	5	56[3]

(1) Duplicates - A single sample split into two portions during a single act of sampling. Assess the overall precision of the sampling and analysis program. Obtained at a frequency of 10% of the number of samples.

(2) Forty-one samples have been identified on the grid. If needed, two samples to be identified in the field will be collected in areas of potential contamination per site (8 samples), and two samples have been identified by RAC sampling as potential hot spots which will be sampled.

(3) Collection of aqueous equipment rinsate blanks will be required at a frequency of one per day and analyzed using CLP SOW OLM03.1 methodology if non-disposable sampling equipment is not used.

be determined during field operations. After the second round of removal, the area will be resampled. If the analytical results are below the established action levels then the remediation will be considered complete in that area and the RAC will conduct backfilling and restoration activities.

2.3 DECONTAMINATION

Disposable sampling equipment (disposable plastic trowels) shall be used to collect the surface soil samples required for this sampling event. If field conditions prevent using disposable equipment then the following procedures must be followed. The equipment involved in field sampling activities will be decontaminated after collecting each independent sample.

The following decontamination steps will be taken:

- Potable water rinse
- Alconox or liquinox detergent wash
- Potable water rinse
- Dilute nitric acid rinse
- Analyte-free water rinse
- Air dry

All decontamination fluids will be collected at the site. Nitric acid rinsate will be collected and neutralized.

2.4 WASTE HANDLING

All disposal equipment, Tyveks and other investigative derived waste (IDW) will be collected by C F Braun and placed in plastic garbage bags. All bagged IDW and containerized liquids will be disposed of by the RAC.

2.5 RECORD KEEPING

In addition to chain-of-custody records provided in Appendix A, a standard sample log sheet for sediment/ soils will be completed for sample description and documentation. This form is also contained in Appendix A.

A bound/weatherproof site logbook shall be maintained by the Field Engineer. The requirements of the site logbook are outlined in SOP SA-6.2. This book will contain a summary of the day's activities and will reference the field notebooks when applicable. All information related to sampling or field activities will be recorded in the field notebook. This information will include, but is not limited to, sampling time, weather conditions, unusual events, field measurements, descriptions of photographs, etc.

At the completion of field activities, the Field Engineer shall submit all field records, data, field notebooks, chain-of-custody receipts, sample log sheets, drilling logs, daily logs, etc., to the Project Manager.

2.6 HEALTH AND SAFETY

All field activities will be performed in accordance with the RAC Site-Specific Health and Safety Plan.

2.7 SAMPLE HANDLING

Sample handling includes the field-related considerations concerning the selection of sample containers, preservatives, allowable holding times and analysis requested. The EPA User's Guide to the Contract Laboratory Program (EPA, December 1988), and the Federal Register (EPA, October 26, 1984) address the topics of containers and sample preservations. Project-specific requirements are discussed further in Section 3.6.

2.8 SAMPLING IDENTIFICATION SYSTEM

Each sample collected will be assigned a unique sample tracking number. This three to four segment alpha-numeric code will identify the location.

The alpha-numeric code to be used in the sampling event is as follows:

(AN)	-	(A)	-	(NN)	-	(A)
[Sample Location]		[Sample Area]		[Sample Number]		[QA/QC Sample Designation]

Sample Location:

S1 = Site 1
S2 = Site 2

Sample Area:

A through C = Site 1 potentially has four separate areas.
A = Site 2 has only one removal area.

Sample Number:

01 through 66 = A sequential ordering of samples taken

QA/QC Sample Designation (if necessary):

E = Equipment Rinse

Duplicate samples will be "blind." The duplicate samples will be recorded in the field book. For example, the first soil sample collected from Site 2 would be designated as:

S2-A-01

If non-disposable equipment is used then a rinsate blank for that location would be required and labeled as:

S2-A-01-E

Information regarding sample labels and tags to be attached before shipment to a laboratory is contained in SOP SA-6.1. It will be very important to keep accurate and through notes in the log book pertaining to sample locations and identification.

2.9 SAMPLE PACKAGING AND SHIPPING

Samples will be packaged and shipped in accordance with SOP SA-6.2. The FOL will be responsible for completion of the following forms:

- Sample Labels
- Chain-of-Custody Forms
- Appropriate labels applied to shipping coolers
- Chain-of-Custody Labels

It is anticipated that the laboratory to be used for the analytical work will provide delivery of sample bottles and pickup of samples on a daily basis. Sample shipment is further discussed in Section 5.

2.10 SAMPLE CUSTODY

Custody of samples must be maintained and documented at all times. Chain-of-custody begins with the collection of the samples in the field. SOP SA-6.1 provides a description of the chain-of-custody procedures to be followed. A sample chain-of-custody form is contained in Appendix A. Documentation and chain-of-custody are further discussed in Section 5.

3.0 QUALITY ASSURANCE OBJECTIVES FOR DATA MANAGEMENT

The overall QA objective is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting that will provide environmental monitoring data of known and acceptable quality. Specific procedures to be used for sampling, chain-of-custody, calibration of field instruments, laboratory analysis, reporting, internal quality control, audits, preventative maintenance, and corrective actions are described in later sections of this FSAP. The purpose of this section is to address the data quality objectives in terms of the PARCC parameters, (Precision, Accuracy, Representativeness, Comparability and Completeness) quantitation and detection limits, field quality control blanks, and bottleware requirements.

3.1 DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) are qualitative and/or quantitative statements regarding the quality of data needed to support the Remedial Action Verification activities. The sampling rationale provided in Section 2.0 of this work plan explains the choice of sample locations and media which will supply information needed for the verification. The use of CLP protocols listed in Table 2-1 is expected to satisfy data quality needs in accordance with Navy and NYSDEC requirements.

3.2 QUANTITATION LIMITS

PCBs will be reported using the established CLP CRQLs for each compound.

3.3 DETECTION LIMITS

Reporting of method detection limits (MDLs) is required when supporting the Navy (CLEAN) program. The MDLs (organics) applicable at the date of analysis will be reported for nondetected analyte results in each data package. These numbers will be corrected for percent moisture and any applicable dilution factors. MDLs must be less than or equal to PQLs.

3.4 PARCC PARAMETERS

The quality of the data set is measured by certain characteristics of the data, namely the PARCC (precision, accuracy, representativeness, comparability, and completeness) parameters. Some of the parameters are expressed quantitatively, while others are expressed qualitatively. The objectives of the sampling activities and the intended use of the data define the PARCC goals.

3.4.1 Precision

Precision characterizes the amount of variability and bias inherent in a data set. Precision describes the reproducibility of measurements of the same parameter for a sample under the same or similar conditions. Precision is expressed as a range (the difference between two measurements of the same parameter) or as a relative percent difference (the range relative to the mean, expressed as a percent). Range and Relative Percent Difference (RPD) values are calculated as follows:

$$Range = OR - DR$$

$$RPD\ (\%) = \frac{100\ (OR - DR)}{[\ (0.5)\ (OR + DR)]}$$

where: OR = original sample result

DR = duplicate sample result

RPDs are used to evaluate both field and laboratory duplicate precision.

RPDs are calculated for each set of field duplicates obtained. NEESA level D requires that 10 percent of all environmental samples obtained shall be field duplicates. Field duplicate precision monitors the consistency with which environmental samples were obtained and analyzed. Field duplicate results for solid matrix samples are considered to be precise if the RPD is less than 50 percent. Field duplicate results for aqueous matrix samples are considered to be precise if the RPD is less than 30 percent.

Laboratory duplicates are analyzed with a frequency of 5 percent (i.e., one laboratory duplicate analyzed per twenty environmental samples of similar matrix). Laboratory duplicates measure the reproducibility with which laboratory results are generated. Results from laboratory duplicate analyses are evaluated against laboratory-derived statistical quality control limits. Procedures for compiling these control limits are defined by the analytical methodology used and the Laboratory Quality Assurance Plan (LQAP). These limits are based on three times the standard deviation of a series of RPD or range values.

3.4.2 Accuracy

Accuracy is the comparison of a spiked sample result against a known or calculated value expressed as a percent recovery (%R). Percent recoveries are derived from analysis of standards spiked into deionized water (blank spike recovery) or into actual samples (matrix spike or surrogate spike recovery). These analyses measure the accuracy of laboratory operations as affected by matrix. Recovery is calculated as follows:

$$\%R = \frac{SSR - SR}{SA} \times 100\%$$

SSR	=	Spiked Sample Result
SR	=	Sample Result
SA	=	Spike Added

In general, spike recoveries are evaluated against acceptance limits statistically-derived by the laboratory in accordance with established practices identified in the analytical method employed and further defined in the LQAP. Generally, upper and lower control limits for accuracy are set at the mean plus or minus three times the standard deviation of a series of %R values.

Surrogates will be spiked into all samples for PCB analysis. In general, matrix spikes and blank spikes are analyzed at a frequency of 5 percent (one per 20 samples).

The various measures of accuracy are used by data reviewers to assess the quality or limitations of the data generated.

3.4.3 Representativeness

All data obtained should be representative of actual conditions at the sampling location. The FSAP and the use of standardized sampling, handling, analytical, and reporting procedures are designed so that the samples taken will present an accurate representation of actual site conditions. The rationales discussed in the FSAP are designed to ensure this. All sampling activities will conform to the protocols given in Section 2.0 of this FSAP.

3.4.4 Comparability

Comparability will be achieved by utilizing standardized sampling and analysis methods and data reporting format. Both analytical procedures and sample collection techniques will maximize the comparability of this new data to previous data. Additionally, consideration will be given to seasonal conditions and other environmental conditions that could influence analytical results.

3.4.5 Completeness

Completeness is a measure of the amount of useable, valid data obtained from the measurement program compared to the total amount expected to be obtained. For relatively clean, homogeneous matrices, 100-percent completeness is expected. However, as matrix complexity and heterogeneity increase, completeness may decrease. Where analysis is precluded or where DQOs are compromised, effects on the overall investigation must be considered. Whether any particular sample is critical to the investigation will be evaluated in terms of the sample location, the parameter in question, the intended data use, and the risk associated with the error.

Critical data points may not be evaluated until all the analytical results are evaluated. If in the evaluation of results it becomes apparent that the data for a specific medium are of insufficient quality (less than 90 percent complete), either with respect to the number of samples or an individual analysis, resampling of the deficient data points may be necessary.

3.5 AQUEOUS FIELD QUALITY CONTROL BLANKS

No aqueous field quality control blanks will be collected during this remedial action verification based on the use of disposable sampling equipment. If it becomes necessary to use non-disposal sampling equipment, equipment rinsate blanks will be collected at a frequency of one per day for PCB analysis.

3.6 BOTTLEWARE

NEESA requires specific bottleware cleaning procedures. Vendor-supplied precleaned bottles will be used at the NWIRP Bethpage. The required certification will be provided. Bottle type and preservation requirements, as well as holding time requirements, are summarized in Table 3-1

TABLE 3-1

SUMMARY OF BOTTLE REQUIREMENTS, PRESERVATION REQUIREMENTS AND HOLDING TIMES
SOIL SAMPLES - SITES 1 AND 2
NWIRP, BETHPAGE, NEW YORK

Analytical Parameter	Container Type	Preservation and Holding Time
PCB	8-oz. clear wide-mouth jars	Chill to 4°C; 7 days from date of collection to date of extraction, 40 days from extraction to analysis.

4.0 PROJECT ORGANIZATION AND RESPONSIBILITY

C F Braun will be responsible for the overall management of the verification sampling. Personnel from the Navy will be actively involved in the investigation and will coordinate with personnel from C F Braun as necessary.

4.1 PROJECT ORGANIZATION

The key firms and personnel involved in the investigation, as well as the chain-of-communication and responsibility of the project personnel are as follows. The Navy Remedial Project Manager (RPM) is responsible for the overall management of the IR Program for the NWIRP Bethpage.

Northern Division
Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop #82
Lester, Pennsylvania 19113
(215) 595-0567

Mr. James Colter, (Code 1821)
Remedial Project Manager

The project organization for work conducted under the CLEAN Contract is provided in Figure 4-1. The project manager and engineer follow the day-to-day activities of the project. Listed below are the telephone numbers of the key personnel to contact with questions pertaining to their specific areas of expertise.

C F Braun Environmental Corporation
Foster Plaza 7
661 Andersen Drive
Pittsburgh, Pennsylvania

Mark Speranza, P.E.
Project Manager
(412) 921-8916

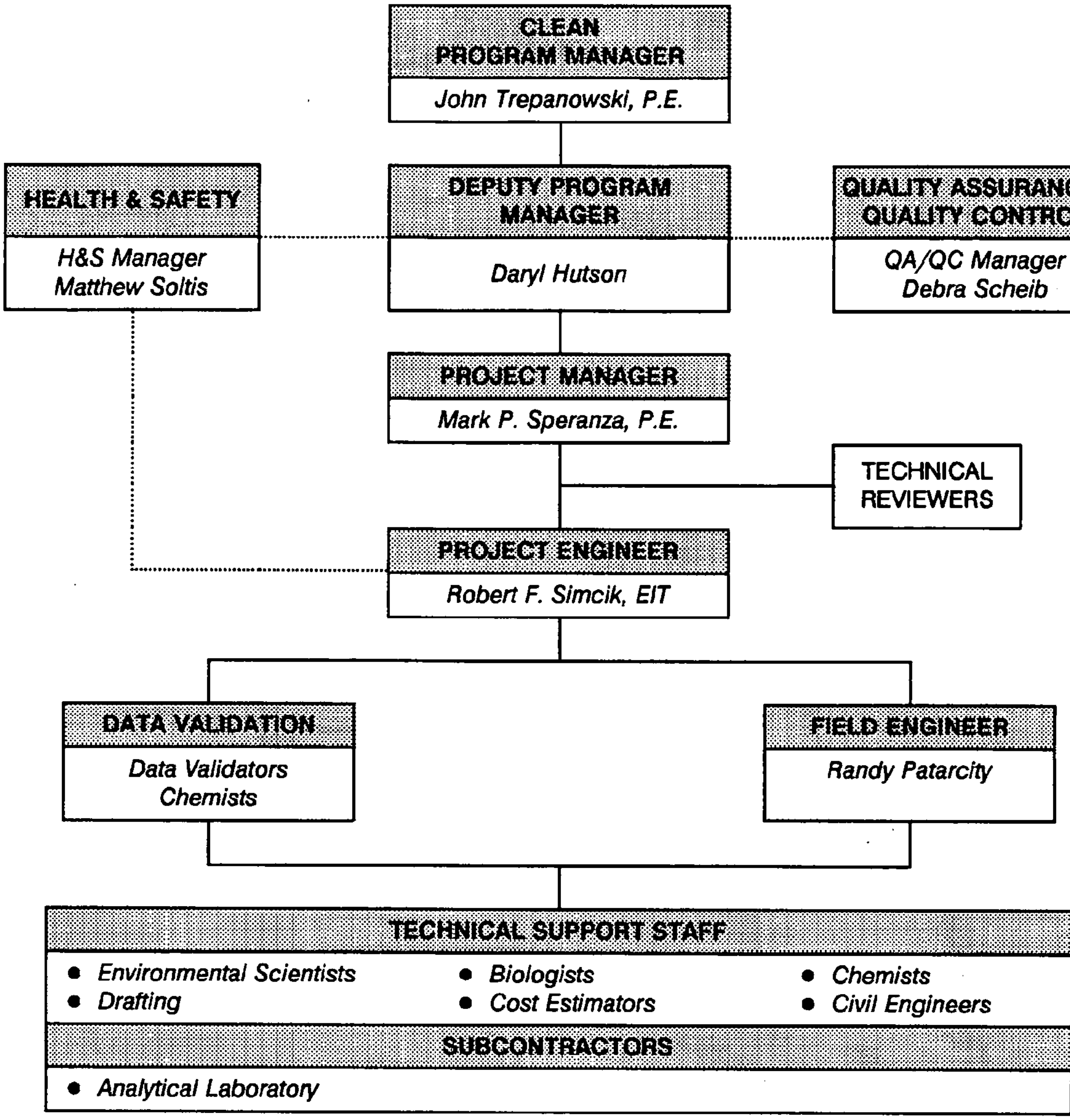
Robert Simcik
Project Engineer
(412) 921-8163

Matthew Soltis
Health and Safety Manager
(412) 921-8912

Debra Scheib
Quality Assurance/
Quality Control Manager
(412) 921-8876

FIGURE 4-1

PROJECT ORGANIZATION



The Project Manager has the primary responsibility for project and technical management of this project. He is responsible for the coordination of all onsite personnel, and for providing technical assistance for all activities that are directly related to the determination of the environmental quality of the site. If quality assurance problems or deficiencies requiring specific action are identified, the project and QA/QC managers will identify the appropriate corrective action.

4.2 FIELD ORGANIZATION

The C F Braun field investigation team will be organized according to the activity planned. For onsite sampling, the sampling team members will be selected based upon the type and extent of effort required. For this effort only one person will be required and will be referred to as the Field Engineer.

The Field Engineer will be responsible for the completion of all sampling and chain-of-custody documentation, will assume custody of all samples, and ensure the proper handling and shipping of samples.

The QA/QC advisor will be responsible for the adherence of all QA/QC guidelines as defined in this document. Strict adherence to these procedures is critical to the collection of acceptable and representative data.

4.3 LABORATORY OPERATIONS

Analysis of all environmental samples will be performed by a Navy-approved laboratory. The laboratory work will be performed in accordance with NEESA Level D guidance as stipulated in the NEESA guidelines (20.2-0478; 6/88). NEESA Data Quality Objectives (DQO) Levels are established based upon regulatory requirements and technical approach. Polychlorinated biphenyls (PCBs) will be analyzed as NEESA Level D, which denotes use of Contract Laboratory Program (CLP) protocols. The QA/QC procedures will meet or exceed NYSDEC requirements.

5.0 DOCUMENTATION AND CHAIN-OF CUSTODY

Sample custody procedures are designed to provide documentation of preparation, handling, storage, and shipping of all samples collected. An example of the chain-of-custody form, which will be used during this investigation, is included in Appendix A.

Samples collected during the site investigation will be the responsibility of identified persons from the time they are collected until they, or their derived data, are incorporated into the final report. Stringent chain-of-custody procedures will be followed to document sample possession.

5.1 FIELD CUSTODY

- The Field Engineer, or designee, is responsible for the care and custody of the samples collected until they are delivered to the analyzing laboratory or entrusted to a carrier.

- Sample logs or other records will always be signed and dated.

- Chain-of-custody sample forms will be completed to the fullest extent possible prior to sample shipment. They will include the following information: project name, sample number, time collected, source of sample and location, description of sample location, matrix, type of sample, grab or composite designation, preservative, number and size of bottle, analysis, and name of sampler.

  These forms will be filled out in a legible manner, using waterproof ink, and will be signed by the sampler. Similar information will be provided on the sample label which will be securely attached to the sample bottle. The label will also include the general analyses to be conducted. In addition, sampling forms will be used to document collection, filtration, and preparation procedures. Copies of all field documentation forms are provided in Appendix B.

5.2 TRANSFER OF CUSTODY AND SHIPMENT

The following procedures will be used when transferring custody of samples:

- Samples will always be accompanied by a chain-of-custody record. When transferring samples, the individuals relinquishing and receiving them will sign, date, and note the time of transfer on the chain-of-custody record. This record documents the sample custody transfer from the sampler to the laboratory, often through another person or agency (common carrier). Upon arrival at the laboratory, internal sample custody procedures will be followed.

- Prior to shipment to the laboratory for analysis, samples will be properly packaged. Individual custody records will accompany each shipment. Shipping containers will then be sealed for shipment to the laboratory. The methods of shipment, courier name, and other pertinent information, will be entered in the remarks section of the custody record.

- All shipments will be accompanied by the chain-of-custody record identifying the contents. The original record will accompany the shipment; a copy will be retained by the field sampler.

- Proper documentation will be maintained for shipments by common carrier.

5.3 SAMPLE SHIPMENT PROCEDURES

The following procedures will be followed when shipping samples for laboratory analysis:

- Samples requiring refrigeration will be promptly chilled with ice or Blue Ice to a temperature of 4°C and will be packaged in an insulated cooler for transport to the laboratory. Ice will be sealed in containers to prevent leakage of water. Samples will not be frozen.

- Only shipping containers that meet all applicable state and Federal standards for safe shipment will be used.

- Shipping containers will be sealed with nylon strapping tape, and custody seals will be signed, dated, and affixed in a manner that will allow the receiver to quickly identify any tampering that may have occurred during transport to the laboratory.

- It is anticipated that the laboratory to be used for the analytical work will provide delivery of sample bottles and pickup of samples on a daily basis. The Field Engineer (or designee) is responsible for coordinating all sample shipments with the laboratory. In accordance with NEESA guidelines, samples will be sent to the laboratory within 24 hours of collection.

5.4 FIELD DOCUMENTATION RESPONSIBILITIES

It will be the responsibility of the Field Engineer to secure all documents produced in the field (geologist's daily logs, lithologic and sampling logs, communications) at the end of each work day.

The possession of all records will be documented; however, only the project Field Engineer or designee may remove field data from the site for reduction and evaluation.

The data generated by the laboratory will be sent to C F Braun and reviewed by the Project Manager and/or staff chemist for completion and acceptance by C F Braun.

6.0 CALIBRATION PROCEDURES

Field equipment such as the Organic Volatile Analyzer (OVA), HNu, the pH and specific conductance meters will be calibrated and operated in accordance with the manufacturer's instructions and manuals. A log will be kept documenting the calibration results for each field instrument. The log will include the date, standards, personnel, and results of the calibration.

Calibration procedures for laboratory equipment used in the analysis of environmental samples will be performed in accordance with method-specific criteria.

7.0 SAMPLE PREPARATION AND ANALYTICAL PROCEDURES

Environmental samples collected during the field investigation for chemical analyses will be analyzed using the appropriate analytical procedures as outlined in the footnote of Table 2-1 of this FSAP. The methods are referenced to the appropriate EPA guidance.

8.0 DATA REDUCTION, VALIDATION, AND REPORTING

8.1 DATA REDUCTION

Raw data from field measurements are recorded directly in field notebooks or on sample logs. Reduction of field data entails the summarization and presentation of this data in tabular form. The reduction of laboratory data entails the manipulation of raw data instrument out-put into reportable results.

Field data are verified on a daily basis by the Field Engineer, and subsequently by a qualified person who is not a member of the field crew. Laboratory data are verified by the group supervisor, and subsequently by the laboratory's QC/Documentation Department.

8.2 DATA VALIDATION

Data validation is the stringent review of an analytical chemical data package with respect to sample receipt and handling, analytical methods, data reporting and deliverables, and document control. The quality of data generated by a laboratory is extremely important; it is an integral part of the investigation and should be clearly tied to the project goals. Data used to develop qualitative trends, for example, will not have the same data validation requirements as data used for litigation purposes.

Data collected during the Remedial Action Verification sampling will be fully validated as follows. PCB data generated through use of CLP protocol analyses (i.e., NEESA level D data), will be validated in accordance with the most recent edition of the EPA Functional Guidelines for Evaluating Organic Analyses. Professional judgement will also be employed.

Data validation reports summarizing non-compliances will be generated, and qualifier flags will be applied to data, where warranted, to alert users of limitations in utility. These validation reports are directed to the Project Manager after internal Senior review is completed by the C F Braun Environmental Data Validation Coordinator.

9.0 INTERNAL QUALITY CONTROL CHECKS

The internal laboratory quality control procedures for the analytical services, as previously discussed in Section 3.0, are specified in the analytical methodology. These specifications include the types of control samples required (sample spikes, surrogate spikes, controls, and blanks), the frequency of each control, the compounds to be used for sample spikes and surrogate spikes, and the quality control acceptance criteria. It will be the laboratory's responsibility to document, in each data package, that both initial and on-going instrument and analytical QC criteria are met.

Analytical results will be compared to acceptance criteria, and documentation will be performed showing that criteria have been met. Any samples in nonconformance with the QC criteria will be identified and reanalyzed by the laboratory, as required. The following procedures must also be employed by the laboratory for the processing of NWIRP Bethpage samples:

- Proper handling and storage of samples.
- Use of qualified and/or certified technicians.
- Use of calibrated equipment.
- Use of standardized test procedures.

10.0 PERFORMANCE AND SYSTEM AUDITS

The following measures have been established to assure that the work is being implemented in accordance with the approved project SOPs and in an overall satisfactory manner.

- The Field Engineer will supervise and check on a daily basis that the soil sampling is being performed correctly, field measurements are accurately made, equipment is thoroughly decontaminated, samples are collected and properly handled, and the field work is accurately and neatly documented.

- The project manager will oversee the Field Engineer and check that management of the acquired data proceeds in an organized and expeditious manner.

- System audits for the laboratory are performed on a regular basis.

A formal audit of the field sampling procedures may be conducted in addition to the auditing that is an inherent part of the daily project activities. If conducted, the auditors will check that sample collection, sample handling, decontamination protocols, and instrument calibration and use are in accordance with the approved project SOPs. The auditors will also check that the field documentation logs and chain-of-custody forms are being filled out properly.

11.0 PREVENTATIVE MAINTENANCE

C F Braun has established a program for the maintenance of field equipment to ensure the availability of equipment in good working order when and where it is needed. This program consists of the following elements:

- The equipment manager keeps an inventory of the equipment in terms of items (model and serial number), quantity, and condition. Each item of equipment is signed out when in use, and its operating condition and cleanliness checked upon return.
- The equipment manager conducts routine checks on the status of equipment and is responsible for the stocking of spare parts and equipment readiness.
- The equipment manager maintains the equipment manual library and trains field personnel in the proper use and care of equipment.
- The Field Engineer is responsible for working with the equipment manager to make sure that the equipment is tested, cleaned, charged, and calibrated in accordance with the manufacturer's instructions before being taken to the job site.

The laboratory follows a well-defined program to prevent the failure of laboratory equipment and instrumentation. This preventative maintenance program includes the periodic inspection, lubrication, cleaning, and replacement of parts of the equipment.

12.0 DATA ASSESSMENT PROCEDURES

12.1 REPRESENTATIVENESS, ACCURACY, AND PRECISION

All data generated in the investigation will be assessed for its representativeness, accuracy, and precision. The completeness of the data will also be assessed by comparing the valid acquired data to the project objectives to see that these objectives are being addressed and met. The specific procedures used to determine data precision, accuracy, and completeness will be provided in the analytical reports. Accuracy will be determined using laboratory spiked samples.

The representativeness of the data will be assessed by determining if the data are consistent with known or anticipated hydrogeologic or chemical conditions and accepted principles. Field measurements will be checked for completeness of procedures and documentation of procedures and results.

Precision and accuracy will be determined using replicate samples and blank and spiked samples, respectively. The specific procedures for determining PARCC parameters are outlined in Section 3.0.

13.0 CORRECTIVE ACTIONS

The QA program will enable conditions adverse to quality to be identified, controlled, and corrected. Potential problems may involve nonconformance with the SOPs and/or analytical procedures established for the project or other unforeseen difficulties. Any person identifying an unacceptable condition will notify the project manager. The project manager, with the assistance of the QA/QC manager, will be responsible for developing and initiating appropriate corrective action and verifying that the correction action has been effective. Corrective actions may include the following: resampling and/or reanalysis of sample, amending or adjusting project procedures. If warranted by the severity of the problem (for example, if a change in the approved FSAP is required), the Navy will be notified in writing and their approval will be obtained prior to implementing any change. Additional work that is dependent on a nonconforming activity will not be performed until the problem has been eliminated.

The laboratory maintains an internal closed-loop corrective action system that operates under the direction of the laboratory QA coordinator.

14.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

The QA/QC Manager (or designee) will review all aspects of the implementation of the FSAP on a regular basis and with the use of designated support personnel, will prepare a summary report. Reviews will be performed at the completion of each field activity and reports will be completed at this time. These reports will include an assessment of data quality and the results of system and/or performance audits. Any significant QA deficiencies will be reported and identified, and corrective action possibilities discussed.

REFERENCES

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U.S. EPA, February 1988, Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses.

U.S. EPA, July 1988, Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses.

U.S. EPA, December 1988, User Guide to the Contract Laboratory Program, OSWER Directive No. 9240.C-01,

U.S. EPA, 1993. Laboratory Statement of Work for Organics, OLM03.1.

APPENDICES

A

APPENDIX A

EVENT SPECIFIC STANDARD OPERATING PROCEDURES

NUS CORPORATION ENVIRONMENTAL MANAGEMENT GROUP	STANDARD OPERATING PROCEDURES	Number GH-1.3	Page 1 of 13
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		Applicability EMG	
		Prepared Earth Sciences	
Subject SOIL AND ROCK SAMPLING		Approved D. Senovich	

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1.0 PURPOSE

The purpose of this procedure is to identify the equipment, sequence of events, and appropriate methods necessary to obtain soil, both surface and subsurface, and rock samples during field sampling activities.

2.0 SCOPE

The methods described within this procedure are applicable while collecting surface and subsurface soil samples; obtaining rock core samples for lithologic and hydrogeologic evaluation, excavation/foundation design and related civil engineering purposes.

3.0 GLOSSARY

Hand Auger- A sampling device used to extract soil from the ground in a relatively undisturbed form.

Thin-Walled Tube Sampler - A thin-walled metal tube (also called Shelby tube) used to recover relatively undisturbed soil samples. These tubes are available in various sizes, ranging from 2 to 5 inches O.D. and 18 to 54 inches long. A stationary piston device may be included in the sampler to reduce sampling disturbance and increase sample recovery.

Split-Barrel Sampler - A steel tube, split in half lengthwise, with the halves held together by threaded collars at either end of the tube. Also called a split-spoon sampler, this device can be driven into resistant materials using a drive weight mounted in the drilling string. A standard split spoon sampler (used for performing Standard Penetration Tests) is 2 inches outside diameter (OD) and 1-3/8 inches inside diameter (ID). This standard spoon typically is available in two common lengths, providing either 20-inch or 26-inch longitudinal clearance for obtaining 18-inch or 24-inch long samples, respectively. These split-spoon samplers range in size from 2-inch O.D. to 3-1/2-inch O.D., depending upon manufacturer. The larger sizes are commonly used when a larger volume of material is required.

Rock Coring - A method in which a continuous solid cylindrical sample of rock or compact rock-like soil is obtained by the use of a double tube core barrel that is equipped with an appropriate diamond-studded drill bit which is advanced with a hydraulic rotary drilling machine.

Wire-Line Coring - As an alternate for conventional coring, this is valuable in deep hole drilling, since this method eliminates trips in and out of the hole with the coring equipment. With this technique the core barrel becomes an integral part of the drill rod string. The drill rod serves as both a coring device and casing.

4.0 RESPONSIBILITIES

Field Operations Leader - Responsible for overall management of field activities and ensuring that the appropriate sampling procedures are being implemented.

Site Geologist - The site geologist directly oversees the sampling procedures, classifies soil and rock samples, and directs the packaging and shipping of soil samples. Such duties may also be performed by geotechnical engineers, field technicians, or other qualified field personnel.

sun at all times. Ship samples protected with suitable resilient packing material to reduce shock, vibration, and disturbance.

Thin-walled undisturbed tube samplers are restricted in their usage by the consistency of the soil to be sampled. Often, very loose and/or wet samples cannot be retrieved by the samplers, and soils with a consistency in excess of very stiff cannot be penetrated by the sampler. Devices such as Denison or Pitcher core samplers can be used to obtain undisturbed samples of stiff soils. Using these devices normally increases sampling costs and therefore their use shall be weighed against the increased cost and the need for an undisturbed sample. In any case, if a sample cannot be obtained with a tube sampler, an attempt shall be made with a split barrel sampler at the same depth so that at least a sample can be obtained for classification purposes.

5.1.4 Continuous Core Soil Samples

The CME continuous sample tube system provides a method of sampling soil continuously during hollow stem augering. The 5-foot sample barrel fits within the lead auger of a hollow auger column. The sampling system can be used with a wide range of I.D. hollow stem augers (from 3-1/4-inch to 8-1/4-inch I.D.). This method has been used to sample many different materials such as glacial drift, hard clays and shales, mine tailigs, etc. This method is particularly used when SPT samples are not required and a large volume of material is needed. Also, this method is useful when a visual description of the subsurface lithology is required.

5.2 SURFACE SOIL SAMPLES

For loosely packed earth or waste pile samples, stainless steel scoops or trowels can be used to collect representative samples. For densely packed soils or deeper soil samples, a hand or power soil auger may be used.

The following methods are to be used:

- Use a soil auger for deep samples (6 to 24 inches) or a scoop or trowel for surface samples. Remove debris, rocks, twigs, and vegetation before collection of soil. Mark the location with a numbered stake if possible and locate sample points on a sketch of the site.
- Use a new or freshly-decontaminated sampler for each sample taken. Attach a label and identification tag. Record all required information in the field logbook and on the sample log sheet, Chain-of-Custody record, and other required forms.
- Pack and ship accordingly.
- When a representative composited sample is to be prepared (e.g., samples taken from a gridded area or from several different depths), it is best to composite individual samples in the laboratory where they can be more precisely composited on a weight or volume basis. If this is not possible, the individual samples (all of equal volume, i.e., the sample bottles shall be full) shall be placed in a decontaminated stainless steel bucket, mixed thoroughly using a stainless steel spatula or trowel, and a composite sample collected.

6.0 REFERENCES

American Society for Testing and Materials, 1985. Method for Penetration Test and Split Barrel Sampling of Soils. ASTM Method D 1586-84, Annual Book of Standards, ASTM, Philadelphia, Pennsylvania.

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U.S. Department of the Interior, 1974, Earth Manual, A Water Resources Technical Publication, 810 pages.

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7.0 RECORDS

None.

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		Effective Date: 05/04/90	Revision: 2
		Applicability: EMG	
		Prepared: Earth Sciences	
Subject: SOIL SAMPLING IN TEST PITS AND TRENCHES		Approved: D. Senovich	

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1.0 **PURPOSE**

This procedure describes the method for logging and sampling of test pits and trenches to determine subsurface soil and rock conditions and recover small-volume or bulk samples. The methods apply only to data collection and do not apply to the construction of excavations.

2.0 **SCOPE**

The procedure is applicable to the collection of bulk and small-volume samples of subsurface soils for laboratory testing which are exposed through excavating at hazardous substance sites.

3.0 **GLOSSARY**

Test pit or trench - A pit or trench, either machine or manually excavated, from which large quantities of soil may be removed.

4.0 **RESPONSIBILITIES**

Site Manager - responsible for determining, in consultation with other project personnel (geologist, geochemist), the need for test pits or trenches, their approximate locations, depths and sampling objectives.

Field Operations Leader (FOL) - responsible for finalizing the location, orientation and depth of test pits/trenches based on on-site conditions and the site geologist's advice. The FOL is ultimately responsible for the proper construction, sampling and backfilling of test pits and trenches, including adherence to OSHA regulations.

Health and Safety Officer (HSO) - responsible for air quality monitoring during test pit construction and sampling, to ensure that workers and offsite (downwind) individuals are not exposed to hazardous levels of airborne contaminants. The HSO may also be required to advise the FOL on other safety-related matters regarding the test pit or trench excavation and sampling, such as mitigative measures to address potential hazards from unstable trench walls, puncturing of drums or other hazardous objects, etc.

Site Geologist/Sampler - responsible for recording all information and data on test pit/trench construction and for the proper collection and logging of samples according to this procedure.

5.0 **PROCEDURES**

5.1 **DATA COLLECTION AND SAMPLING**

5.1.1 **General**

Test pits and trenches are usually logged as they are excavated. Records of each test pit/trench will be made on prepared forms or in a field notebook. If the log is made in a field notebook, it will be transcribed to the prepared forms. These records include plan and profile sketches of the test pit/trench showing materials encountered, their depth and distribution in the pit/trench, and sample locations. These records will also include safety and sample screening information.

Requirements for sampling shall be determined by the Site Manager, and shall be documented in the Project Operation Plan (POP). A copy of this plan shall be maintained by the Field Operations Leader. To expedite sampling, the crew shall have sufficient tools and equipment to sample each pit. The tools and equipment must be properly decontaminated prior to use.

Entry of test pits by personnel is extremely dangerous and shall be avoided unless absolutely necessary. Pits more than 4 feet deep must be shored prior to entry, the "buddy" system must be used, and all applicable H&S and OSHA requirements followed.

The final depth and type of samples obtained from each test pit will be determined at the time the test pit is excavated. Sufficient samples are usually obtained and analyzed to quantify contaminant distribution as a function of depth for each test pit. Additional samples of each waste phase and any fluids encountered in each test pit may be collected.

In some cases, samples of soil may be extracted from the test pit for reasons other than waste sampling and chemical analysis, such as to obtain geotechnical information. Such information would include soil types, stratigraphy, strength, etc., and could therefore entail the collection of disturbed (grab or bulk) or relatively undisturbed (hand-carved or pushed/driven) samples, which can be tested for geotechnical properties. The purposes of such explorations are very similar to those of shallow exploratory or test borings, but often test pits offer a faster, more cost-effective method of sampling than borings.

5.1.2 Sampling Equipment

The following equipment is needed for taking samples for chemical or geotechnical analysis from test pits and trenches:

- ~~Backhoe or other excavating machinery.~~ Pit or Removal Area Preformed by RAC BFR Env. Sampling only.
- Shovels, picks and hand augers, stainless steel trowels. OR Disposable trowels
- Sample container - bucket with locking lid for large samples and glass bottles for chemical or geotechnical analysis samples.
- Polyethylene bags for enclosing sample; buckets.
- Remote sampler consisting of 10-foot sections of steel conduit (1-inch diameter), hose clamps and right angle adapter for conduit (see Attachment A).

5.1.3 Sampling Methods

The methods discussed in this section refer to test pit sampling from grade level. If test pit entry is required, see Section 5.1.4.

- Excavate trench or pit in several depth increments. After each increment the operator will wait while the sampler inspects the test pit from grade level to decide if conditions are appropriate for sampling. (Monitoring of volatiles by the HSO will also be used to evaluate the need for sampling.) Practical depth increments range from 2 to 4 feet.

The backhoe operator, who will have the best view of the test pit, will immediately cease digging if:

- Any fluid phase or groundwater seepage is encountered in the test pit.
- Any drums, other potential waste containers, obstructions or utility lines are encountered.
- Distinct changes of material are encountered.

This action is necessary to permit proper sampling of the test pit and to prevent a breach of safety protocol. Depending upon the conditions encountered, it may be required to excavate more slowly and carefully with the backhoe.

- Remove loose material to the greatest extent possible with backhoe.
- Secure walls of pit if necessary. (There is seldom any need to enter a pit or trench which would justify the expense of shoring the walls. All observations and samples can generally be taken from the ground surface.)
- Samples of the test pit material will be obtained either directly from the backhoe bucket or from the material once it has been deposited on the ground. The sampler or Field Operations Leader directs the backhoe operator to remove material from the selected depth or location within the test pit/trench. The bucket is brought to the surface and moved away from the pit. The sampler and/or HSO then approaches the bucket and monitors its contents with a photoionization (HNU) or OVA meter. The sample is collected from the center of the bucket or pile and placed in sample jars using a clean stainless steel trowel or spatula.
- If a composite sample is desired, several depths or locations within the pit/trench are selected and a bucket is filled from each area. It is preferable to send individual sample bottles filled from each bucket to the laboratory for compositing under the more controlled laboratory conditions. However, if compositing in the field is required, each sample bottle shall be emptied into a mixing container (e.g., stainless steel bucket) and thoroughly stirred prior to being placed into the sample jars. Composite sampling is not appropriate for samples which will undergo analysis for volatile organic compounds.

- Using the remote sampler shown in Attachment A, samples can be taken at the desired depth from the side wall or bottom of the pit. The face of the pit/trench shall first be scraped (using a long-handled shovel or hoe) to remove the smeared zone that has contacted the backhoe bucket. The sample is then collected directly into the sample jar, by scraping with the jar edge, eliminating the need to utilize samplers and minimizing the likelihood of cross-contamination. The sample jar can be capped, removed from the assembly, and packaged for shipment.

- Prepare shipping papers, labels, and chain-of-custody records, as described in SA-6.2, Sample Packaging and Shipping.

5.1.4 In-Pit Sampling

Samples can also be obtained by personnel entering the test pit/trench. This is necessary when soil conditions preclude obtaining suitable samples from the backhoe bucket (e.g., excessive mixing of soils or wastes within the test pit/trench) or when samples from relatively small discrete zones within the test pit are required. This approach may also be necessary to sample any seepage occurring at discrete levels or zones in the test pit that are not accessible with remote samplers.

In general, personnel shall sample and log pits and trenches from the ground surface, except as provided for by the following criteria:

- The project will benefit significantly from the improved quality of the logging and sampling data obtained if personnel enter a pit or trench rather than conduct such operations from the ground surface.

- There is no practical alternative means of obtaining such data.

- The Site Health & Safety Officer determines that such action can be accomplished without breaching site safety protocol. This determination will be based on actual monitoring of the pit/trench after it is dug (including, at a minimum, measurements of volatile organics, explosive gases and available oxygen).

- An experienced geotechnical professional determines that the pit/trench is stable or is made stable prior to entrance of any personnel (by grading the sidewalls or using shoring). OSHA requirements (Reference 1) must be strictly implemented.

If these conditions are satisfied, one person will enter the pit/trench. On potentially hazardous waste sites, this individual will be dressed in safety gear as required by the conditions in the pit, usually Level B. He will be affixed to a safety rope and continuously monitored while in the pit.

A second individual will be fully dressed in protective clothing including a self-contained breathing device and on standby during all pit entry operations. The individual entering the pit will remain therein for as brief a period as practical, commensurate with performance of his work. After removing the smeared zone, samples are obtained with a clean trowel or spoon. As an added precaution, it is advisable to keep the backhoe bucket in the test pit when personnel are working below grade. Such personnel can either stand in or near the bucket while performing sample operations. In the event of a cave-in they can either be lifted clear in the bucket, or at least climb up on the backhoe arm to reach safety.

5.1.5 Geotechnical Sampling

In addition to the equipment described in Section 5.1.2, the following equipment is needed for geotechnical sampling:

- Soil sampling equipment, similar to that used in shallow drilled boring (i.e., open tube samplers), which can be pushed or driven into the floor of the test pit.
- Suitable driving (i.e., a sledge hammer) or pushing (i.e., the backhoe bucket) equipment which is used to advance the sampler into the soil.
- Knives, spatulas, and other suitable devices for trimming hand-carved samples.
- Suitable containers (bags, jars, tubes, boxes, etc.), labels, wax, etc. for holding and safely transporting collected soil samples.
- Geotechnical equipment (pocket penetrometer, torvane, etc.) for field testing collected soil samples for classification and strength properties.

Disturbed grab or bulk geotechnical soil samples may be collected for most soils in the same manner as comparable soil samples for chemical analysis. These collected samples may be stored in jars or plastic-lined sacks (larger samples), which will preserve their moisture content. Smaller samples of this type are usually tested for their index properties, to aid in soil identification and classification, while larger bulk samples are usually required to perform compaction tests.

Relatively undisturbed samples are usually extracted in cohesive soils using open tube samplers, and such samples are then tested in a geotechnical laboratory for their strength, permeability and/or compressibility. The techniques for extracting and preserving such samples are similar to those used in performing Shelby tube sampling in borings, except that the sampler is advanced by hand or backhoe, rather than a drill rig. Also, the sampler may be extracted from the test pit by excavation around the sampler when it is difficult to pull it out of the ground. If this excavation requires entry of the test pit the requirements described in Section 5.1.4 must be followed. The open tube sampler shall be pushed or driven <u>vertically</u> into the floor or steps excavated in the test pit at the desired sampling elevations. Extracting tube samples horizontally from the walls of the test pit is not appropriate, because the sample will not have the correct orientation.

A sledge hammer or the backhoe may be used to drive or push the sampler or tube into the ground. Place a piece of wood over the top of the sampler or sampling tube to prevent damage during driving/pushing of the sample. Pushing the sampler with a constant thrust is always preferable to driving it with repeated blows, to minimize disturbance to the sample. If the sample cannot be extracted by rotating it at least two revolutions (to shear off the sample at the bottom), hand excavation to remove the soil from around the sides of the sampler and slice off the sample at its bottom may be required. If this requires entry of the test pit, the requirements in Section 5.1.4 must be followed. Prepare, label, pack and transport the sample in the required manner, as described in SA-6.2, Sample Packaging and Shipping.

Hand-carved block samples are extracted in a similar manner to open tube samples, except that the sampling container (usually a large tube or box with no top or bottom) is not used to cut the sample. Instead, the surrounding sections of the test pit floor are carved away by hand to leave a sample slightly smaller in plan dimensions than the container, with the sample remaining connected to the test pit floor at its bottom. The container is slipped over the sample, and the annular space and top of the sample is covered with melted wax. The bottom of the sample is then sliced away from the test pit floor, the container is inverted, about 1/2 inch of soil removed, and the space filled with melted wax. Caps are then installed, taped, and dipped in hot wax for each end of the container, and the block sample is labeled and shipped in the same manner as a tube sample.

5.2 RECORDS

The following information will be recorded on the test pit/trench log form and in the field notebook:

- Name, work assignment number, and location of job.
- Date of digging or trenching.
- Surface elevation.
- Depth, surface area and orientation of pit or trench.
- Sample numbers.
- Method of taking samples, type and size of samples.
- Approximate water levels after stabilization (if below the water table), and location and depth of any seeps.
- Description of soil.
- Other pertinent information, such as HNU or OVA readings, weather conditions, etc.
- List of photographs.
- Name of contractor, backhoe (or other equipment) operator and sampler.
- Date and type of backfill.

6.0 REFERENCES

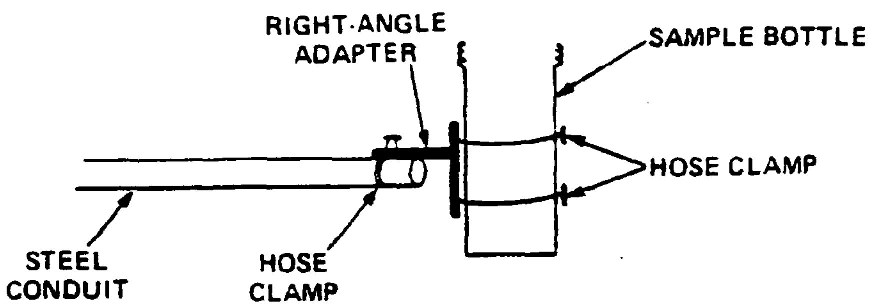
OSHA, 1979. Excavation Trenching and Shoring, 29 CFR 1926.650-653.

7.0 ATTACHMENTS

Attachment A - Remote Sampling/Sample Holder for Test Pit/Trench

ATTACHMENT A
REMOTE SAMPLE HOLDER FOR TEST PIT/TRENCH SAMPLING

REMOTE SAMPLE HOLDER FOR TEST PIT/ TRENCH SAMPLING



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1.0 PURPOSE

This purpose of this procedure is to provide information on chain-of-custody procedures to be used under the NUS Program.

2.0 SCOPE

This procedure describes the steps necessary for transferring samples through the use of Chain-of-Custody Records. A Chain-of-Custody Record is required, without exception, for the tracking and recording of all samples collected for on-site or off-site analysis (chemical or geotechnical) during program activities. Use of the Chain-of-Custody Record Form creates an accurate written record that can be used to trace the possession and handling of the sample from the moment of its collection through analysis and its introduction as evidence. This procedure identifies the necessary custody records and describes their completion.

This procedure does not take precedence over region-specific or site-specific requirements for chain-of-custody.

3.0 GLOSSARY

Chain-of-Custody Record Form - A Chain-of-Custody Record Form is a printed two-part form that accompanies a sample or group of samples as custody of the sample(s) is transferred from one custodian to another custodian. A Chain-of-Custody Record Form is a controlled document, provided by the regional office of EPA.

The chain-of-custody form is a two-page carbon-copy type form. The original form accompanies the samples during shipment, and the pink carbon-copy is retained in the project file.

Controlled Document - A consecutively-numbered form released by EPA or Program Management Office (PMO) for use on a particular work assignment. All unused forms must be returned or accounted for at the conclusion of the assignment.

Custodian - The person responsible for the custody of samples at a particular time, until custody is transferred to another person (and so documented), who then becomes custodian. A sample is under your custody if:

- It is in your actual possession.
- It is in your view, after being in your physical possession.
- It was in your physical possession and then you locked it up to prevent tampering.
- It is in a designated and identified secure area.

Sample - A sample is physical evidence collected from a facility or the environment, which is representative of conditions at the point and time that it was collected.

4.0 RESPONSIBILITIES

Field Operations Leader - Responsible for determining that chain-of-custody procedures are implemented up to and including release to the shipper.

Field Samplers - Responsible for initiating the Chain-of-Custody Record and maintaining custody of samples until they are relinquished to another custodian, to the shipper, or to the common carrier.

Remedial Investigation Leader - Responsible for determining that chain-of-custody procedures have been met by the sample shipper and analytical laboratory.

5.0 PROCEDURES

5.1 OVERVIEW

The term "chain-of-custody" refers to procedures which ensure that evidence presented in a court of law is what it is represented to be. The chain-of-custody procedures track the evidence from the time and place it is first obtained to the courtroom and, secondly, provide security for the evidence as it is moved and/or passes from the custody of one individual to another.

Chain-of-custody procedures, recordkeeping, and documentation are an important part of the management control of samples. Regulatory agencies must be able to provide the chain of possession and custody of any samples that are offered for evidence, or that form the basis of analytical test results introduced as evidence. Written procedures must be available and followed whenever evidence samples are collected, transferred, stored, analyzed, or destroyed.

5.2 SAMPLE IDENTIFICATION

The method of identification of a sample depends on the type of measurement or analysis performed. When in-situ measurements are made, the data are recorded directly in bound logbooks or other field data records, with identifying information.

5.2.1 Sample Label

Samples, other than in-situ measurements, are removed and transported from the sample location to a laboratory or other location for analysis. Before removal, however, a sample is often divided into portions, depending upon the analyses to be performed. Each portion is preserved in accordance with the Sampling Plan. Each sample container is identified by a sample label (see Attachment B). Sample labels are provided by the PMO. The information recorded on the sample label includes:

- **Project:** EPA Work Assignment Number (can be obtained from the Sampling Plan).
- **Station Location:** The unique sample number identifying this sample (can be obtained from the Sampling Plan).
- **Date:** A six-digit number indicating the day, month, and year of sample collection; e.g., 12/21/85.
- **Time:** A four-digit number indicating the 24-hour time of collection (for example: 0954 is 9:54 a.m., and 1629 is 4:29 p.m.).
- **Medium:** Water, soil, sediment, sludge, waste, etc.

- **Concentration**: The expected concentration (i.e., low, medium, high).
- **Sample Type**: Grab or composite.
- **Preservation**: Type of preservation added and pH levels.
- **Analysis**: VOA, BNAs, PCBs, pesticides, metals, cyanide, other.
- **Sampled By**: Printed name of the sampler.
- **Case Number**: Case number assigned by the Sample Management Office.
- **Traffic Report Number**: Number obtained from the traffic report labels.
- **Remarks**: Any pertinent additional information.

Using just the work assignment number of the sample label maintains the anonymity of sites. This may be necessary, even to the extent of preventing the laboratory performing analysis from knowing the identity of the site (e.g., if the laboratory is part of an organization that has performed previous work on the site).

5.2.2 Sample Identification Tag

A Sample Identification Tag (Attachment F) must also be used for samples collected for CLP (Contract Laboratory Program) analysis. The Sample Identification Tag is a w[illegible], waterproof paper label, approximately 3-by-6 inches, with a reinforced eyelet, and string or w[illegible] or attachment to the neck of the sample bottle. The Sample Tag is a controlled document, and i[illegible]ovided by the regional EPA office. Following sample analysis, the Sample Tag is retained by the la[illegible]atory as evidence of sample receipt and analysis.

The following information is recorded on the tag:

- **Project Code**: Work Assignment Number.
- **Station Number**: The middle portion of the Station Location Number, (between the hyphens).
- **Month/Day/Year**: Same as Date on Sample Label.
- **Time**: Same as Time on Sample Label.
- **Designate - Comp/Grab**: Composite or grab sample.
- **Station Location**: Same as Station Location on Sample Label.
- **Samplers**: Same as Sampled By on Sample Label.
- **Preservative**: Yes or No.
- **Analyses**: Check appropriate box(es).

- **Remarks**: Same as Remarks on Sample Label (make sure the Case Number and Traffic Report numbers are recorded).

- **Lab Sample Number**: For laboratory use only.

The tag is then tied around the neck of the sample bottle.

If the sample is to be split, it is aliquoted into similar sample containers. Identical information is completed on the label attached to each split.

Blank, duplicate, or field spike samples shall not be identified as such on the label, as they may compromise the quality control function. Sample blanks, duplicates, spikes, and splits are defined in Procedure SA-6.6.

5.3 CHAIN-OF-CUSTODY PROCEDURES

After collection, separation, identification, and preservation, the sample is maintained under chain-of-custody procedures until it is in the custody of the analytical laboratory and has been stored or disposed of.

5.3.1 Field Custody Procedures

- Samples are collected as described in the site-specific Sampling Plan. Care must be taken to record precisely the sample location and to ensure that the sample number on the label matches the sample log sheet and Chain-of-Custody Record exactly.

- The person undertaking the actual sampling in the field is responsible for the care and custody of the samples collected until they are properly transferred or dispatched.

- When photographs are taken of the sampling as part of the documentation procedure, the name of the photographer, date, time, site location, and site description are entered sequentially in the site logbook as photos are taken. Once developed, the photographic prints shall be serially numbered, corresponding to the logbook descriptions.

- Sample labels shall be completed for each sample, using waterproof ink unless prohibited by weather conditions, e.g., a logbook notation would explain that a pencil was used to fill out the sample label because a ballpoint pen would not function in freezing weather.

5.3.2 Transfer of Custody and Shipment

Samples are accompanied by a Chain-of-Custody Record Form. Chain-of-Custody Record Forms used in EPA Regions I-IV are shown in Attachments A through D. The appropriate form shall be obtained from the EPA Regional Office. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the Record. This Record documents sample custody transfer from the sampler, often through another person, to the analyst in the laboratory. The Chain-of-Custody Record is filled out as follows:

- Enter header information (project number, samplers, and project name -- project name can be obtained from the Sampling Plan).

- Sign, date, and enter the time under "Relinquished by" entry.

- Enter station number (the station number is the middle portion of the station location number, between the hyphens).
- Check composite or grab sample.
- Enter station location number (the same number as the station location on the tag and label).
- Enter the total number of containers per station number and the type of each bottle.
- Enter either the inorganic traffic report number, the organic traffic report number, or the SAS number for each station number in the remarks column.
- Enter the tag number from the bottom of the sample identification tag in the remarks column for each station location.
- Make sure that the person receiving the sample signs the "Received by" entry, or enter the name of the carrier (e.g., UPS, Federal Express) under "Received by." Receiving laboratory will sign "Received for Laboratory by" on the lower line and enter the date and time.
- Enter the bill-of-lading or Federal Express airbill number under "Remarks," in the bottom right corner, if appropriate.
- Place the original (top, signed copy) of the Chain-of-Custody Record Form in the appropriate sample shipping package. Retain the pink copy with field records.
- Sign and date the custody seal, a 1- by 3-inch white paper label with black lettering and an adhesive backing. Attachment G is an example of a custody seal. The custody seal is part of the chain-of-custody process and is used to prevent tampering with samples after they have been collected in the field. Custody seals are provided by ZPMO on an as-needed basis.
- Place the seal across the shipping container opening so that it would be broken if the container is opened.
- Complete other carrier-required shipping papers.

The custody record is completed using black waterproof ink. Any corrections are made by drawing a line through and initialing and dating the change, then entering the correct information. Erasures are not permitted.

Common carriers will usually not accept responsibility for handling Chain-of-Custody Record Forms; this necessitates packing the record in the sample container (enclosed with other documentation in a plastic zip-lock bag). As long as custody forms are sealed inside the sample container and the custody seals are intact, commercial carriers are not required to sign off on the custody form.

If sent by mail, the package will be registered with return receipt requested. If sent by common carrier or air freight, proper documentation must be maintained.

The laboratory representative who accepts the incoming sample shipment signs and dates the Chain-of-Custody Record, completing the sample transfer process. It is then the laboratory's responsibility to maintain internal logbooks and custody records throughout sample preparation and analysis.

5.3.3 Receipt for Samples Form

Whenever samples are split with a private party or government agency, a separate Receipt for Samples Record Form is prepared for those samples and marked to indicate with whom the samples are being split. The person relinquishing the samples to the party or agency shall require the signature of a representative of the appropriate party acknowledging receipt of the samples. If a representative is unavailable or refuses to sign, this is noted in the "Received by" space. When appropriate, as in the case where the representative is unavailable, the custody record shall contain a statement that the samples were delivered to the designated location at the designated time. This form must be completed and a copy given to the owner, operator, or agent-in-charge even if the offer for split samples is declined. The original is retained by the Field Operations Leader.

6.0 REFERENCES

U.S. EPA, 1984. User's Guide to the Contract Laboratory Program, Office of Emergency and Remedial Response, Washington, D.C.

7.0 ATTACHMENTS

Attachment A - Chain-of-Custody Record Form for use in Region I
Attachment B - Chain-of-Custody Record Form for use in Region II
Attachment C - Chain-of-Custody Record Form for use in Region III
Attachment D - Chain-of-Custody Record Form for use in Region IV
Attachment E - Sample Label
Attachment F - Sample Identification Tag
Attachment G - Chain-of-Custody Seal

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		Prepared Earth Sciences	
Subject SAMPLE PACKAGING AND SHIPPING		Approved D. Senovich	

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1.0 PURPOSE

This procedure provides instruction for sample packaging and shipping in accordance with U.S. Department of Transportation (DOT) regulations.

2.0 SCOPE

Samples collected at hazardous waste sites usually have to be transported elsewhere for analysis. This requires that the samples be appropriately preserved to prevent or minimize chemical alteration prior to analysis, and be transported to protect their integrity, as well as to protect against any detrimental effects from leakage or breakage. Regulations for packaging, marking, labeling, and shipping hazardous materials and wastes are promulgated by the U.S. Department of Transportation and described in the Code of Federal Regulations (49 CFR 171 through 177, in particular 172.402h, Packages Containing Samples). In general, these regulations were not intended to cover shipment of samples collected at controlled or uncontrolled hazardous waste sites or samples collected during emergency responses. However, the EPA has agreed through a memorandum of agreement to package, mark, label, and ship samples observing DOT procedures. The information presented here is for general guidance.

This procedure is applicable to all samples taken from uncontrolled hazardous substance sites for analysis at laboratories away from the site.

3.0 GLOSSARY

Carrier - A person or firm engaged in the transportation of passengers or property.

Hazardous Material - A substance or material in a quantity and form which may pose an unreasonable risk to health and safety or property when transported in commerce ("commerce" here to include any traffic or transportation). Defined and regulated by DOT (49 CFR 173.2) and listed in Attachment A of this guideline.

Hazardous Waste - Any substance listed in 40 CFR Subpart D (¥261.20 et seq) or otherwise characterized as ignitable, corrosive, reactive, or EP toxic as specified under 40 CFR Subpart C (¥261.20 et seq) that would be subject to manifest requirements specified in 40 CFR 262. Defined and regulated by EPA.

Marking - Applying the descriptive name, instruction, cautions, weight, or specification marks or combination thereof required to be placed outside containers of hazardous materials.

n.o.i. - Not otherwise indicated.

n.o.s. - Not otherwise specified.

ORM - Other regulated material.

Packaging - The assembly of one or more containers and any other components necessary to assure compliance with the minimum packaging requirements of 49 CFR 174, including containers (other than freight containers or overpacks), portable tanks, cargo tanks, tank cars, multiunit tank car tanks.

Placard - Color-coded, pictorial sign depicting the hazard class symbol and name to be placed on all four sides of a vehicle transporting certain hazardous materials.

Reportable Quantity (RQ) - A parenthetical note of the form "(RQ-1000/454)" following an entry in the DOT Hazardous Materials table (49 CFR 172.101) indicates the reportable quantity of the substance in pounds and kilograms. If a spill of that amount or more of the substance occurs during transit or storage, a report must be filed with DOT according to ¥171.15-15 concerning hazardous materials incidents reports. If the material spilled is a hazardous waste, a report must always be filed, regardless of the amount, and must include a copy of the manifest. If the RQ notation appears, it must be shown either immediately before or after the proper shipping name on the shipping paper (or manifest). Most shipping papers and manifests will have a column designated "HM" which may be used for this purpose.

4.0 RESPONSIBILITIES

Field Operations Leader or Team Sampling Leader - responsible for determining that samples are properly packaged and shipped.

Sampling Personnel - responsible for implementing the packaging and shipping requirements.

5.0 PROCEDURES

5.1 INTRODUCTION

Samples collected for shipment from a site shall be classified as either environmental or hazardous material (or waste) samples. In general, environmental samples are collected off-site (for example from streams, ponds, or wells) and are not expected to be grossly contaminated with high levels of hazardous materials. On-site samples (for example, soil, water, and materials from drums or bulk storage tanks, obviously contaminated ponds, lagoons, pools, and leachates from hazardous waste sites) are considered hazardous. A distinction must be made between the two types of samples in order to:

- Determine appropriate procedures for transportation of samples. If there is any doubt, a sample shall be considered hazardous and shipped accordingly.
- Protect the health and safety of laboratory personnel receiving the samples. Special precautions are used at laboratories when samples other than environmental samples are received.

5.2 ENVIRONMENTAL SAMPLES

5.2.1 Packaging

Environmental samples may be packaged following the procedures outlined in Section 5.4 for samples classified as "flammable liquids" or "flammable solids." Requirements for marking, labeling, and shipping papers do not apply.

Environmental samples may also be packed without being placed inside metal cans as required for flammable liquids or solids.

- Place sample container, properly identified and with a sealed lid, in a polyethylene bag, and seal the bag.
- Place sample in a fiberboard container or metal picnic cooler which has been lined with a large polyethylene bag.
- Pack with enough noncombustible, absorbent, cushioning materials to minimize the possibility of the container breaking.
- Seal large bag.
- Seal or close outside container.

5.2.2 Marking Labeling

Sample containers must have a completed sample identification tag and the outside container must be marked "Environmental Sample." The appropriate side of the container must be marked "This End Up" and arrows placed appropriately. No DOT marking or labeling are required.

5.2.3 Shipping Papers

No DOT shipping papers are required. However, the appropriate chain-of-custody forms must be included with the shipment.

5.2.4 Transportation

There are no DOT restrictions on mode of transportation.

5.3 DETERMINATION OF SHIPPING CLASSIFICATION FOR HAZARDOUS MATERIAL SAMPLES

Samples not determined to be environmental samples, or samples known or expected to contain hazardous materials, must be considered hazardous material samples and transported according to the requirements listed below.

5.3.1 Known Substances

If the substance in the sample is known or can be identified, package, mark, label and ship according to the specific instructions for that material (if it is listed) in the DOT Hazardous Materials Table, 49 CFR 172.101.

Unz and Company have published the following steps to help in locating a proper shipping name from the Hazardous Materials Table, 49 CFR 172.101.

1. Look first for the chemical or technical name of the material, for example, ethyl alcohol. Note that many chemicals have more than one technical name, for example, perchloroethylene (not listed in 172.101) is also called tetrachloroethylene (listed 172.101). It may be useful to consult a chemist for all possible technical names a material can have. If your material is not listed by its technical name then. . . . . .

2. Look for the chemical family name. For example, pentyl alcohol is not listed but the chemical family name is: alcohol, n.o.s. (not otherwise specified). If the chemical family name is not listed then. . . . .

3. Look for a generic name based on end use. For example, Paint, n.o.s or Fireworks, n.o.s. If a generic name based on end use is not listed then. . . . .

4. Look for a generic family name based on end use, for example, drugs, n.o.s. or cosmetics, n.o.s. Finally, if your material is not listed by a generic family name but you suspect or know the material is hazardous because it meets the definition of one or more hazardous classes, then. . . . .

5. You will have to go the the general hazard class for a proper shipping name. For example, Flammable Liquid, n.o.s, or Oxidizer, n.o.s.

5.3.2 Unknown Substances

For samples of hazardous substances of unknown content, select the appropriate transportation category according to the DOT Hazardous Materials Classification (Attachment A), a priority system of transportation categories.

The correct shipping classification for an unknown sample is selected through a process of elimination, utilizing Attachment A. Unless known or demonstrated otherwise (through the use of radiation survey instruments), the sample is considered radioactive and appropriate shipping regulations for "radioactive material" followed.

If a radioactive material is eliminated, the sample is considered to contain "Poison A" materials (Attachment B), the next classification on the list. DOT defines "Poison A" as extremely dangerous poisonous gases or liquids of such a nature that a very small amount of gas, or vapor of the liquids, mixed with air is dangerous to life. Most Poison A materials are gases or compressed gases and would not be found in drum-type containers. Liquid Poison A would be found only in closed containers; however,all samples taken from closed drums do not have to be shipped as Poison A, which provides for a "worst case" situation. Based upon information available, a judgment must be made whether a sample from a closed container is a Poison A.

If Poison A is eliminated as a shipment category, the next two classifications are "flammable" or "nonflammable" gases. Since few gas samples are collected, "flammable liquid" would be the next applicable category. With the elimination of radioactive material, Poison A, flammable gas, and nonflammable gas, the sample can be classified as flammable liquid (or solid) and shipped accordingly. These procedures would also suffice for shipping any other samples classified below flammable liquids in the DOT classification table (Attachment A). For samples containing unknown materials, categories listed below flammable liquids/solids on Attachment A are generally not used because showing that these materials are not flammable liquids (or solids) requires flashpoint testing, which may be impractical and possibly dangerous at a site. Thus, unless the sample is known to consist of materials listed as less hazardous than flammable liquid (or solid) on Attachment A, it is considered a flammable liquid (or solid) and shipped as such.

For any hazardous material shipment, utilize the shipping checklist (Attachment C) as a guideline to ensure that all sample-handling requirements are satisfied.

5.4 PACKAGING AND SHIPPING OF SAMPLES CLASSIFIED AS FLAMMABLE LIQUID (OR SOLID)

5.4.1 Packaging

Applying the word "flammable" to a sample does not imply that it is in fact flammable. The word prescribes the class of packaging according to DOT regulations.

1. Collect sample in the prescribed container with a nonmetallic, Teflon-lined screw cap. To prevent leakage, fill container no more than 90 percent full.

2. Complete sample label and sample identification tag and attach securely to sample container.

3. Seal container and place in 2-mil thick (or thicker) polyethylene bag, one sample per bag. Position sample identification tag so that it can be read through bag. Seal bag.

4. Place sealed bag inside metal can and cushion it with enough noncombustible, absorbent material (for example, vermiculite or diatomaceous earth) between the bottom and sides of the can and bag to prevent breakage and absorb leakage. Pack one bag per can. Use clips, tape, or other positive means to hold can lid securely, tightly and permanently. Mark can as indicated in Paragraph 1 of Section 5.4.2, below.

5. Place one or more metal cans (or single 1-gallon bottle) into a strong outside container, such as a metal picnic cooler or a DOT-approved fiberboard box. Surround cans with noncombustible, absorbent cushioning materials for stability during transport. Mark container as indicated in Paragraph 2 of Section 5.4.2.

5.4.2 Marking/Labeling

1. Use abbreviations only where specified. Place the following information, either hand-printed or in label form, on the metal can (or 1-gallon bottle):

   - Laboratory name and address.

   - "Flammable Liquid, n.o.s. UN1993" or "Flammable Solid, n.o.s. UN1325."

Not otherwise specified (n.o.s) is not used if the flammable liquid (or solid) is identified. Then the name of the specific material is listed before the category (for example, Acetone, Flammable Liquid), followed by its appropriate UN number found in the DOT Hazardous Materials table (49 CFR 172.101).

2. Place all information on outside shipping container as on can (or bottle), specifically:

   - Proper shipping name.
   - UN or NA number.
   - Proper label(s).
   - Addressee and sender.

   Place the following labels on the outside shipping container: "Cargo Aircraft Only" and "Flammable Liquid" (or "Flammable Solid"). "Dangerous When Wet" label shall be used if the solid has not been exposed to a wet environment. "Laboratory Samples" and "THIS SIDE UP" or "THIS END UP" shall also be marked on the top of the outside container, and upward-pointing arrows shall be placed on all four sides of the container.

5.4.3 Shipping Papers

1. Use abbreviations only where specified. Complete the carrier-provided bill of lading and sign certification statement (if carrier does not provide, use standard industry form, see Attachment D). Provide the following information in the order listed (one form may be used for more than one exterior container).

   - "Flammable Liquid, n.o.s. UN1993" or "Flammable Solid, n.o.s. UN1325."
   - "Limited Quantity" (or "Ltd. Qty.").
   - "Cargo Aircraft Only."
   - Net weight (wt) or net volume (vol), just before or just after "Flammable Liquid, n.o.s." or "Flammable Solid, n.o.s.," by item, if more than one metal can is inside an exterior container.
   - "Laboratory Samples" (if applicable).

2. Include Chain-of-Custody Record, properly executed in outside container.

3. "Limited Quantity" of "Flammable Liquid, n.o.s." is limited to one pint per inner container. For "Flammable Solid, n.o.s.," net weight of inner container plus sample shall not exceed one pound; total package weight shall not exceed 25 pounds.

5.4.4 Transportation

1. Transport unknown hazardous substance samples classified as flammable liquids by rented or common carrier truck, railroad, or express overnight package services. Do not transport by any passenger-carrying air transport system, even if they have cargo-only aircraft. DOT regulations permit regular airline cargo-only aircraft, but difficulties with most suggest avoiding them. Instead, ship by airline carriers that only carry cargo.

2. For transport by government-owned vehicle, including aircraft, DOT regulations do not apply. However, procedures described above, with the exception of execution of the bill of lading with certification, shall still be used.

6.0 REFERENCES

U.S. Department of Transportation, 1983. Hazardous Materials Regulations, 49 CRF 171-177.

NUS Standard Operating Procedure SA-6.1 - Sample Identification and Chain-of-Custody

NUS Standard Operating Procedure SA-1.2 - Sample Preservation

NUS Standard Operating Procedure SF-1.5 - Compatibility Testing

7.0 ATTACHMENTS

Attachment A - DOT Hazardous Material Classification (49 CFR 173.2)
Attachment B - DOT List of Class "A" Poisons (49 CFR 172.101)
Attachment C - Hazardous Materials Shipping Checklist
Attachment D - Standard Industry Certification Form

ATTACHMENT B

DOT LIST OF CLASS "A" POISON (49 CFR 172.101)

Material	Physical State at Standard Temperature
Arsine	Gas
Bromoacetone	Liquid
Chloropicrin and methyl chloride mixture	Gas
Chloropicrin and nonflammable,nonliquefied compressed gas mixture	Gas
Cyanogen chloride	Gas (>13.1°C)
Cyanogen gas	Gas
Gas identification set	Gas
Gelatin dynamite (H. E. Germaine)	----
Grenade (with Poison "A" gas charge)	----
Hexaethyl tetraphosphate/compressed gas mixture	Gas
Hydrocyanic (prussic) acid solution	Liquid
Hydrocyanic acid, liquefied	Gas
Insecticide (liquefied) gas containing Poison "A" or Poison "B" material	Gas
Methyldichloroarsine	Liquid
Nitric oxide	Gas
Nitrogen peroxide	Gas
Nitrogen tetroxide	Gas
Nitrogen dioxide, liquid	Gas
Parathion/compressed gas mixture	Gas
Phosgene (diphosgene)	Liquid

ATTACHMENT C
HAZARDOUS MATERIALS SHIPPING CHECKLIST

PACKAGING

1. Check DOT 172.500 table for appropriate type of package for hazardous substance.
2. Check for container integrity, especially the closure.
3. Check for sufficient absorbent material in package.
4. Check for sample tags and log sheets for each sample, and chain-of-custody record.

SHIPPING PAPERS

1. Check that entries contain only approved DOT abbreviations.
2. Check that entries are in English.
3. Check that hazardous material entries are specially marked to differentiate them from any nonhazardous materials being sent using same shipping paper.
4. Be careful all hazardous classes are shown for multiclass materials.
5. Check total amounts by weight, quantity, or other measures used.
6. Check that any limited-quantity exemptions are so designated on the shipping paper.
7. Offer driver proper placards for transporting vehicle.
8. Check that certification is signed by shipper.
9. Make certain driver signs for shipment.

RCRA MANIFEST

1. Check that approved state/federal manifests are prepared.
2. Check that transporter has the following: valid EPA identification number, valid driver's license, valid vehicle registration, insurance protection, and proper DOT labels for materials being shipped.
3. Check that destination address is correct.
4. Check that driver knows where shipment is going.
5. Check that the driver is aware of emergency procedures for spills and accidents.
6. Make certain driver signs for shipment
7. Make certain one copy of executed manifest and shipping document is retained by shipper.

ATTACHMENT D

STANDARD INDUSTRY CERTIFICATION FORM

NO PCS	SIZE	GROSS WEIGHT	H M	D O T PROPER SHIPPING NAME	HAZARD CLASS	CODE		CONTAINER NUMBERS	PIC	BULK
1	55 gal	200 lbs.	x	Nitric Acid, fuming	Oxidizer	SS-[illegible]	C	1	✓	
1	55 gal	450 lbs	x	Flammable liquid, n.o.s.	Flammable liquid	SS-[illegible]	—	2		✓
1	55 gal	250 lbs	x	Flammable liquid, n.o.s.	Flammable liquid	SS-[illegible]	B	3	✓	
1	15 A	12 lbs.	x	Bromine	Corrosive Material	SS-[illegible]	C	4	✓	

SHIPPER'S CERTIFICATION

This is to certify that the above named materials are properly classified, described, packaged, marked and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

____
Shipper's Signature

Placards Req'd ________________

Shipment Date __________ Manifest No __________

Disposer Work Order ________________

Service Order No ________________

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Subject SITE LOGBOOK		Approved D. Senovich	

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1.0 PURPOSE

This procedure describes the process for keeping a site logbook.

2.0 SCOPE

The site logbook is a controlled document which records all major on-site activities during a Remedial Investigation/Feasibility Study. At a minimum, the following activities/events shall be recorded in the site logbook:

- Arrival/departure of site visitors
- Arrival/departure of equipment
- Sample pickup (chain-of-custody form numbers, carrier, time)
- Sampling activities/sample logsheet numbers
- Start or completion of borehole/trench/monitoring well installation or sampling activities
- Health and Safety issues

The site logbook is initiated at the start of the first on-site activity (e.g., initial reconnaissance survey). Entries are made for every day that on-site activities take place which involve RI/FS contractor personnel. One current site logbook is maintained per site.

The site logbook becomes part of the permanent site file maintained in the RI contractor's office. Because information contained in the site logbook may be admitted as evidence in cost recovery or other legal proceedings, it is critical that this document be properly maintained.

3.0 GLOSSARY

Site Logbook - The logbook is a bound notebook with consecutively numbered pages that cannot be removed. Upon entry of data, the logbook requires signature by the responsible site leader (see Section 5.1).

4.0 RESPONSIBILITIES

The site logbook is issued by the Regional Manager (or his designee) to the Site Manager for the duration of the project. The Site Manager releases the site logbook to the Field Operations Leader or other person responsible for the direction of on-site activities (e.g., Reconnaissance Survey Team Leader, Sampling Team Leader). It is the responsibility of this person (or his designee) to keep the site logbook current while in his possession, and return it to the Site Manager or turn it over to another field team. Following the completion of all fieldwork, the site logbook is returned to the Site Manager for inclusion in the permanent site files.

5.0 PROCEDURES

5.1 GENERAL

The cover of each site logbook contains the following information:

- Project Name
- NUS Project Number
- RI/FS Contractor and Site Manager's Name
- Sequential Book Number

- Start Date
- End Date

Daily entries into the logbook may contain a variety of information. At the beginning of each day the following information must be recorded:

- Date
- Start time
- Weather
- All field personnel present
- Any visitors present

During the day, a summary of all site activities and level of personal protection shall be recorded in the logbook. The information need not duplicate that recorded in other field notebooks (e.g., sample logbook, Site Geologist's notebook, Health and Safety Officer's notebook, etc.), but shall summarize the contents of these other notebooks and refer to the page locations in these notebooks for detailed information. An example of a site logbook page is shown in Attachment A.

The sample logsheet for each sample collected (see Procedure SA-6.6) must be referenced. If measurements are made at any location, the measurements and equipment used must either be recorded in the site logbook or reference must be made to the notebook and page number(s) on which they are recorded (see Attachment A).

All entries shall be made in black pen. No erasures are permitted. If an incorrect entry is made, the data shall be crossed out with a single strike mark, and initialed and dated. At the completion of entries by any individual, the logbook must be signed. It must also be signed by the Field Operations Leader or responsible site leader at the end of each day.

5.2 PHOTOGRAPHS

When movies, slides, or photographs are taken of a site or any monitoring location, they are numbered to correspond to logbook entries. The name of the photographer, date, time, site location, site description, and weather conditions are entered in the logbook as the photographs are taken. A series entry may be used for rapid-sequence photographs. The photographer is not required to record the aperture settings and shutter speeds for photographs taken within the normal automatic exposure range. However, special lenses, films, filters, and other image-enhancement techniques must be noted in the logbook. If possible, such techniques shall be avoided, since they can adversely affect the admissibility of photographs as evidence. Chain-of-custody procedures depend upon the subject matter, type of film, and the processing it requires. Film used for aerial photography, confidential information, or criminal investigation require chain-of-custody procedures. Adequate logbook notation and receipts may be used to account for routine film processing. Once processed, the slides of photographic prints shall be serially numbered and labeled according to the logbook descriptions.

6.0 REFERENCES

None.

7.0 ATTACHMENTS

Attachment A - Typical Site Logbook Entry

ATTACHMENT A
TYPICAL SITE LOGBOOK ENTRY

START TIME: ____________ DATE: ____________

SITE LEADER: ____________________
PERSONNEL:

NUS	DRILLER	EPA

WEATHER: Clear, 68°F, 2-5 mph wind from SE

ACTIVITIES:

1. Steam jenney and fire hoses were set up.

2. Drilling activities at well ______ resumes. Rig geologist was ______________. See Geologist's Notebook, No. 1, page 29-30, for details of drilling activity. Sample No. 123-21-S4 collected; see sample logbook, page 42. Drilling activities completed at 11:50 and a 4 inch stainless steel well installed. See Geologist's Notebook, No. 1, page 31, and well construction details for well ________.

3. Drilling rig No. 2 steam-cleaned at decontamination pit. Then set up at location of well ________.

4. Well ________ drilled. Rig geologist was ____________________. See Geologist's Notebook, No. 2, page ______ for details of drilling activities. Sample numbers 123-22-S1, 123-22-S2, and 123-22-S3 collected; see sample logbook, pages 43, 44, and 45.

5. Well ________ was developed. Seven 55-gallon drums were filled in the flushing stage. The well was then pumped using the pitcher pump for 1 hour. At the end of the hour, water pumped from well was "sand free."

6. EPA remedial project manger arrives on-site at 14:25 hours.

7. Large dump truck arrives at 14:45 and is steam-cleaned. Backhoe and dump truck set up over test pit ____________.

8. Test pit ________ dug with cuttings placed in dump truck. Rig geologist was ______________. See Geologist's Notebook, No. 1, page 32, for details of test pit activities. Test pit subsequently filled. No samples taken for chemical analysis. Due to shallow groundwater table, filling in of test pit _____ resulted in a very soft and wet area. A mound was developed and the area roped off.

9. Express carrier picked up samples (see Sample Logbook, pages 42 through 45) at 17:50 hours. Site activities terminated at 18:22 hours. All personnel offsite, gate locked.

____
Field Operations Leader

NUS CORPORATION ENVIRONMENTAL MANAGEMENT GROUP	STANDARD OPERATING PROCEDURES	Number: SF-2.2 Page: 1 of 5 Effective Date: 05/04/90 Revision: 1 Applicability: EMG Prepared: Earth Sciences Approved: D. Senovich
Subject: WASTE HANDLING		

TABLE OF CONTENTS

1.0 PURPOSE

The purpose of these procedures is to provide general reference information on the control of contaminated materials.

2.0 SCOPE

This procedure describes methods of handling contaminated material during remedial investigation activities. These activities often results in the production or relocation of contaminated materials that must be properly managed to protect the public and the environment as well as to meet legal requirements.

These guidelines are for information only and are not to take precedence over the requirements of project specific plans for the control of contaminated materials.

3.0 GLOSSARY

None.

4.0 RESPONSIBILITIES

Site Manager - Responsible for selecting an appropriate disposal method for contaminated material which may be generated during RI activities.

Field Operations Leader - Responsible for carrying out the requirements established in the Field Operation Plan and overall management of field activities.

5.0 PROCEDURES

5.1 OVERVIEW

For the purposes of these procedures, contaminated materials are defined as any byproducts of a field investigation that are suspected or known to be contaminated with hazardous substances. These byproducts include such materials as decontamination solutions, disposable equipment, drilling muds, well-development fluids, and spill-contaminated materials.

The procedures for obtaining permits for investigations of sites containing hazardous substances are not clearly defined at present. In the absence of a clear directive to the contrary by the EPA and the states, it must be assumed that hazardous wastes generated during investigations will require compliance with Federal agency requirements for generation, storage, transportation, or disposal. In addition, there may be state regulations that govern the disposal action. This procedure will exclusively describe the technical methods used to control contaminated materials.

The work plan for a site investigation must include a description of control procedures for contaminated materials. This planning strategy would assess the type of contamination, estimate the amounts that would be produced, describe containment equipment and procedures, and delineate storage or disposal methods. As a general policy, it is wise to select investigation methods that minimize the generation of contaminated spoils. Handling and disposing of potentially hazardous materials are expensive and dangerous. Until sample analysis is complete, it is assumed that all produced materials suspected of contamination from hazardous chemicals will always require containment.

5.2 SOURCES OF CONTAMINATED MATERIALS AND CONTAINMENT METHODS

5.2.1 Decontamination Solutions

All decontamination solutions and rinses must be assumed to contain the hazardous chemicals associated with the site unless there are analytical or other data to the contrary. The solution volumes could vary from a few gallons to several hundred gallons in cases where large equipment required cleaning.

Containerized rinse solutions such as those recommended for the personnel decontamination station are best stored in 55-gallon drums (or equivalent containers) that can be sealed until ultimate disposal at an approved facility. Larger equipment such as backhoes and tractors should be decontaminated in an area provided with an impermeable liner and a liquid collection system. A decontamination area for large equipment could consist of a bermed concrete pad with a floor drain leading to a buried holding tank.

5.2.2 Disposal Equipment

Disposable equipment that could be contaminated during a site investigation typically includes rubber gloves, boots, broken sample containers, and laboratory tissues. These items are small and can easily be contained in 55-gallon drums with lids. These containers should be closed at the end of each work day and upon project completion to provide secure containment.

5.2.3 Drilling Muds and Well-Development Fluids

Drilling muds and well-development fluids are materials used in groundwater monitoring well installations. Their proper use could results in the surface accumulation of contaminated liquids and muds that require containment. Often monitoring wells are placed off the site to determine if hazardous chemicals have migrated below ground. These offsite wells require especially careful management since they threaten contamination of offsite property.

The volumes of drilling muds and well-development fluids used depend on well diameter and depth, groundwater characteristics, and geologic formations. There are no simple mathematical formulas available for accurately predicting these volumes. It is best to rely on the experience of reputable well drillers familiar with local conditions and the well installation techniques selected. These individuals should be able to estimate the sizes of containment structures required. Since guesswork is involved, one should always be prepared so halt drilling or other well-development operations if more containment capacity is needed.

Drilling fluid (mud) is mixed and stored in a container commonly referred to as a mud pit. This mud pit consists of a suction section from which drilling fluid is withdrawn and pumped through hoses and down the drill pipe to the bit and back up the hole to the settling section of the mud pit. In the settling section, the fluid velocity is reduced by a screen and several flow-restriction devices, thereby allowing the well cuttings to settle out of the fluid.

The mud pit may be either portable above-ground tanks commonly made of steel which is preferred or stationary in-ground pits (Figure 5-1). The above-ground tanks have a major advantage over the in-ground pits because the tanks isolate the natural soils from the contaminated fluids within the drilling system. The tanks are also portable and can usually be cleaned easily.

As the well is drilled, the sediments that accumulate in the settling section must be removed. This is best done by shoveling them into drums or other similar containers. When the drilling is complete, the contents of the above-ground tank are likewise shoveled or pumped into drums, and the tank is cleaned and available for use.

If in-ground pits are used, they should not extend into the natural water table. They should also be lined with a bentonite-cement mixture followed by a layer of flexible impermeable material such as plastic sheeting. Of course, to maintain its impermeable seal, the material used would have to be nonreactive with the wastes. An advantage of the in-ground pits is that well cuttings do not necessarily have to be removed periodically during drilling because the pit can be made deep enough to contain them. Depending on site conditions, the in-ground pit may have to be totally excavated and refilled with uncontaminated natural soils when the drilling operation is complete.

When the above-ground tank or the in-ground pit is used, a reserve tank or pit should be located at the site as a backup system for leaks, spills, and overflows. In either case, surface drainage should be such that any excess fluid could be controlled within the immediate area of the drill site.

The containment procedure for well-development fluids is similar to that for drilling fluids. The volume and weight of contaminated fluid will be determined by the method of development. When a new well is bailed to produce clear water, substantially less volume and weight of fluid result than when backwashing or high-velocity jetting is used.

5.2.4 Spill-Contaminated Materials

A spill is always possible when a site investigation involves opening and moving containers of liquids. Contaminated sorbents and soils resulting from spills will have to be contained. Small quantities of spill-contaminated materials are usually best contained in drums, while larger quantities can be placed in lined pits or in other impermeable structures. In some cases on-site containment may not be feasible, and immediate transport to an approved disposal site will be required.

5.3 DISPOSAL OF CONTAMINATED MATERIALS

Actual disposal techniques for contaminated materials are the same as those for any hazardous substance--incineration, landfilling, treatment, and so on. The problem centers around the assignment of responsibility for disposal. The responsibility must be determined and agreed upon by all involved parties before the field work starts. If the site owner or manager was involved in activities that precipitated the investigation, it seems reasonable to encourage his acceptance of the disposal obligation. In instances where a responsible party cannot be identified, this responsibility may fall on the public agency or private organization investigating the site.

Another consideration in selecting disposal methods for contaminated materials is whether the disposal can be incorporated into subsequent site cleanup activities. For example, if construction of suitable onsite disposal structure is expected, contaminated materials generated during the investigation should be stored at the site for disposal with other site materials. In this case, the initial containment structures should be evaluated for use as long-term storage structures. Also, other site conditions such as drainage control, security, and soil type must be considered so that proper storage is provided. If onsite storage is expected, then the limited containment structures should be designed for that purpose.

6.0 REFERENCES

NUS Corporation: Standard Operating Procedure No. 4.33, Control of Contaminated Material

B

APPENDIX B

FIELD FORMS

Brown & Root Environmental

SAMPLE LOG SHEET

[ ] SURFACE SOIL
[ ] SUBSURFACE SOIL
[ ] SEDIMENT
[ ] LAGOON/POND
[ ] OTHER

SAMPLERS SIGNATURE________________

SITE NAME________________

SITE NUMBER________________

SAMPLE No.	SAMPLE METHOD	DEPTH (FT)	DATE	TIME	SAMPLED BY	CONCENTRATION (L)LOW (H)HIGH	(G)GRAB (C)COMPOSITE	ANALYSES							No. OF CONT TOTAL	SOIL DESCRIPTION

REMARKS:

LAB:

ACAD: FORMS\LOG DWG 2/11/93 MB

DAILY ACTIVITIES RECORD

Brown & Root Environmental

PROJECT ______________ LOCATION ______________

CLIENT ______________ ARRIVAL TIME ______ JOB NO. ______

DATE ______________ DEPARTURE TIME ______________

CONTRACTOR ______________ DRILLER ______________

BORING NO. ______________ HNUS REPRESENTATIVE

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

COMMENTS: ______________

APPROVED BY:

HNUS FIELD REPRESENTATIVE

DRILLER OR REPRESENTATIVE

Brown & Root Environmental

EQUIPMENT CALIBRATION LOG

Instrument (Name/Model No./Serial No.): ______________________

Manufacturer ______________________ Date Purchased ______________

Calibration Date	Initial Settings	Standard/Gas Used	Procedure	Adjustments Made	Final Settings	Signature	Comments

TEST PIT LOG

Brown & Root Environmental

PROJECT: TEST PIT NO.:

PROJECT NO. DATE:

LOCATION:

FIELD GEOLOGIST:

DEPTH (Ft.)	LITHOLOGY CHANGE (Depth, Ft.)	MATERIAL DESCRIPTION (Soil Density / Consistency, Color)	USCS	REMARKS

Test Pit Cross Section and / or Plan view

REMARKS

PHOTO LOG

TEST PIT

PAGE ___ OF ___