5060-017-314

FIELD SAMPLING AND ANALYSIS PLAN FOR BUILDINGS 33 AND 34 NETC GOULD ISLAND, NEWPORT, RHODE ISLAND

PREPARED BY:
ENSR CONSULTING & ENGINEERING

SUBMITTED BY:
HALLIBURTON NUS ENVIRONMENTAL CORPORATION

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN) PROGRAM

CONTRACT NO. N62472-90-D-1298
CONTRACT TASK ORDER (CTO) NO. 36

APRIL 1992

HALLIBURTON NUS
Environmental Corporation

Donohue ENGINEERS ARCHITECTS SCIENTISTS

ENSR™

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COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN) PROGRAM

Submitted to:
Northern Division
Environmental Branch, Code 18
Naval Facilities Engineering Command
Building 77-L, U.S. Naval Base
Philadelphia, PA 19112-5094

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Contract No. N62472-90-D-1298
Contract Task Order Number 0036

APRIL 1992

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1.1 FACILITY DESCRIPTION

The Naval Education and Training Center (NETC) Gould Island Annex is located on Gould Island in Narragansett Bay, west of Newport, Rhode Island (Figure 1-1). The northern end of the island is occupied by structures identified as Buildings 33 (the former Power Plant) and 34 (the former Acetylene Building). The Quonset hut adjacent to these buildings, originally included in the scope of work, is not included in this plan, since a site visit conducted by ENSR on March 3, 1992 did not reveal any indications of hazardous material.

Building 33 - Power Plant

According to the file information from NETC, Building 33 was used to supply compressed air, electricity, and steam for process and heating purposes. This file information describes the following equipment in the powerhouse:

- Four (4) diesel engine-driven generators;
- Five (5) diesel engine-driven air compressors;
- Four (4) synchronous motor-driven air compressors;
- One (1) electric motor-driven fire pump;
- One (1) gasoline engine-driven fire pump;
- Four (4) low pressure, hand-fired heating boilers; and
- One (1) high pressure, hand-fired heating boiler.

Other file information indicates that one diesel generator and one generator in the boilerhouse were added in 1942. Additional auxiliary equipment is also described, such as a switchboard, accumulators for compressed air, motor-generators, network transformers, and pumps. Twelve compressed gas cylinders of unconfirmed content have also been identified in Building 33.

Building 33 is a single story structure with a basement. The total area of Building 33 is 24,642 square feet. The building is divided into three main areas: the boiler house, with five boilers; the pump area; and the powerhouse. The south end of the powerhouse contains four diesel generators. The northern end contains six large compressors and four smaller compressors.

Building 34 - Acetylene Building

Building 34 is described as the acetylene generator building on a site plan found in the files, with an area covering 1,204 square feet. This building was constructed in 1942. Due to the overgrown vegetation, access to the building is difficult. One document reviewed noted this building has a basement and piping, which will need to be accessed during this project. There were, however, no hazardous materials observed either outside or inside the main part of the building.

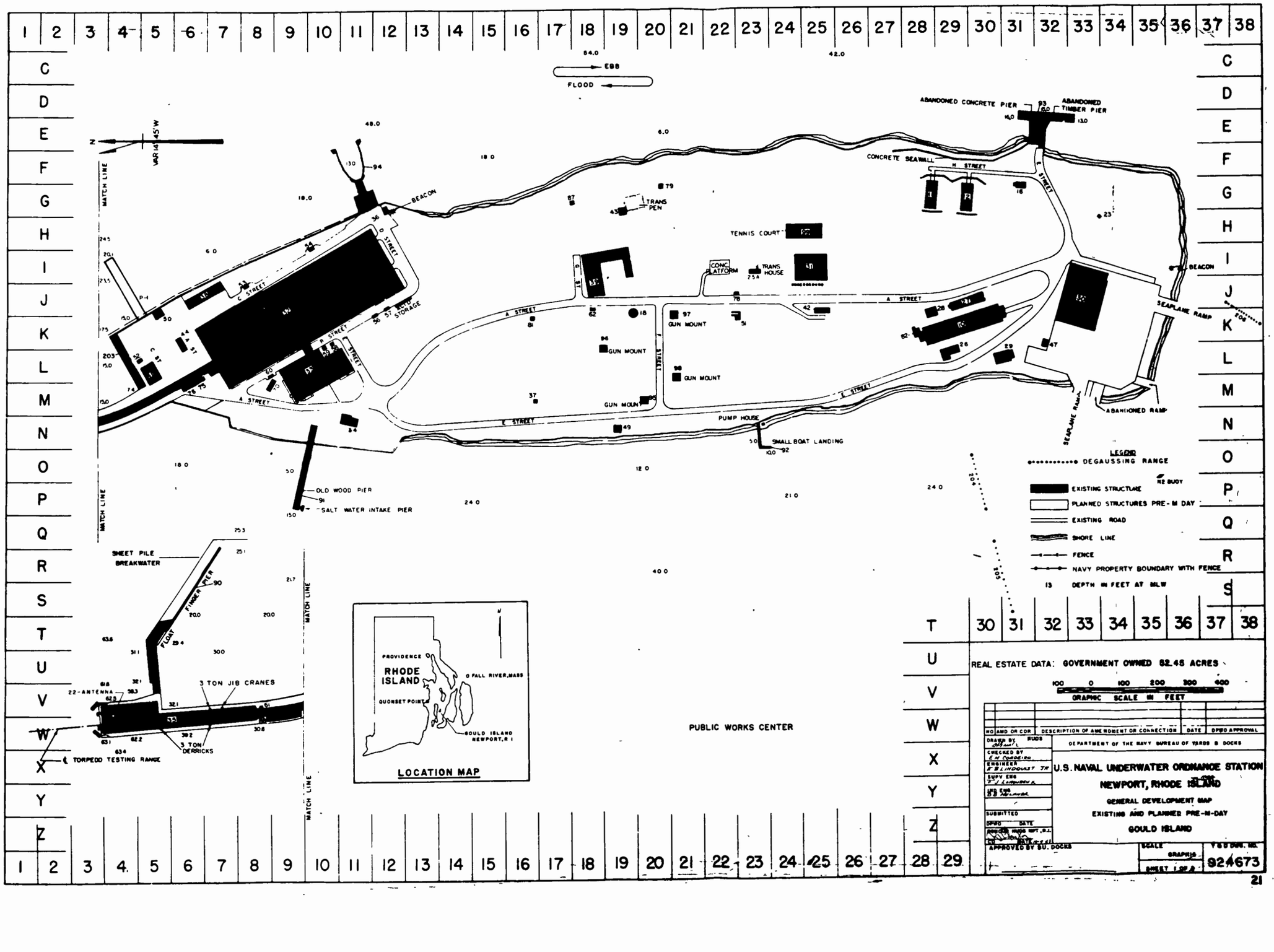


FIGURE 1-1
FACILITY LOCATION MAP
NETC GOULD ISLAND
NEWPORT, RI

1.2 INVESTIGATION OBJECTIVE

The primary objective of this investigation is to determine if any hazardous materials are present in and around Buildings 33 and 34 so that the Navy can remove and dispose of these materials off-site prior to the demolition of the buildings. The focus during this operation will be to identify, sample, and classify any materials or wastes contained in drums, pails, machinery, pits or other containers or devices on-site.

1.3 PROJECT ORGANIZATION AND RESPONSIBILITIES

The field activities to be conducted to accomplish the above project objective and carry out the Navy's Statement of Work, dated 12 November 1991, will be performed by a HALLIBURTON NUS Field Team consisting of ENSR Consulting and Engineering (ENSR) personnel and subcontractors. The project coordination, direction and reporting will be accomplished by designated managers and technical points-of-contact between the Northern Division Naval Facilities Engineering Command (NFEC), HALLIBURTON NUS Environmental Corporation (HALLIBURTON NUS), and ENSR. A project organization chart depicting the individuals involved in the management and field activities for this investigation are presented on Figure 1-2.

Specific responsibilities and assignments have been given to each member of the HALLIBURTON NUS Field Team and these are generally listed as:

- Carol Bois, Technical Manager: (i) coordinate the field program (ii) determine sample locations and number of samples (iii) oversee the field operations.

- John Rice, Sampler and Notetaker: (i) mobilization and demobilization on site; (ii) preparation of waste materials inventory, (iii) collection and labelling of samples for field testing and lab analysis, and (iv) preparation of a waste inventory map.

- Charles Martin, Field Team Leader, Site Safety Officer and Logbook keeper: (i) mobilization and demobilization on site; (ii) maintain the Site Logbook, (iii) monitoring for hazardous conditions; (iv) brief all subcontractors on HASP elements; and (v) prepare documentation for laboratory analysis.

The Project Manager, Steven Croce, will be in daily contact with the HALLIBURTON NUS Field Team to obtain the investigation's status, provide key decision-making, track subcontractors' performance, and resolve problems with coordination as appropriate within the Project Organization.

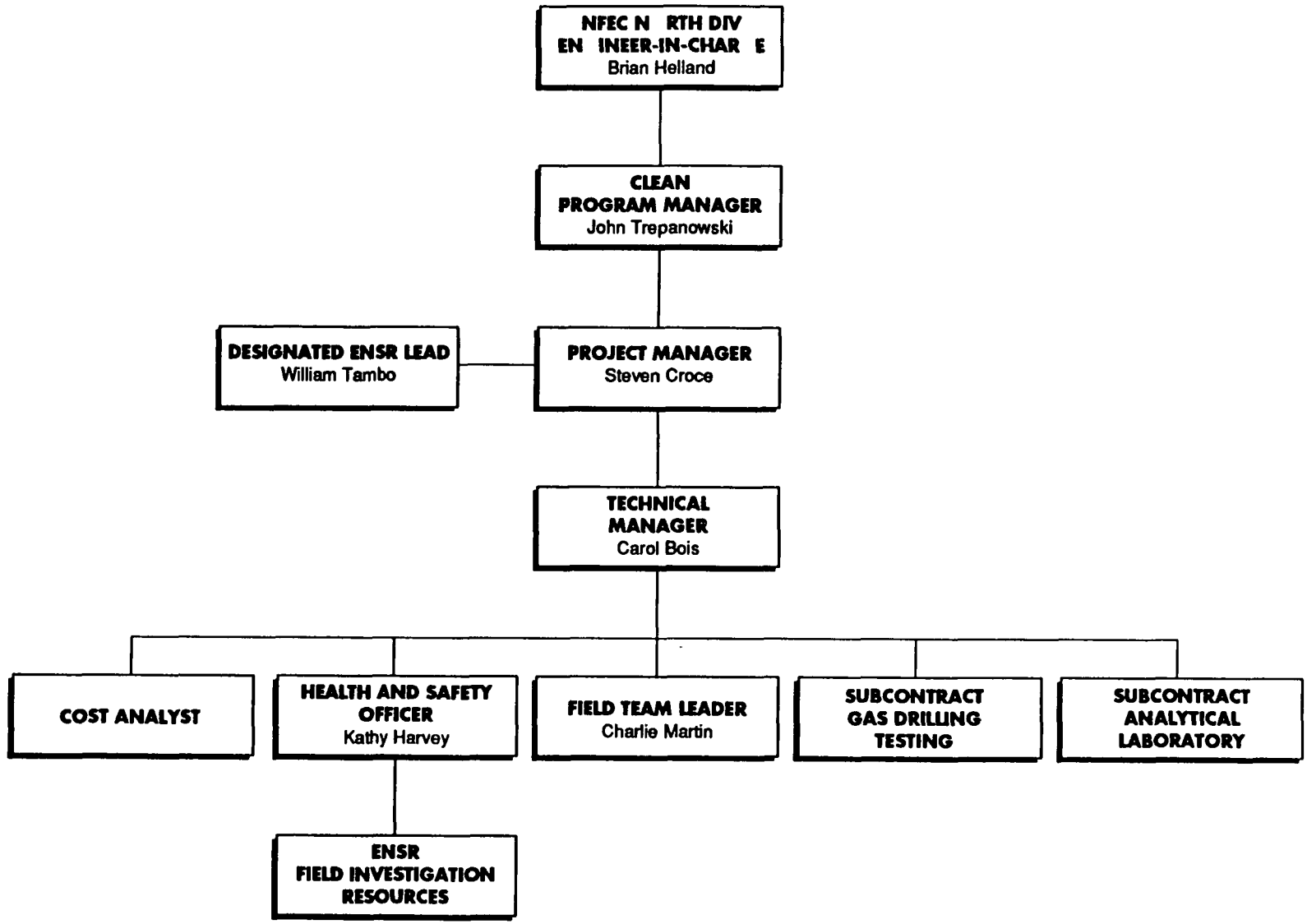


FIGURE 1-2

HALLIBURTON NUS Team Project Organization Chart

2.0 INVESTIGATION KICK-OFF MEETING

Prior to commencing the field investigation activities, the HALLIBURTON NUS Field Team will meet with the appropriate NETC personnel to discuss the following:

- Planned investigative activities
- Health and safety pre-entry briefing
- Logistics for transporting equipment and personnel
- Schedule for implementation of field activities

Communication links and emergency procedures will be discussed in detail in the event of an accident or need to evacuate the Facility.

All health and safety checks (i.e. fit-tests and emergency response) will be performed, and subcontract documentation on medical monitoring and training will have been received prior to conducting field activities.

The HALLIBURTON NUS Field Team assignments and areas of concern will be reviewed concerning escorting and participation in subcontractor activities involving gas cylinder inspection and sampling.

The HALLIBURTON NUS Field Team will have appropriate reference documents available on site relating to health and safety issues, and standard operating procedures and forms. The pertinent documents to be referenced and followed are:

- CLEAN Quality Control Management Plan (QCMP) and Standard Operating Procedures, Vol. 1 and 2 (Refs. 1 & 2), dated August 1991.
- Health and Safety Plan for Buildings 33 and 34 Waste Sampling and Analysis Investigation at NETC, Gould Island Annex, dated April 13, 1992.

3.0 FIELD INVESTIGATION

3.1 PRE-SAMPLING INVENTORY

Prior to initiation of sampling, the HALLIBURTON NUS Field Team will inspect the buildings to locate and inventory all structures, containers and equipment which may contain hazardous materials, and will require sampling and analysis. The identified structures, containers or equipment will be assigned an alpha numeric identification number and labeled. The identification number will be entered into the field log book along with a detailed description of the anticipated hazardous material to be sampled and analyzed for, the estimated volume of material, a description of the container and the container location. All inventoried units will be accurately located on a NETC facility map of appropriate scale and detail.

3.2 COMPRESSED GAS CYLINDER TESTING

Testing of four of the 12 compressed gas cylinders in Building 33 will be conducted by a subcontractor. The cylinder testing will be conducted in accordance with technical specifications which were submitted to the potential subcontractors for bids. The subcontractor is responsible for all cylinder handling activities including sample collection, characterization and securing the cylinders on site for storage prior to offsite disposal. A Work Plan (Appendix A) for the gas cylinder testing will be submitted as an addendum to this FSAP upon the selection and award of the subcontract for the gas cylinder testing.

Eight of the cylinders appear to be fire extinguishers. Of the remaining four, the markings indicate contents as follows:

- One unknown cylinder in the southeast corner of the building.
- One labelled "oxygen", painted green (northeast corner).
- One labelled "acetylene", painted yellow (northeast corner).
- One labelled "helium", green with an orange band (northwest corner).

The cylinder marked "helium" was originally located in Building 35, but was not sampled in the investigation of that building. It will be sampled as part of the gas cylinder testing program.

The HALLIBURTON NUS Field Team will continually monitor the ambient air using an HNu device for the presence of hazardous atmospheres while the subcontractor is conducting their gas cylinder investigations. The Field Team will also assist the subcontractor in their mobilization/demobilization at the site. The Point-of-Contact (POC) for this responsibility will be the HALLIBURTON NUS Field Team Leader. The FTL will, at a minimum, coordinate with the subcontractor on such items as:

- Determining which gas testing parameters to analyze for each cylinder.
- Determining whether cylinder is empty, and if so, whether it is to be cut into scrap.
- Any procedural changes other than those outlined in Work Plan.

3.3 ELECTRICAL EQUIPMENT INSPECTION

The HALLIBURTON NUS Field Team will conduct a thorough investigation of both buildings to develop an inventory and identify the location of all electrical equipment which may contain hazarous materials. The electrical equipment inspection will:

- Identify the likely use of such equipment.
- Indicate where hazardous dielectric fluids and/or lubricants could be present.
- Inventory the equipment on-site using an alphanumeric labeling system.
- Indicate the locations of the electrical equipment on a facility map.

All inspection observations will be recorded in the field log book. A member of the HALLIBURTON NUS Field Team will assign an alphanumeric label to each electrical unit to be sampled and locate each unit on the NETC facility map to complete the waste materials inventory.

The results of this inspection will aid the HALLIBURTON NUS Field Team in determining the number of electrical fluids samples to be collected for field testing purposes. The inspection results will also prevent unnecessary disassembly of equipment where fluids are not present.

3.4 SAMPLING REQUIREMENTS

ENSR's preliminary inventory during a site visit on March 3, 1992, identified specific containers, tanks and areas which would need to be sampled. Table 3-1 outlines the general locations, type and number of samples to be collected in Building 33. Figure 3-1 is a plan of the building and waste inventory. Based on the site visit, Building 34 is not anticipated to contain any materials to be sampled; however, the HALLIBURTON NUS Field Team will conduct a thorough reconnaissance of the building as part of this task and be prepared to obtain necessary additional samples.

In general, oil samples will be collected from available ports in the equipment (e.g., generators, compressors, and electrical equipment). Where possible, composite samples will be collected within each of the five main areas in the building. Solid samples will be collected with a stainless steel spoon. Liquid samples will be collected directly into the sample container, or into a smaller clean container which will be used to transfer the material into the sample jar. All sampling equipment will be decontaminated in between samples to ensure that no cross-contamination occurs.

Water was observed in the sumps near the diesel generators and in the basement. A review of previous analyses performed in 1986 by Thibault & Associates of Providence, RI (see Appendix B) indicates that the water in both areas did not contain PCBs greater than 1 ppm; it also did not contain pesticides or herbicides. Total metals results did not indicate significant levels. Therefore, the water that has collected in various locations in the building will not be sampled or analyzed.

One quart of each sample will be collected to allow the laboratory to perform compatibility testing and subsequent waste disposal analysis. The samples will be labelled and placed on ice in a cooler. The Field Team Leader (FTL) will be responsible for ensuring that proper documentation, sample collection, and sample preservation methods are followed.

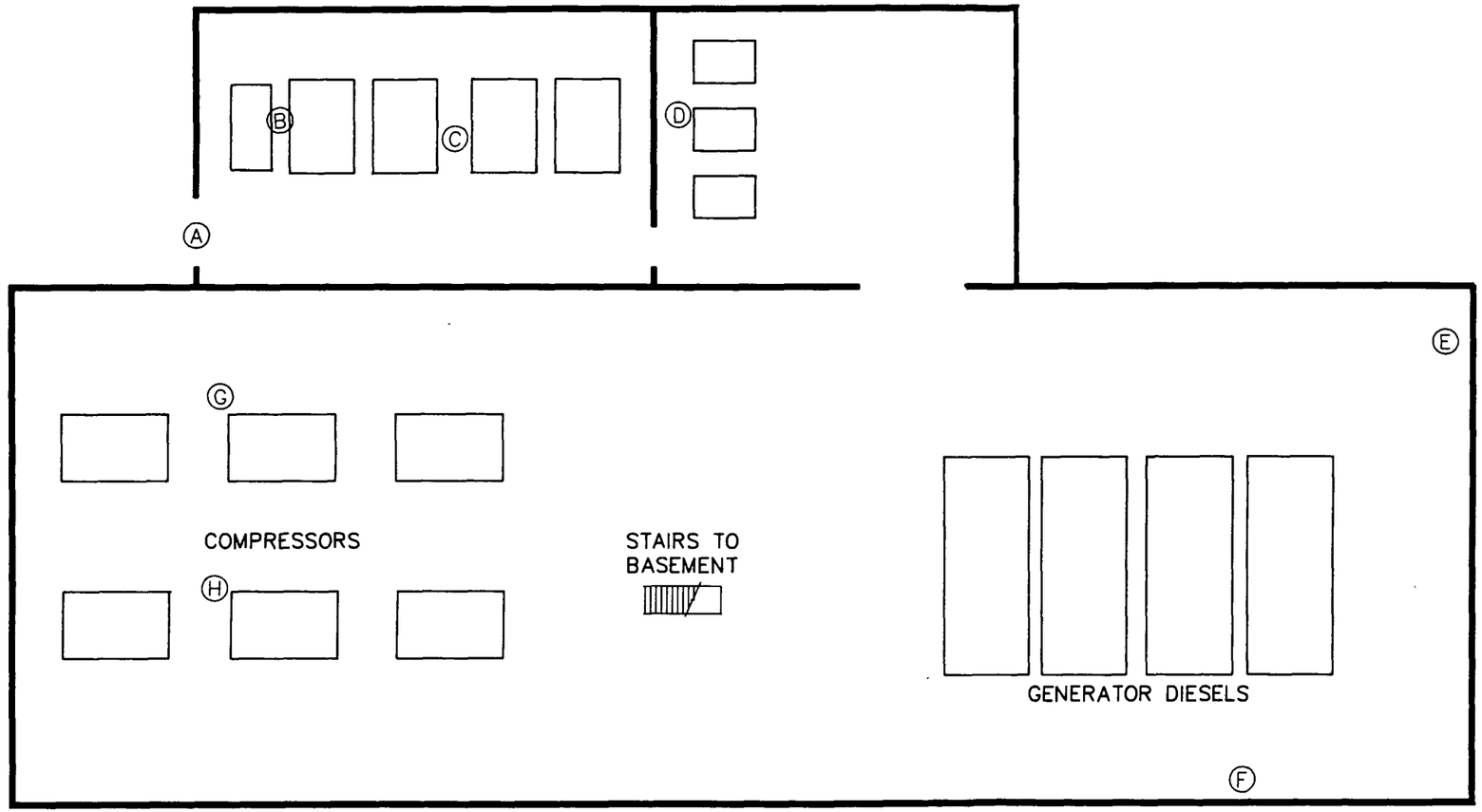
TABLE 3-1

SAMPLES FOR COMPATIBILITY TESTING
GOULD ISLAND, RI

Area	Description of Material	Existing Container	No. Samples/Type		
			Solid	Liquid	Oil
Boiler House	Sodium Sulfite	(10) 50-lb. bags	2		
	Oil	(3) 5-gall. pails			1
	Hardened Material	(1) 5-gall. pail	1		
	Oil	Piping/equipment			2
Pump Area	Oil	Piping/equipment			1
Generator Area	Oil	(1) 5-gall. pail			1
	Oil	Piping/equipment			1
Compressor Area	Oil	Piping/Equipment			2
	Glycerine	(1) Pint Bottle		1	
Basement	Protective Coating	(1) 5-gall. pail		1	
	Rustoleum	(1) 5-gall. pail		1	
	Oil	Piping/Tanks/Equipment		1	
Total Samples/Media[1]			3	4	8
1 Duplicate (QA/QC)				1	
Total Samples[2]			3	5	8

Notes: 1 Subtotal number of all solid, liquid and oil field samples, not including QA/QC samples

2 Total number of all solid, liquid, oil and QA/QC samples



LOCATIONS

Ⓐ PAIL WITH HARDENED MATERIAL

Ⓑ 10 BAGS SODIUM SULFITE

Ⓒ 3 PAILS WITH OIL AND WATER/OIL

Ⓓ SEDIMENT/DIRT IN PIPING TRENCH

Ⓔ INSULATING OIL/GAS CYLINDER

Ⓕ 2 PAILS (RUSTED)/OILY SURFACE

Ⓖ GAS CYLINDER (ACETYLENE)/GAS CYLINDER (OXYGEN)

Ⓗ 1 PINT BOTTLE (GLYCERINE)

REF: POWER AND BOILER HOUSE FLOOR PLAN
JAN. 28, 1942; JOHN BRACKETT, NY, NY

20 0 20 40

SCALE IN FEET

ENSR CONSULTING & ENGINEERING

FIGURE 3-1
WASTE INVENTORY BUILDING 33 (POWER HOUSE)
NETC GOULD ISLAND
NEWPORT, RI

DRAWN BY:	DATE:	PROJECT NO
FD	4/92	5060-017

5060148

The documentation for each sample to be collected during this investigation will be provided on a Sample Log Sheet to be completed by the HALLIBURTON NUS Field Team. An example of the Sample Log Sheet is provided in Appendix C, and is referenced to the CLEAN QCMP, SOP SA-6.4.

4.0 SAMPLING METHODOLOGIES

4.1 PROCEDURES

A one quart sample of material will be obtained from each container and/or area covered in the inventory outlined in Section 3.0. Each container will be sampled following a method which is safest and most convenient for that container. Prior to sample collection, and where practical based on container type, the material will be inspected to identify all phase separations.

If possible, tanks will be sampled from the top. However, the physical size, shape, construction material, and location of access will determine the best methods of opening and sampling. Most tanks are open at the top. Tanks will be sampled in accordance with the CLEAN QCMP, SOP SA-5.3, Tank Sampling (see Appendix C). If both a liquid and a sludge exist in a single container or area, the liquid will be sampled first so as to avoid the sludge being disturbed and mixing with the liquid sample. The equipment required for sampling of the tanks will be dependent on the sampling situation. Types of equipment used may include polyethylene dippers or bailers. Because most of the tanks are almost empty, a polyethylene dipper will likely be the most commonly used equipment utilized in acquiring samples.

Trenches and pits will be sampled in a similar manner as tanks. Again, most trenches and pits are open at the top.

Drums and other small containers will be opened and sampled in accordance with the CLEAN QCMP, SOP SA-5.1, Drum Opening and Sampling. Drums will typically be sampled with a glass sampling thief. With small containers (5 gallons or less), a disposable polyethylene syringe or plastic scoop may be used for sampling. Where possible, similar materials (such as small amounts of oil) from the same area will be composited to obtain a sample.

Mechanical and electrical devices with fluid reservoirs will be top sampled if direct access to the reservoir is possible. Otherwise, the sample will be obtained from the fill or drain plug, if one exists. Sampling from small openings may require the use of a syringe or peristaltic pump and a short piece of plastic tubing.

4.2 EQUIPMENT DECONTAMINATION

To prevent cross contamination between sample locations, all reusable equipment will be decontaminated before reuse in accordance with the CLEAN QCMP, SOP SF-2.3, Decontamination of Chemical Sampling and Field Analytical Equipment. The following steps will be followed for proper equipment decontamination:

- Potable water rinse
- Liquinox detergent wash
- Scrubbing of the equipment if heavily contaminated
- Potable water rinse
- Rinse with 10 percent nitric acid solution
- Deionized water rinse

- Methanol rinse
- Hexane rinse
- Deionized water rinse
- Air dry

If stainless steel equipment is used the nitric acid rinse step will be omitted due to the low pH of nitric acid, which may potentially leach metals. The hexane rinse step will only be used when sampling for pesticides, PCBs, or fuels.

All decontamination fluids will be contained and labelled by the HALLIBURTON NUS Field Team, and left on site for disposal by NETC. Similarly, the unused sample volumes from field testing and sample compositing will be appropriately segregated into containers and labeled by the HALLIBURTON NUS Field Team, and left on site for disposal by NETC.

4.3 REPRESENTATIVE SAMPLE COLLECTION

Representative samples will be obtained through both grab sampling and composite sampling. Grab samples will be collected from the individual containers. Where possible, composite samples will be obtained from similar equipment, structures or containers if the same materials are anticipated.

4.3.1 Grab Samples

Grab samples taken from the individual containers and/or areas will be collected in clear one-quart containers. These samples will be labeled with the project name, the appropriate alphanumeric label, time the sample was taken, date the sample was taken, and medium of sample. Sample labels and documentation will be in accordance with the CLEAN QCMP, SOP SA-6.1, Sample Identification and Chain-of-Custody. Examples of the labels, chain-of-custody and custody seals to be used are provided in Appendix D. The samples will then be delivered to the laboratory where the samples will be stored at 4°C, (or refrigerated) if they are not analyzed immediately.

4.3.2 Composite Samples

Composite samples will be collected if similar materials (e.g., oil from the same type of equipment) are available and consolidation of samples is necessary. For example, two open containers of oil in the boiler area may be combined, if each container alone does not have sufficient volume to be sampled. All compatible samples will be composited using a representative volume from each sample container in the compatibility group, creating one sample for each group. A representative volume will be calculated as the ratio of volume in each container or area sampled to the overall volume of the compatibility group sampled. These samples will be labeled in accordance with the HALLIBURTON NUS SOP SA-6.1, Sample Identification and Chain-of-Custody. After all the composite samples are collected, they will be sent to the analytical laboratory for testing.

A duplicate sample of each composite sample will be retained by the laboratory for future reference and potential testing by selected waste disposal facilities.

5.0 SAMPLE ANALYSIS BY LABORATORY HAZARDOUS CATEGORIZATION TESTING

Each of the grab samples collected by the HALLIBURTON NUS Field Team will be classified in a subcontractor laboratory using established compatibility testing procedures (as shown in Figure 5-1). The purpose of this testing scheme is: (1) to separate and classify various unknown containerized waste materials into compatible groups based on their physical and chemical characteristics, (2) to identify incompatible waste materials and some hazardous components, and (3) to assure that no uncontrolled reactions occur during bulking operations.

The compatibility testing is composed of eight testing procedures and they are:

1.) SOLUBILITY TEST - Purpose: To check the water and hexane solubility of the waste material.

2.) PEROXIDE TEST - Purpose: This test is used to determine if hydrogen peroxide or various organic peroxides are present. Special disposal procedures may be required on samples containing peroxides.

3.) OXIDIZER TEST - Purpose: The objective of this test is to detect the presence of strong oxidizing agents such as chlorine and chlorine dioxide. Results are used to determine the necessity of performing spot tests for cyanide and/or sulfide.

4.) HALOGEN TESTING - Purpose: This test determines if any halogenated organic compounds are present in the sample. If the test is positive, care must be used in testing the samples in gas chromatography (GC) equipment set up to test for polychlorinated biphenyls (PCBs). Also, if the test is positive, more sophisticated testing of the sample may be required.

5.) pH TESTING - Purpose: Quick determination of whether the pH of any sample is extreme (<4 or >12). Extreme pH requires special care in handling and preparing the samples for further analysis and in-field bulking of the material.

6.) SULFIDE TESTING - Purpose: The objective of the test is to quickly determine whether sulfide is present in the sample. Sulfides may interfere with other analyses or create a hazard during sample processing or field bulking operations.

7.) CYANIDE TESTING - Purpose: The object of the test is to quickly determine whether cyanide is present in the sample. If present, precautions must be taken to ensure that acidification of the sample does not create hazardous conditions for laboratory personnel. Specialized disposal practices will also be employed with the material the sample represents.

8.) FLASH TESTING - Purpose: The objective of this test is to determine if the sample will flash. Special disposal procedures may be required on samples that flash above safe handling temperatures.

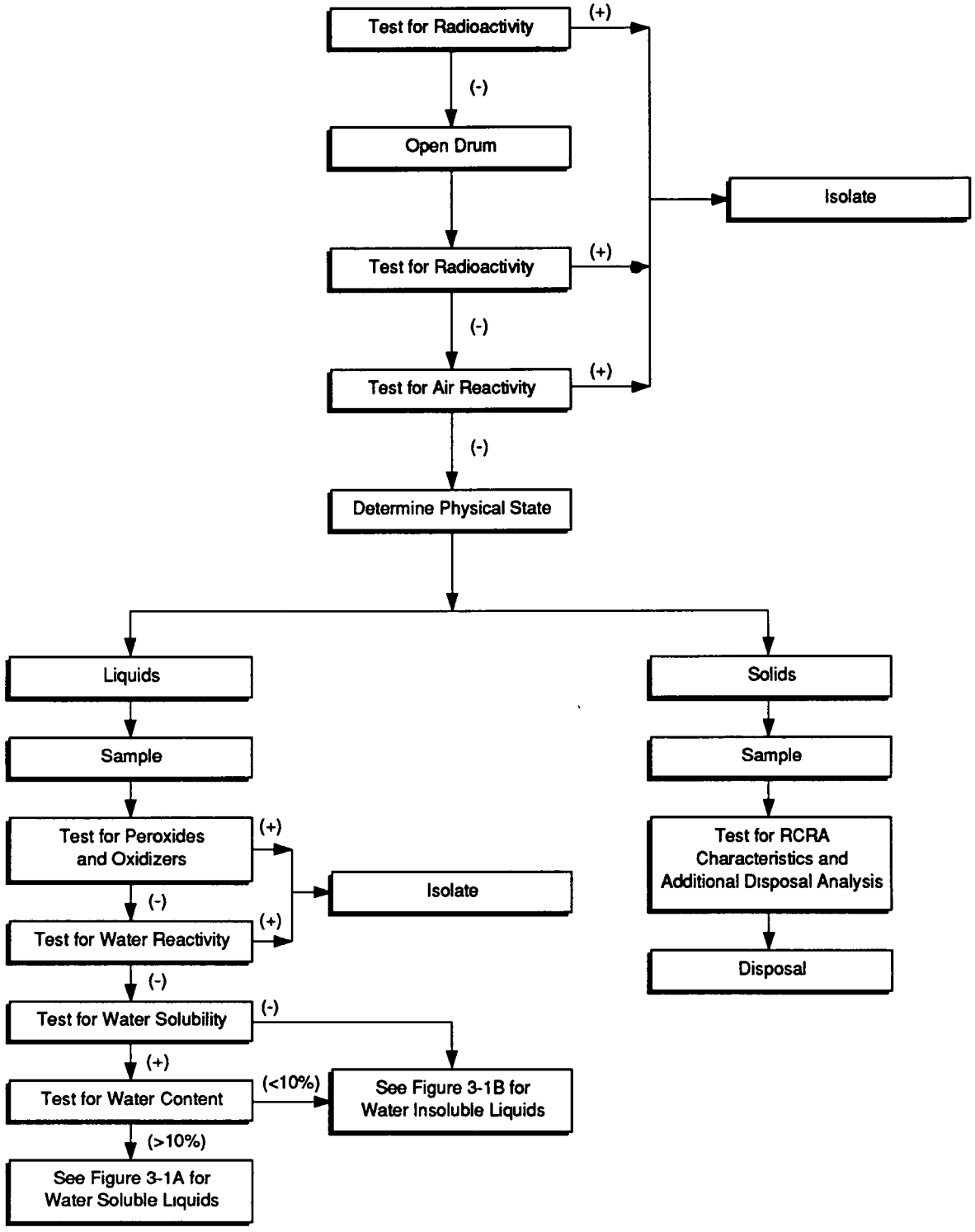


FIGURE 5-1

Compatibility Testing Procedures for Consolidating Waste Materials

M911078

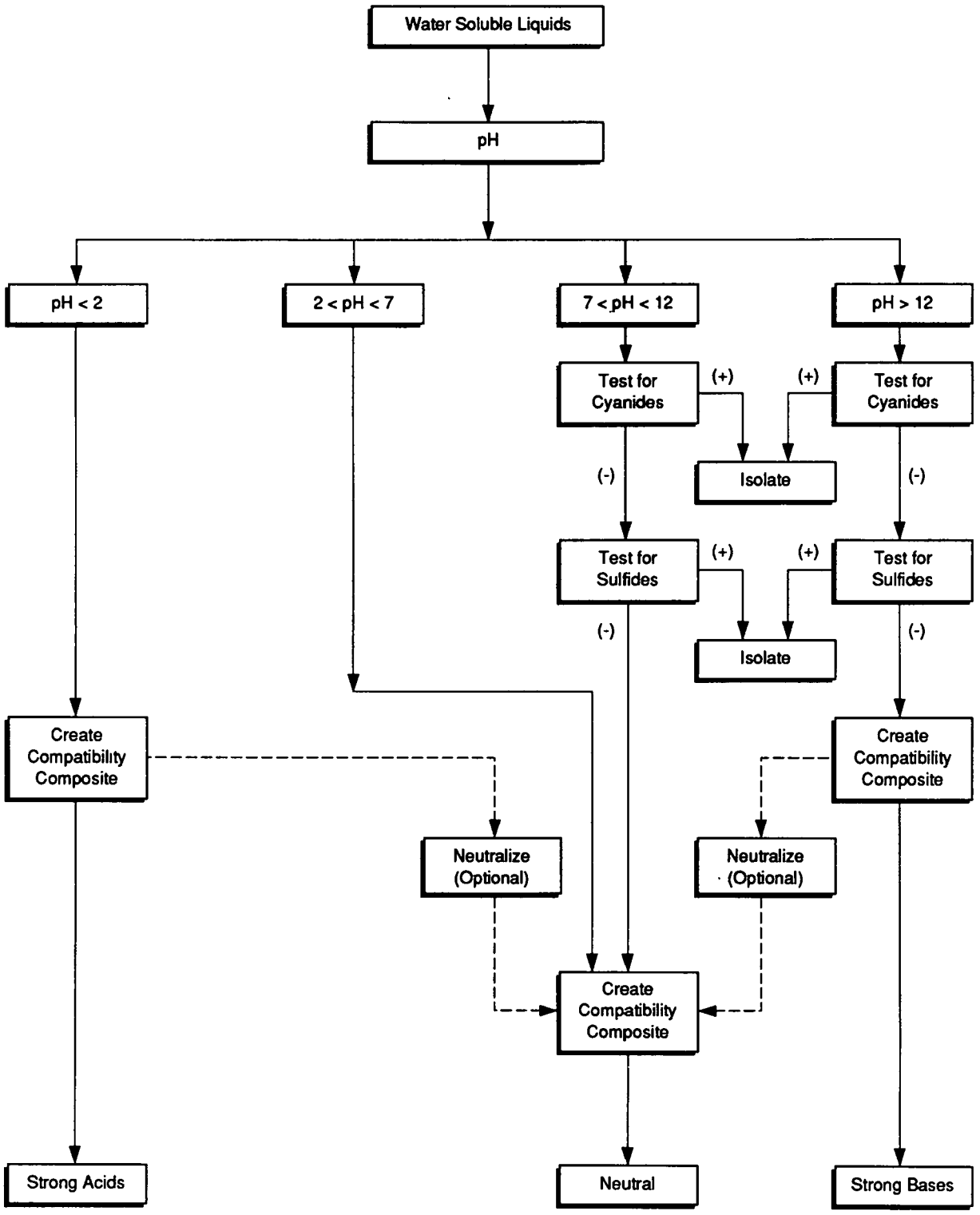


FIGURE 5-1

Compatibility Testing Procedures for Consolidating Waste Materials (continued)

M911079

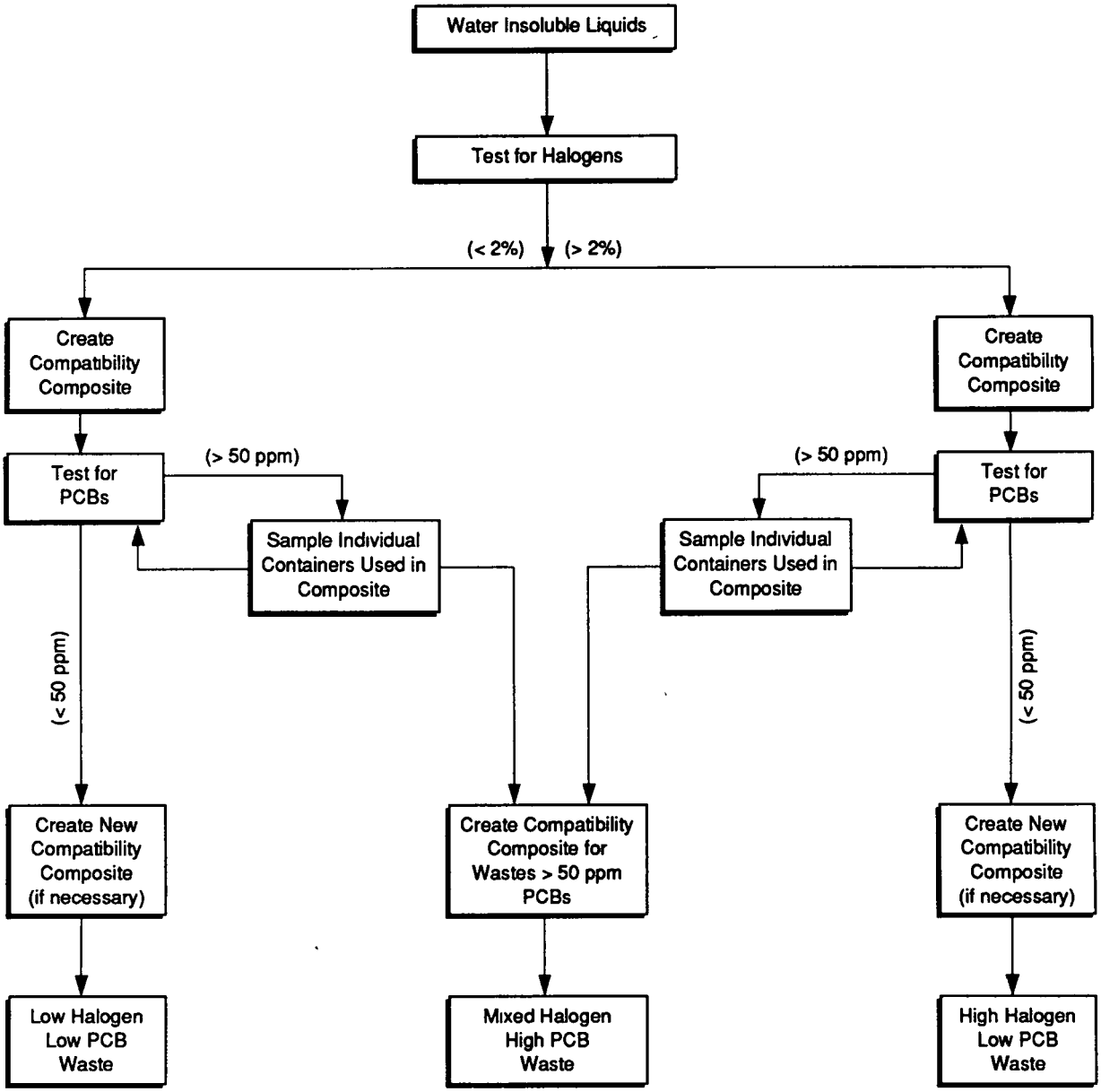


FIGURE 5-1

Compatibility Testing Procedures for Consolidating Waste Materials (continued)

M911080

After the samples have been tested, they will be segregated into groups of compatible material for later compositing.

6.0 WASTE CATEGORIZATION AND DISPOSAL ANALYSIS

A representative sample of each waste material category or group will be composited in the laboratory for disposal analysis once hazardous categorization testing results are received. Categorization/compositing will be performed under the direction of the HALLIBURTON NUS Team. The limited number of samples for disposal analyses will be made up of weighted aliquots of the wastes which they represent.

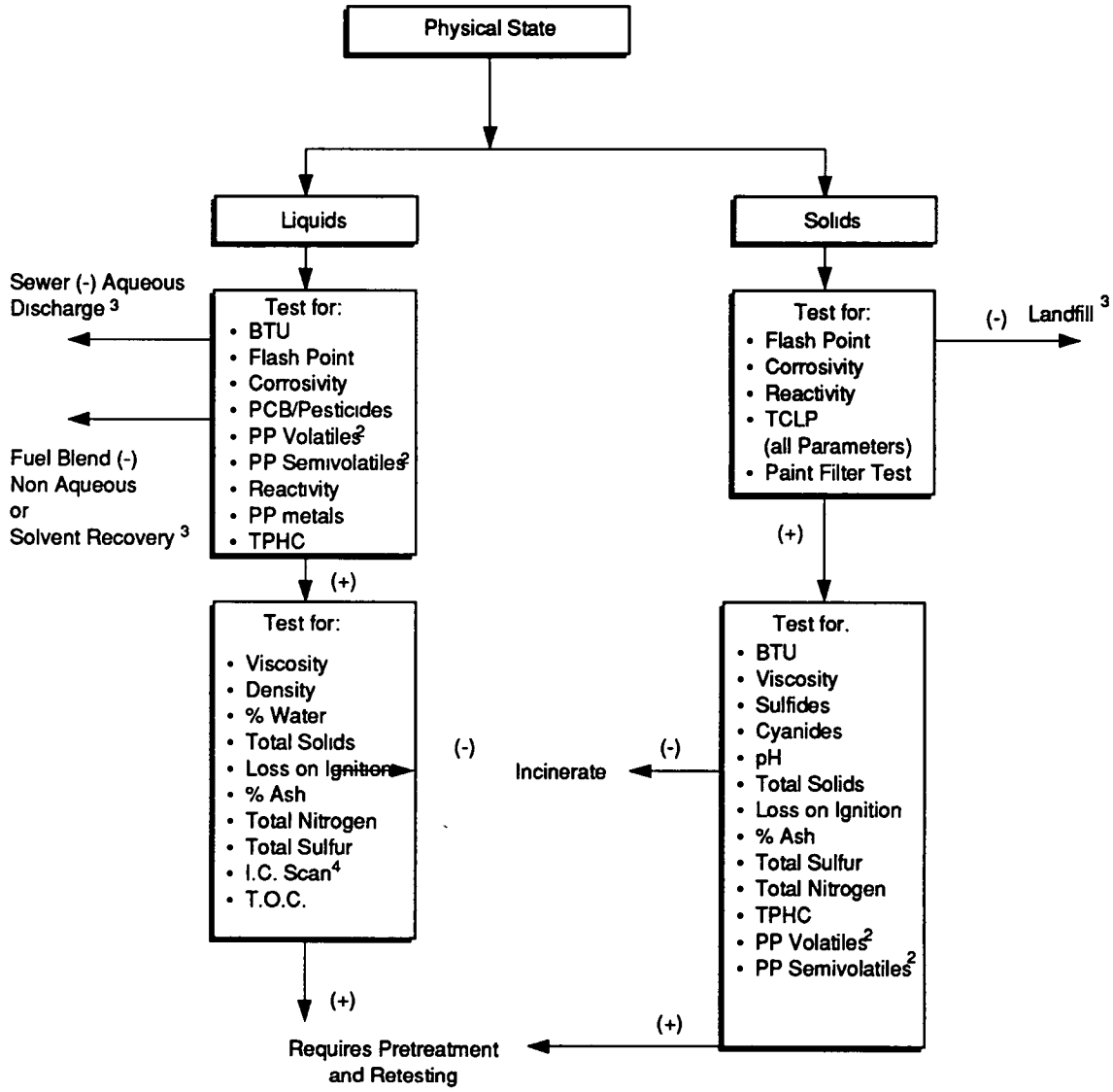
The samples will be analyzed for waste disposal parameters in accordance with the flowchart provided in Figure 6-1. The results of these analyses will be used to define the type of treatment and/or disposal option appropriate for each group or category of material sampled. (Additional analysis may be necessary in the future depending on the particular waste disposal or treatment facility selected.) The laboratory test methodologies to be followed for the waste disposal analyses include:

Parameter	Methods
• BTU	ASTM D 3176-74
• Flashpoint (Ignitability)	EPA SW846-1010 (3rd Ed.)
• Reactivity	EPA SW846-9010 & 9030 (Chpt. 7)
• Corrosivity	ASTM 423
• PCB/Pesticides	EPA SW846-8080
• PP Volatiles & NBS	EPA SW846-8240
• PP Semivolatiles & NBS	EPA SW846-8270
• Metals (16)	EPA SW846-7000 series
• Zero Headspace; TCLP Extraction[1]	Federal Register 40CFR dated 7/1/91; Pt.261, Ap.II
• TCLP Volatiles	Federal Register 40CFR dated 7/1/91; Pt.261, Ap.II
• TCLP Semivolatiles	Federal Register 40CFR dated 7/1/91; Pt.261, Ap.II
• TCLP Metals (8)	Federal Register 40CFR dated 7/1/91; Pt.261, Ap.II
• TCLP Pesticides	Federal Register 40CFR dated 7/1/91; Pt.261, Ap.II
• Total Petroleum Hydrocarbons	EPA 418.1
• Viscosity	ASTM D445-79
• Density	ASTM 213E
• Moisture (% water)	ASTM D1744-64
• Total Solids	SM (17th Edition) Section 2540
• Loss on Ignition	ASTM D482-80
• Percent Ash	ASTM D48
• Total Nitrogen	ASTM D240
• Total Sulfur	ASTM D129-64
• Ion Chromatograph Scan (IC)	SM (17th Edition) Section 4110
• Reactive Cyanides and Sulfides	EPA SW 846-7.3.3.2 & 7.3.4.2
• Total Organic Carbon	EPA 415.1/415.2

EPA - U.S. Environmental Protection Agency
ASTM - American Society of Testing Materials
SM - Standard Methods for Water/Wastewater

The laboratory tests used will depend on whether the material is a liquid or solid as shown on Figure 6-1.

[1]latest procedures published in the Federal Register on June 29, 1990.



[1] Based on American NuKEM Procedures

[2] Includes a Forward Library Search

[3] May Require Additional Tests for Acceptance

[4] I.C Scan - Ion Chromatagraph Scan

FIGURE 6-1

Analytical Laboratory [1] Testing Procedures for Waste Disposal

M911081

7.0 COLLECTION OF QUALITY CONTROL SAMPLES

Quality control samples will be collected during the field sampling activities. The quality control samples will include only field duplicates. No field blanks will be collected and tested since all samples being sent to the off-site analytical laboratory are being tested for compatibility testing and disposal purposes and are not being used for site characterization purposes. All quality control samples will be collected in accordance with the Internal QC Checks and Frequency Section of the CLEAN Quality Control Management Plan (QCMP) dated August 1991.

7.1 FIELD DUPLICATES

Field duplicates provide precision information regarding homogeneity, handling, shipping, storing, preparation, and analysis. Field duplicates will be collected by mixing a double portion of the required volume of sample and dividing it into two sample containers. However, for volatile organic samples, co-located, rather than duplicate samples will be collected. Co-located samples are collected by filling sample containers successively, rather than mixing. Field duplicates will be collected at a rate of one per ten samples of matrix material.

8.0 DOCUMENTATION, SHIPPING, AND PACKAGING

8.1 DOCUMENTATION

All field documentation will be generated in accordance with the CLEAN QCMP, SOP SA-6.3 and SA-6.4, Site Logbook and Forms Used in RI Activities, respectively (see Appendix C). The Project Manager (PM) has assigned the responsibility of keeping the Site Logbook to the SSO. This person's responsibility will be to keep the logbook current while in his possession, and to forward it to the PM for inclusion in the permanent site file upon completion of all field activities.

The PM will also be responsible for the review and approval of all subcontractors completed forms, logbooks and reports.

Ultimately, all documentation and results from the field activities will be reviewed, organized and arranged by the PM in a report to inventory the hazardous wastes materials on site and determine, on a preliminary basis, the appropriate disposal methods for such waste materials.

It is the responsibility of the Field Team Leader and SSO to ensure that the appropriate forms are correctly used and accurately filled out. The forms that will be used at this site will be sample labels, chain-of-custody record forms, custody seals, and sample log sheets.

8.2 SHIPPING AND PACKAGING

Samples collected for shipment from the Site will be classified as either environmental or hazardous material (or waste) samples. A distinction must be made between the two types of samples in order to determine the appropriate procedures for sample transportation. Shipping procedures will be in accordance with the CLEAN QCMP, SOP SA-6.2, Sample Packing and Shipping Specifications (see Appendix C).

APPENDIX A
WORK PLAN FOR GAS CYLINDER TESTING
BUILDING 33 - POWERHOUSE
NETC GOULD ISLAND

To Be Supplied as an Addendum

APPENDIX B
THIBAULT & ASSOCIATES

Thibault & Associates environmental scientists & engineers

Dave Dickinson

THIBAULT & ASSOCIATES

environmental engineers scientists and analytical laboratory

ENVIRONMENTAL LABORATORY REPORT

Company: Oak Point Associates
P.O. Box K
Biddeford, ME 04005

Date Received: 5/20 to 6/10/86
Date Reported: 6/18/86
Job Number: 95281

Attention: Mr. Peter Dunn

All Analyses In mg/l Unless Specified

Underground Tanks South End of Island
--- SOUTH TANK ---

Sample Number:	8605-518
Description:	Sludge Sample South Tank

Parameter	
Lead[1]	<0.05

Sample Number:	8605-516
Description:	South Tank Water

Volatile Organics[2]	
Methanol	<0.001
Acetone	0.23
1,1-Dichloroethane	0.022
Chloroform	0.78
1,1,2-Trichloro-1,2,2-trifluoroethane	0.083
1,2-Dichloroethane	0.19
1,1,1-Trichloroethane	0.20
Carbon Tetrachloride	16.
1,2-Dichloropropane	0.21
trans-1,3-Dichloropropene	0.40
Trichloroethylene	1.29
Benzene	0.77
Hexane	0.19
1,1,2,2-Tetrachloroethylene (co-elutes with 1,1,2,2-Tetrachloroethane)	0.33
Toluene	2.9
Ethylbenzene	0.59
m-Xylene	0.64
o,p-Xylenes	0.70
1,4-Dichlorobenzene	0.51
Unknowns A[3]	0.53
Unknowns B[4]	3.6
Unknowns C[5]	2.8
Unknowns D[6]	0.12

treated to discharge

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All Analyses In mg/l Unless Specified

Underground Tanks South End of Island

--- SOUTH TANK ---

Sample Number:	605-520
Description:	South Tank Water
Parameter	
Lead[7]	0.07
Oil & Grease	<5.
Specific Conductance[9]	285.

--- NORTH TANK ---

Sample Number:	8605-521
Description:	Sludge Sample North Tank
Parameter	
Lead[1]	<0.05

Sample Number:	8605-519
Description:	North Tank Water
Parameter	
Lead[7]	0.05
Oil & Grease	<5.
Specific Conductance[9]	161.
Volatile Organics[2]	
Methanol	<0.001
Ethanol	1.5
Methylene Chloride	0.019
Acetone	0.41
1,1-Dichloroethane	0.016
Chloroform	0.55
1,2-Dichloroethane	0.023
1,1,1-Trichloroethane	0.021
Carbon Tetrachloride	9.9
1,2-Dichloropropane	0.024

treatment to discharge

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All Analyses In mg/l Unless Specified

— NORTH TANK —

Volatile Organics (Cont'd)

Trichloroethylene	0.11
Benzene	3.60
Hexane	0.014
1,1,2,2-Tetrachloroethylene (co-elutes with 1,1,2,2-Tetrachloroethane)	0.16
Toluene	9.0
Chlorobenzene	0.046
Ethylbenzene	0.056
m-Xylene	0.12
o,p-Xylenes	0.12
1,4-Dichlorobenzene	0.017
Unknowns A[3]	0.52
Unknowns B[4]	0.83
Unknowns C[5]	0.95
Unknowns D[6]	0.008

water require treatment to discharge.

BUILDING 53 (Transformer Hut)

Sample Number:	8605-522	8605-523
Description:	Soil Floor Composite	Water Sump Composite
Parameter		
Total PCBs[8]	430.10	<1.

BUILDING 56 (Transformer Hut)

Sample Number:	8605-526	8605-527
Description:	Soil Floor Composite	Water Sump Composite
Parameter		
Total PCBs[8]	790.10	<1.

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All Analyses In mg/l Unless Specified

BUILDING 54 (Transformer Hut)

Sample Number:	8605-524	8605-525
Description:	Soil Floor Composite	Water Sump Composite
Parameter		
Total PCBs[8]	770.[10]	1.

BUILDING 59 (Transformer Hut and Annex)

Sample Number:	8605-528	8605-529	8605-530
Description:	-- North Half of Building -- Floor	Sump Floor	South Side, Annex Basement Floor
Parameter			
Total PCBs[8]	741.[10]	20.	4.

BUILDING 60 (Transformer Hut)

Sample Number:	8605-531	8605-532
Description:	Floor Soil Sample	Sump Water Sample
Parameter		
Total PCBs[8]	730.[10]	21.

BUILDING 33 (Generator/Compressor Building)

Sample Number:	8605-533
Description:	Liquid on Floor Between Generators
Parameter	
Total PCBs[8]	2.

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All Analyses In mg/l Unless Specified

BUILDING 33 (Generator/Compressor Building)

Sample Number:	8605-536
Description:	Water in Basement Composite of 3 Locations

Parameter	
Total PCBs[8]	<1.
Pesticides	N.D.
Herbicides	N.D.

not Haz

Sample Number:	8605-534	8605-535
Description:	——— Floor Scrapings ———	
	Composite From 5 Compressor Sumps	7 Locations on Main Level

Parameter		
Total PCBs[8]	2.	<1.
Arsenic[1]	N.A.	<0.005
Barium[1]	N.A.	<1.
Cadmium[1]	N.A.	0.097
Chromium[1]	N.A.	<0.05
Lead[1]	N.A.	0.05
Mercury[1]	N.A.	<0.0002
Selenium[1]	N.A.	<0.01
Silver[1]	N.A.	<0.025

not Haz

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All Analyses In mg/l Unless Specified

BUILDING 33 (Generator/Compressor Building)

Sample Number:	8605-537	8605-538	
Description:	Basement Water		
	Composite of 3 Locations	Bottom of Stairs	
Parameter			
Arsenic[7]	<0.005	N.A.	NOT HW
Barium[7]	<1.	N.A.	Require
Cadmium[7]	<0.005	N.A.	treatment to
Chromium[7]	<0.05	N.A.	discharge
Lead[7]	<0.05	N.A.	
Mercury[7]	<0.0002	N.A.	
Selenium[7]	<0.01	N.A.	
Silver[7]	<0.025	N.A.	
Oil & Grease	N.A.	<5.	

BUILDING 44 (Pump House)

Sample Number:	8605-539	
Description:	Waste Oil on Floor	
Parameter		
Total PCBs[8]	18.	OK

Sample Number:	8605-540	Diesel
Description:	Tank 1 - Oil	
Parameter		
Lead	20.	HW
Total PCBs[8]	8.	

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All Analyses In mg/l Unless Specified

BUILDING 44 (Pump House)

Sample Number:	8605-541
Description:	Tank 2 - Water
Parameter	
Oil & Grease	21.
Specific Conductance[9]	1880.
Volatile Organics[2]	
Acetone	0.43
Chloroform	0.12
Benzene	0.058
Toluene	0.092
m-Xylene	0.026
o,p-Xylenes	0.022
1,4-Dichlorobenzene	0.048
Unknowns B[4]	0.059
Unknowns D[6]	0.012
Sample Number:	8605-542
Description:	Tank 2 - Oil
Parameter	
Lead	44.
Total PCBs[8]	3.
Sample Number:	8605-543
Description:	Tank 3 - Water
Parameter	
Oil & Grease	14.
Specific Conductance[9]	932.

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All Analyses In mg/l Unless Specified

Sample Number:	8605-543
Description:	Tank 3 - Water
Volatile Organics[2]	
Carbon Tetrachloride	0.063
Benzene	0.011
o,p-Xylenes	0.002
1,4-Dichlorobenzene	0.004
Unknowns D[6]	0.001
Sample Number:	8605-544
Description:	Tank 3 - Oil
Parameter	
Lead	55.
Total PCBs[8]	8.
Sample Number:	8605-545
Description:	Tank 4 - Water
Parameter	
Oil & Grease	560.*
Specific Conductance[9]	374.
Volatile Organics[2]	
1,4-Dichlorobenzene	0.005
Unknowns D[6]	0.002
Sample Number:	8605-546
Description:	Tank 4 - Oil
Parameter	
Lead	18.
Total PCBs[8]	6.

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All Analyses In mg/l Unless Specified

Sample Number:	8605-547
Description:	Tank 5 - Water
Parameter	
Oil & Grease	6.
Specific Conductance[9]	509.
Volatile Organics[2]	
Benzene	0.001
Toluene	0.007
m-Xylene	0.003
o,p-Xylenes	0.006
1,4-Dichlorobenzene	0.013
Unknowns D[6]	0.005

treatment to discharge.

Sample Number:	8605-548
Description:	Tank 5 - Oil

DIESEL

Parameter	
Lead	23.
Total PCBs[8]	8.

— HW

Description:	Composite of Water From Tanks 2-5
Parameter[7]	
Arsenic	<0.005
Barium	<1.
Cadmium	<0.005
Chromium	0.10
Lead	0.12
Mercury	<0.0002
Selenium	<0.01
Silver	0.025

NOT HW

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Richard C. Hittinger

Richard C. Hittinger
Environmental Chemist

1 - Analyses was performed in accordance with Method 1310, Extraction Procedure (EP) Toxicity Test Method and Structural Integrity Test, in EPA Publication, Test Methods for Evaluating Solid Waste, July, 1982.
2 - Purge and trap analysis for volatile organics were performed using a Tekmar LSC-3. Chromatographic separation was achieved using a Tracor 540 gas chromatograph with a Carbopack B-1% SP-1000 column. Flame ionization was used to quantify compounds (Modification of EPA 601).
3 - Unknowns A grouped and calculated as Acetone.
4 - Unknowns B grouped and calculated as Trichloroethylene.
5 - Unknowns C grouped and calculated as Toluene.
6 - Unknowns D grouped and calculated as o-Xylene.
7 - Total digested metals.
8 - PCB results report in mg/kg. ppm.
9 - Specific Conductance units in umhos/cm.
10 - Exceeds hazardous limit under TSCA.
* - Sample contaminated during collection.
N.D. - Not detected.
N.A. - Not analyzed.

RCH/ksb

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QUALITY ASSURANCE
JUNE, 1986

Concentrations In mg/l Unless Specified

Parameter	Sample Number	Original Sample Conc.	Amount Spike Added	Observed Spike	Percent Recovery
Barium	8605-535	<1.	1.0	1.0	50*
Cadmium	8605-535	0.097	0.200	.284	94
Chromium	8605-535	<0.05	2.00	2.02	100
Lead	8605-535	0.05	2.00	2.00	98
Mercury	8605-535	<0.0002	0.001	0.00072	62*
Selenium	8605-535	<0.01	0.050	0.050	90
Silver	8605-535	<0.025	1.0	0.95	94

* - Low recoveries due to small size of spike additions.

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VOLATILE ORGANICS
QUALITY ASSURANCE
JUNE, 1986

Concentrations In mg/l Unless Specified

Parameter	Sample Number	Original Sample Conc.	Amount Spike Added	Observed Spike	Percent Recovery°
Methylene Chloride	8505-576	- 0 -	0.110	0.111	101
1,1-Dichloro-ethylene	8505-576	- 0 -	0.066	0.067	102
1,1-Dichloro-ethane	8505-576	- 0 -	0.113	0.116	103
trans-1,2-Dichloro-ethylene	8505-576	.007	- 0 -	0.010*	--
Chloroform	8505-576	- 0 -	0.120	0.128	107
1,1,1-Trich-loroethane	8505-576	.022	- 0 -	0.021*	--
Carbon Tetra-chloride	8505-576	- 0 -	0.174	0.188	108
1,2-Dichloro-propane	8505-576	- 0 -	0.150	0.161	107
Trichloro-ethylene	8505-576	.032	0.140	0.190	113
2-Chloroethyl Vinyl Ether	8505-576	- 0 -	0.188	0.196	104
1,1,2,2-Tetra chloroethylene	8505-576	.026	0.160	0.246	138

o - Percent Recovery is corrected for concentration in the original sample. The Observed Spike concentration is uncorrected.
* - No Spike was added and the concentration represents a replicate analysis.

APPENDIX C
CLEAN STANDARD OPERATING PROCEDURES

NUS CORPORATION

ENVIRONMENTAL MANAGEMENT GROUP

STANDARD OPERATING PROCEDURES

Number	Page
SA-5 1	1 of 18
Effective Date: 05/04/90	Revision: 1
Applicability: EMG	
Prepared: Earth Sciences	
Approved: D Senovich	

Subject: DRUM OPENING AND SAMPLING

TABLE OF CONTENTS

1.0 PURPOSE

The purpose of this procedure is to provide general reference information for use in planning for and implementing sampling programs involving the moving and/or opening of closed containers in uncontrolled hazardous substance sites. Procedures are provided for selecting containers to be opened and for moving and opening them. In addition, site organization, protective clothing, worker protection, and other safety procedures are discussed.

2.0 SCOPE

This procedure is applicable to opening and sampling of closed containers (120 gallons or less) on uncontrolled hazardous substance sites. Bulk tanks such as railroad tank cars, large above- and below-ground tanks (with a capacity of more than 120 gallons) and tank trailers are not considered in this guideline.

3.0 GLOSSARY

Air Reactive Wastes - Some chemicals, such as white phosphorus or barium oxide, react with oxygen in the air, while others, such as sodium, cesium or various metal hydrides, react with the moisture or water vapor in the air. Many of these compounds are explosive when they come in contact with air or water.

Container - is defined as any drum, bottle, can,bag, etc., with a capacity of 120 gallons (450 liters) or less.

Glass Thief - a glass tube 4 feet long and 3/4 inches in diameter, used for taking samples from drums. The tube is usually broken and disposed of in the drum following sampling.

4.0 RESPONSIBILITIES

Field Operations Leader (FOL) - responsible for the overall safe conduct of the container opening and sampling operations. These include informing and obtaining help from local authorities if necessary; selection of containers to open/sample; testing; moving, and staging of containers; container opening and sampling; resealing; and halting operations, including ordering site evacuation or requesting public evacuation (with help from local authorities) if necessary. The drum opening and sampling program will be planned in detail in the Site Operations Plan. If any unexpected results (e.g., explosions, atmospheric releases) occur, the FOL must inform the Site Manager immediately Together with the Health and Safety Officer and outside assistance, if necessary, (e.g., EPA's Emergency Response Team), he must determine the most prudent course of action.

Health and Safety Officer (HSO) - responsible for safety of all on-site operations, alerting the FOL of any potentially unsafe conditions, and halting work if on-site personnel or off-site public health is threatened.

Site Manager - responsible for determining that opening and sampling of containers is necessary for the RI program, and the approximate numbers and types of containers to be opened.

5.0 PROCEDURES

5.1 GENERAL PRINCIPLES

In general, a container opening and sampling program will have one of the following objectives:

- To determine (usually for enforcement case support) the presence of hazardous materials on the site. Such a program involves a very limited number of containers, perhaps as few as one.
- To characterize the range of materials present at a site. Containers would be chosen for sampling by means of systematic selection criteria.
- To characterize container contents for such purposes as bulking for disposal This program may involve opening and sampling every container on a site in support of a remedial-action program, and performing on-site compatibility testing.

The guidance presented is based on field experience in working with containers on uncontrolled hazardous substance sites. It will be evident that in many cases hard-and-fast rules cannot be given, and professional judgment is required because uncontrolled variables are involved. For example, no one can be absolutely certain of any assessment of the potential contents of a container. Labels cannot be absolutely trusted; only educated guesses can be made by a through review of all available background data, such as potential sources of the wastes.

Three basic risks are involved in moving and opening closed containers: (1) exposure of personnel to toxic materials, (2) fire, and (3) explosion. The first risk can be reasonably eliminated through the use of proper skin and respiratory protection equipment. The use of Level A protection acceptably reduces the risk of a worker being injured by toxic vapors, mists, or splashes. In the same way, standard fire prevention procedures can be used to reduce the fire hazard through th use of detector instruments and proper equipment. These include the use of non-sparking tools and intrinsically safe radios, pumps, and other equipment, as well as the staging of fire fighting equipment and the elimination of any other possible ignition sources.

The explosive risk, however, is not as easily handled, and thus is the primary consideration in any container-opening operation. Even if no solid evidence of the presence of explosives is found during the preliminary data collection, one can never be certain that explosives have not been disposed of at the site. In order to provide the same reasonable level of protection against this risk as against toxic exposure and fire, a very cautious approach, such as the one recommended in this procedure, should be used.

5.2 BACKGROUND REVIEW

This section details the elements of a site background review necessary to prepare a Site Operations Plan for drum opening. The decision of whether or not to conduct the operations depends on the assessment of the site history. Therefore, it is important that the following tasks are completed thoroughly.

5.2.1 Preliminary Assessment and Site Inspection

The FIT preliminary assessment and site inspection (if available) or the RI evaluation of existing data should be consulted in planning for a container-opening operation. Of special importance are items that can be used to characterize the types of hazardous materials present at the site (e.g., generator

records, manifests, inventories, personal interviews, monitoring data). The review of all such data should search for the possible presence of shock-sensitive explosives and/or reactive chemicals

5.2.2 Explosive Product Survey

If the site is a waste disposal or storage operations, a survey of commercial producers or users of explosives within the area served by the facility must be conducted The determination of the area covered in this survey is a judgment that should be based on locations of known waste generators that used the facility and geographic locations of the site. Agencies that could assist in identifying explosive producers or users are local and state police units, state transportation departments, the U.S. Department of Transportation (DOT), and EPA state hazardous-waste permit offices Standard Industrial Classification (SIC) codes can be used to locate producers of explosives from lists of manufacturers available from state commerce agencies, local chamber of commerce, planning agencies, etc.

5.2.3 Site Visit

A site visit is required prior to planning a drum opening operation. This visit may be in addition to the Preliminary Assessment and Site Inspection. Information on the following should be gathered during the site visit:

- Site boundaries - fences, roads, natural boundaries, etc.
- Access points and travel routes on the site.
- Topographic features
- Adjacent land uses - residential, agricultural, public use areas, commercial establishments, schools, natural areas,etc.
- Power lines, railroad, and public roads close to the site.
- Container storage areas - provide observational details; describe if drums are jumbled, stacked, piled, arranged in rows, etc. General condition of drums indicates if containers can be grouped according to visual features, contents, or any other classification method.
- Buildings and other site structures, as well as any other disposal areas such as lagoons, surface piles, etc.
- Location of water sources.
- Location of potential staging areas.

In general, the FIT preliminary assessment and site inspection should have been completed prior to NUS involvement in opening and sampling drums. Field characterization resulting from the FIT work should help to establish ambient conditions and identify potential hot spots. This information is to be plotted on the site sketch required in the Site Operations Plan. Observations from maps and aerial photographs can also be used in c mpiling the site sketch.

During the site visit, local officials should be contacted to arrange for fire protection and police support during the operati n. Interviews should also be conducted with site workers, local officials, and any other people familiar with the site's history.

The central purpose of the background review is to evaluate the risk presented to personnel engaged in drum-opening operations. Assessment of drum contents is most important because it identifies specific risks. However, other site features also affect the hazard potential. Leaking and corroded drums, crowded and poorly organized conditions, and drums of unknown and apparently diverse origins are conditions that require careful planning.

There are no accurate quantitative methods available to evaluate the total danger Assessment of the danger is subjective and should be done by personnel experienced in field operations at hazardous sites. Good professional judgment is required, and project management must feel that adequate information is available to support a decision to conduct the drum-opening operations Any positive indication of shock-sensitive materials that might react or explode requires special consideration.

5.3 CONTAINER SELECTION CONSIDERATIONS

The containers selected for opening and sampling will depend on the purpose of the operations and on considerations of safety--that is, a container that may detonate is to be avoided. Even though many drums are found at uncontrolled disposal sites where the contents are unknown, it is worthwhile to consider drum markings and types, as well as drum groupings.

When considering sampling for enforcement, the first choice of drums would be those marked with known hazardous materials (trade name, chemical name, empirical formula), or hazardous labeling. Next would be those isolated by themselves or material contained in an exotic metal container (e.g., aluminum, nickel, monel, stainless steel). Then consideration should be given to the unmarked drum piles or stacks. These should be sampled randomly among the various distinguishable drum lots.

When sampling for site characterization purposes, a concerted effort should be made to distinguish drum lots and to get a good drum count among the lots. A drum that appears to be characteristic and in the center of all the major drum lots should be sampled first, followed by drums in as many of the smaller lots as practical. Also, if practical, duplicate samples should be taken on major drum lots at either end of a lot to see if the wastes appear to be characteristic all the way through.

On most abandoned waste sites, there is some organization or pattern to the way the material was placed on the site. The pattern is occasionally as detailed as finding the flammable solvents in one area, acids in another, cyanide in another, recoverable metals in a fourth, and so on. Some disposal facilities stencil control numbers on drums to indicate specific lots. Often, if the site was poorly run, the only indication that a group of drums is related will be their color, size, or type.

Typically, waste is shipped to sites in 55-gallon drums on trucks. About 60 to 80 drums are delivered from a given load, depending on the weight of the load. During the initial site inspection, one should look for distinguishing features in an attempt to define the different lots of drums on the site. Often the trade name, chemical name, or empirical formula will be written on the drum. Another distinguishing feature would be drums of exotic metal such as aluminum, nickel, monel, stainless steel, etc. A manufacturing facility will use a specified DOT coded drum, a strange drum size, or a drum with an unusual configuration or adaptation for a particular process line (center of drum head fill bung, double-sided fill/vent bungs, etc.).

At almost every site that has been receiving waste, there is an isolated group of containers. Approach these with care but do try to determine why they were segregated. Occasionally a group of drums is found marked 'DFW' (roughly translates as "Don't Fool With") because of their extreme hazard or because the people handling them have had an accident or other unusual experience with them.

In any lot of drums there is sometimes encountered an unusual or out-of-place container This oddball container will not fit the pattern, color, size, etc., of those around it (e g , it may be the only distended drum among undistended drums or a lined drum among unlined drums)

An attempt should be made to avoid drums that are structurally damaged or if their movement or sampling would endanger a team member Samples of drums in stacks or piles should not be taken if at all possible

Before sampling any drums, an external radioactivity scan must be conducted with the results recorded in the field notebook. On a site where many different types of containers are present, they should be sampled in the following order, based on what they can be expected to contain and in increasing order of hazard:

- Paper, plastic, cloth, and burlap bags.
- Glass carboys and jugs (except chemical reagent or laboratory-packed bottles)
- Fiberboard drums.
- Plastic and polyethylene carboys and containers.
- Plastic-lined steel drums.
- Steel drums.
- Exotic metal drums.
- Odd containers (distended, isolated, marked "DFW," etc.).

Attachment A contains information on the types, sizes, DOT designation, openings, and recommended opening techniques for the various kinds of containers. Any drum without a DOT designation should be avoided, as it may have military origins. The DOT designation, which is usually found on the bottom of a drum, can be useful in determining the material of the drum.

5.4 CONTAINER HANDLING AND STAGING

Personnel involved in handling and transporting containerized waste shall work in teams containing no fewer than two people. Visual contact shall be maintained between members of the working team at all times. All team members shall be able to communicate between themselves and with the Site Health and Safety Officer by intrinsically safe two-way radio at all times on the work site.

Prior to physically handling a drum or other container, the following preliminary classifications checklist must be reviewed and each response noted in a field notebook:

- Is the drum radioactive?
- Does the drum exhibit leakage or deterioration, i.e., is it unsound?
- Does the drum exhibit apparent internal pressure?
- Is the drum empty?
- Does the drum contain markings which would indicate that the contents are potentially explosive?

The results of the preliminary classification checklist dictate which specific procedures shall be followed in handling, opening, and sampling the drum.

The handling, movement, and transport of drums and other containers should be by use of mechanical equipment only; equipment may consist of a grappler equipped backhoe or front-end loader Drum transportation should be with front-end loaders or fork lifts with modified carrying platforms Portions of equipment that contact drums or canisters should be constructed of non-ferrous metals or contact portions should be coated or lined to preclude spark generation Handling and transport equipment must be equipped with full frontal and slide splash and explosion shields. Class ABC fire extinguishers shall be fitted to the body of each piece of equipment.

When possible, drums or other containers to be sampled should be opened and sampled in place to minimize handling. However, when drums are stacked or are close together, they may have to be moved to prevent sympathetic detonation of, or chemical reaction with, other drums around the one being opened. The main criterion is distance to other drums--a reasonable distance should be maintained to keep the drum to be opened segregated from others.

Drums or containers exhibiting the following characteristics require special treatment in handling and sampling:

- Leaking or deteriorated drums
- Bulging drums
- Drums containing explosive or shock-sensitive waste
- Drums containing radioactive waste
- Lab packs
- Gas cylinders

When drums are moved, they should be taken to a staging and sampling area that is diked or bermed to control any major spillage. Again, this area should be far enough away from other drums on the site to prevent a chain reaction. Only one container at a time should be placed in the staging area and opened. One crew can be moving and setting up the remote-opening equipment on the next container while another crew is sampling, labeling, and resealing the first container.

Containers that are inside warehouses, basements, or other buildings must be moved outside before they can be opened. If this is not possible, the Site Manager should be contacted for special assistance in developing the opening plan. Adequate ventilation is critical for container-opening operations.

Empty drums containing less than 1 in. of solid residual waste and those resulting from on-site bulking and repack operations shall be loaded by grappler into transport equipment and placed within the empty drum staging area. Residuals, where possible, shall be transferred to repack contianers prior to movement.

5.5 REMOTE OPENING

Because of the possibility of encountering a drum containing a shock-sensitive material, any drum to be moved and/or sampled should be remotely shaken. One way of doing this is to carefully tie a rope around the drum and shake it from behind a barrier at a safe distance.

The required method of opening drums is by remote means (except as noted in Attachment A). Three types of remote-opening equipment are available: the bung spinner, the remote-controlled drill, and the drum piercer.

The bung spinner consists of:

- Air impact wrench with nonsparking adapter
- Drum-mounting bracket.
- Two-stage regulator.
- Compressed-air cylinder with 100 ft. of air hose and control valve.

The impact wrench is mounted over the bung on top of the drum by means of the steel-mounting bracket. The air tank, regulator, and control valve can be placed up to 100 ft. away from the drum in a well-protected location.

A remote-controlled, air-operated, self-feeding, and self-retracting drill can also be used. This tool consists of:

- Self-feeding and self-retracting drill.
- Drum-mounting bracket.
- 100 feet of air and control hoses.
- Two-stage high-pressure regulator.
- Compressed air cylinder.
- Filter/regulator/lubricator unit.

As with the bung spinner, the air tank, regulator, and control valves can be placed up to 100 feet away from the drum in a well-protected location. There are two controls on this piece of equipment--a start valve and an emergency retract valve.

The drum piercer consists of:

- Hydraulic ram with hand pump.
- 100 feet of hydraulic hose.
- Drum-mounting bracket (top or side).
- Piercing nail.

This unit uses the same bracket as the drum drill. The hydraulic ram slowly forces the steel piercer thr ugh the drum surface as the hand pump is operated. When the 1/2 in.-diameter hole is complete, op ning a relief valve on the pump allows the spring to retract the piercer from the hole.

When any of these pieces of equipment is used, the control lines are to be extended to their maximum, and drum-opening personnel are to operate the controls from behind sandbags, a concrete or brick structure, or other solid barriers. Remember, the opening surfaces of the drill or bung spinner should be decontaminated after each use.

The following guidelines are offered for other types of containers:

- Ring-closed, open-top drums - Loosen the ring and then remove it remotely by means of a rope. If it is necessary to cut the ring, do so near the bolt or clamp/lever so that there will be a place to attach the rope.

- Glass carboys or jugs with lapped/ground-glass stopper or plastic cap - Slowly release any retaining wire and vent any pressure. Remove the stopper or cap by hand only.

- Fiberpacks or corrugated cardboard containers - Release the locking ring and remove the ring and lid by hand.

- Plastic or polyethylene carboys and plastic-lined drums (when necessary) - Use a nonsparking aluminum, brass, or beryllium bung wrench of the proper size. Do not use a bung wrench on any distended drums of this type; remote methods will be applied.

- Plastic Kraft paper, burlap, or cloth bags - Use a trowel or sampling trier The bags should be resealed or placed in an overpack.

5.6 PROBLEM CONTAINERS

Special handling techniques are required for containers which may expose personnel to particularly hazardous conditions. These techniques are described in general below, although site-specific conditions may require the development of specialized methods in the Site Operations Plan.

5.6.1 Leaking or Deteriorated Drums

- The contents of drums that exhibit leakage or apparent deterioration such that movement will cause repture (determined by the HSO) must immediately be transferred to a repack drum. Equipment, including transfer pumps used in the repack operation, must be of explosion proof construction.

- Leaking drums containing sludges or semi-solids, drums that are structurally sound but which are open and contain liquid or solid waste, and drums which are deteriorated but can be moved without rupture, must be immediately placed in overpack containers.

5.6.2 Bulging Drums

- Drums which potentially may be under internal pressure, as evidenced by bulging, must be sampled in place. Extreme care shall be exercised when working with and adjacent to potentially pressurized drums.

- Should movement of a pressurized drum be unavoidable, handle only with a grappler unit constructed for explosive containment. The bulging drum should be moved only as far as necessary to allow seating on firm ground or it should be carefully overpacked.

- Openings into pressurized drums shall be plugged and the bung holes fitted with pressure venting caps set at 5 psi release.

5.6.3 Drums Containing Explosive or Shock Sensitive Waste

- If drums containing wastes that have been identified by sampling, or are suspected by visual examination to be explosive in nature are found, the Site Manager and HSO must be notified immediately, before the drums are handled in any way.

- If the Site Manager and HSO approve handling of these drums, they shall be handled with extreme caution. Initial handling shall be by a grappler unit constructed for explosive containment. Drums shall be palletized prior to transport to a high hazard interim storage and disposal area.

- If at any time during remedial activities, an explosive, pursuant to provisions of Title 18, U.S Code, Chapter 40 (Importation, Manufacture, Distribution, and Storage of Explosive Materials, 1975 Explosives List) is identified, it should be secured and the appropriate state and federal agencies notified.

- Identification of an explosive substance during the course of a remedial action is usually based on the experience of the on-site personnel. Potentially explosive materials usually may be identified by their physical characteristics -- texture, color, density, etc., as well as the way they are packaged or labeled. Most explosives are solids. In some cases they are packaged in water-tight containers to exclude water, while in other cases they are packaged wet to preclude explosion.

- Prior to handling or transporting drums containing explosive wastes, personnel working in the area shall be removed to a safe distance (as determined by the HSO). Continuous contact with the command post shall be maintained until handling or transporting operations are complete. An audible siren signal system, similar to that employed in conventional blasting operations, shall be used to signify the commencement and completion of explosive waste handling or transporting activities.

5.6.4 Drums Containing Radioactive Waste

- Drums containing radioactive wastes shall not be handled until radiation levels have been determined by an initial field survey which is recorded in a field notebook. The survey shall include background levels, direct gamma readings and laboratory analysis of drum surface wipe samples.

- Depending on the level of radiation encountered, handling and transport may require special shielding devices to protect personnel. Following handling and transport, equipment used shall be surveyed by the HSO and decontaminated to background levels prior to recommencing work. Surveys shall also be made of the ground surface in the vicinity of original drum storage to identify potential soil contamination by spilled or leaked radioactive waste. Prior to recommencing work in the area, radioactive soil areas shall be isolated to prevent tracking of radioactive contaminants about the site, and workers who entered the area should have their gloves and boots surveyed for radiation.

5.6.5 Packaged Laboratory Wastes (Lab Packs)

- If drums known or suspected of containing discarded laboratory chemicals, reagents or other potentially dangerous materials in small volume, or individual containers are found, the Site Manager is to be notified immediately, before the drums or containers are moved or opened.

- If the Site Manager and HSO approve the handling or these containers, they shall be handled with extreme caution. Until otherwise categorized, they shall be considered explosive or shock sensitive wastes. Initial handling shall be by a grappler unit constructed for explosive containment. Drums shall be palletized and overpacked if required prior to transport to the Lab pack staging area for sorting, identification, repacking and/or stabilization.

- Prior to handling or transportating Lab Packs from the existing drum area, personnel working in the immediate area shall be removed to a safe distance. Continuous contact with the command post shall be maintained until handling or transporting operations are

complete. An audible siren signal system, similar to that employed in conventional blasting operations will be used to signify the commencement and cessation of Lab Pack handling or transporting activities.

5.6.6 Air Reactive Wastes

- If the presence of an air reactive substance is verified or even suspected, the material should be immediately segregated and transported to a separate high hazard interim storage and disposal area.

- Air reactive wastes may be discovered during opening or sampling operations Air reactive substances normally require special packaging. They may be stored under water or some other liquid to minimize air contact. They may also be found in sealed ampoules, corrugated drums, stainless steel canisters, or specially lined drums.

5.6.7 Gas Cylinders

- Gas cylinders, when encountered, should be stored and disposed of on a special case basis depending on the integrity of the cylinders and type of substance they are expected to contain.

5.7 CONTAINER SAMPLING

5.7.1 Equipment

- Personal protection equipment.

- 500 ml, wide-mouth amber glass bottle with teflon cap liner.

- Uniquely numbered sample identification labels and tags filled out and affixed to sample containers before sampling commences.

- 4-ft. x 3/4-in. ID glass sampling thief.

- Remotely operated opening device.

- One gallon covered cans half-filled with absorbent material (for offsite shipment only).

5.7.2 Sampling Procedures

All drums and mechanical equipment should be grounded prior to the commencement of sampling. If the bung or container lid can be removed, sample contained liquids using a glass thief, which shall then be broken and discarded within the barrel. A barrel that has a badly rusted bung, or that cannot be sampled as above, shall be safely entered with a hydraulic penetrating device operated remotely. All openings shall be plugged except during sampling operation.

The steps to be followed in sampling are as follows:

- Record any markings, special drum conditions, and type of opening in the field notebook, on the sample log sheet, and, later, on the Chain-of-Custody form Locate the general area on a sketch of the site.
- Stencil an identifying number on the drums and record in logbook. Consult the sampling plan for identifications.
- Make certain that the drum/container is set on a firm base, preferably in a fully upright position.
- Open the drum/container as described in Section 5.5 and Attachment A.
- Insert glass tubing almost to the bottom of the drum or until a solid layer is encountered. About 1 foot of tubing should extend above the drum.
- Allow the waste in the drum to reach its natural level in the tube. Then cap the top of the sampling tube with a tapered stopper, ensuring liquid does not come into contact with stopper.
- Carefully remove the capped tube from the drum and insert the uncapped end in the sample container. Do not spill liquid on the outside of the sample container. Release the stopper and allow the glass thief to drain completely into the sample container.
- Deliver 100 to 250 ml of the sample (the sampling plan will specify the amount) to a clean, wide-mouth, 500-ml (1-pt) glass sample jar. If the sample is not free flowing and is taken through a bung opening, repeated sampling may be necessary.
- Place the used sampling tube, along with paper towels or waste rags used to wipe up any spills, into an empty metal barrel for subsequent disposal. If glass tubing has been used, it may be broken and left inside the drum being sampled.
- Cap the sample container tightly and place prelabeled and tagged sample container in a carrier.
- Replace the bung or lids or place plastic over the drum/container.
- Measure the sample for radioactivity and record results in a field notebook. If the meter readings exceed 10 mR/hr, notify the FOL immediately.
- Fill out Chain-of-Custody Record and carefully pack samples. The finished package will be padlocked or custody-sealed for shipment to the laboratory. The preferred procedure includes the use of a custody seal across filament tape that is wrapped around the package at least twice The custody seal (paper, plastic, or metal) is then folded over and stuck to itself so that the only access to the samples is by cutting the filament tape or breaking the seal to unwrap the tape. The seal is signed before the package is shipped.

  Complete the appropriate traffic report. Drum samples are always considered to be high-hazard samples.

5.7.3 Sample Preservation and Packing Procedures for Drummed Waste Samples

- No preservatives shall be used.
- Place sample container in a ziplock plastic bag.
- Place each bagged container in a 1-gallon covered can containing absorbent packing material. Place lid on can.
- Mark the sample identification number on the outside of the can.
- Arrange for the appropriate transportation mode consistent with the type of hazardous waste involved.

5.8 RESEALING AND SITING CONTAINERS

All containers opened for sampling need to be resealed to prevent the escape of vapors and possible reactions from rainwater, air and so on. The resealing methods will depend on the opening methods used and include the following.

- Replacing the bung, screw cap, etc.
- Replacing the lid and retaining ring.
- Placing the drum in an overpack (larger drum) when it cannot be resealed by any other method.
- If a hole is drilled, use of a special rubber or plastic plug. A drum bonnet should be used to ensure that rainwater does not seep around the plug.

It is important to note that these resealing methods are for the purpose of preventing leakage from the container while it is in storage on the site. If the container is to be moved off the site, DOT regulations regarding transportation of drums must be complied with. These will generally require more rigorous sealing procedures.

Once the drum is sampled and resealed, it should be left where it cannot react with other containers on the site. For a small number of drums, the storage areas may be the staging and opening area. In any event, the sampled drums should be placed in an area away from other groups of containers on the site. The reason is that slowly progressing chemical reactions can start when a container is opened and the contents exposed to air or the disturbance caused by handling the drum. Such a reaction could take hours or even days to occur. Another reason for the segregation and identification of drums for recovery is for use as evidence.

5.9 PUBLIC EVACUATION/ALERT CONSIDERATION

5.9.1 General

The potential ne d for evacuation of the site and surrounding area must be considered when the Site Operations Plan and Health and Safety Plan are developed. The HASP should describe the conditions requiring evacuations and the parties responsible for issuing and nforcing an evacuation order Several site-specific factors influence the need for, and the extent of, the evacuation or alerting of the nearby off-site public. These factors include the following.

- Proximity of residences, shopping or other commercial or business areas, factories, highways, railroads, and airfields or other transportation routes that may have to be evacuated This information will be available from the background review and preliminary site inspections.

- Proximity of other facilities that could be involved in, cause, or propagate a fire, explosion, or toxic release on the site. This information will also be known from the background review and site inspection.

- Presence of explosive, flammable, or volatile substances on the site. Some general indications of the types of hazards present may be provided by the background review and site inspection. The probability of encountering explosives (i e., directly detonatable or shock-sensitive materials as opposed to explosive vapor-oxygen mixtures) will have been reduced by the screening procedures applied during earlier site evaluation Preliminary assessment and site inspection may provide indications, or definite knowledge, that specific compounds presenting known flammability or toxicity hazards are in the containers. Of these known hazards, those having the greatest potential for atmospheric spread off the site should be used in estimating evacuation hazard distances as described below. For example, if several volatile toxic liquids, or toxic vapors, are present, those having the greatest toxic potential in air, as measured by a Threshold Limit Value (TLV) or classified as Immediately Dangerous to Life and Health (IDLH), should determine the hazard distance, since these have the potential for the greatest health impacts.

  Atmospheric drift of a toxic or flammable vapor cloud or plume can often extend to great distances from the site, and hence potentially threaten more people than even an explosive hazard. Similarly, thermal-radiation hazards generated by even a large fire on the site generally reach to distances which are small compared to possible atmospheric drift distances of a vapor cloud.

- Potential for an accident on the site which could result in an atmospheric release of flammable or toxic liquid or vapor. This possibility should be remote if only one drum is opened at a time and if that drum is segregated from other drums.

  The most important parameter that needs to be estimated for any accident is the rate of liberaiton of flammable or toxic vapor; unfortunately, this is often the most uncertain quantity.

- Prevailing wind speed and direction and atmospheric stability affect very strongly the pattern of atmospheric spread of a gas cloud. If these can be quantitatively estimated at the time an actual accidental release occurs, this information should be used in calculating an estimated evacuation corridor as detailed below.

  However, because wind direction is subject to rapid and unpredictable variations, and because atmospheric drift of a concentrated cloud or plume is greatest under stable atmospheric conditions and low wind speeds, it is usually preferable to take a conservative approach. Thus, one should base a public hazard evacuation distance, in any direction from the site, on an assumed worst-case atmospheric condition, that is, a stable atmosphere and moninal low wind speed, say 5 mph.

5.9.2 Plausible Accident Scenario

A plausible but hypothetical scenario for an accident that may be expected to occur during closed-container opening operations would involve a release, from only the one 55-gallon drum being opened, of a volatile toxic liquid that rapidly vaporizes and forms a nonburning but continuous source of a toxic vapor plume. The rate of vapor generation and release can be calculated from the assumption that the upright drum is completely open at the top and a knowledge of the vapor pressure and some other readily available chemical properties of the chemical involved. For simplicity, the fact that a complex mixture of chemicals may actually be involved is neglected and the most toxic liquid or vapor is treated as if it were a pure component.

5.9.3 Estimating Hazard Evacuation Radius

Once the rate of atmospheric release of vapor is estimated for the accident scenario, outside assistance from any of several sources may be sought to estimate an atmospheric dispersion distance appropriate for the degree of flammability or toxicity hazard of the chemical involved. This estimate would then be used as a recommendation of an evacuation radius to be made to the responsible official in charge at the site, who will actually determine the necessity and extent of public evacuation.

Outside assistance in estimating the hazard radius in an emergency situation may be obtained from EPA's Emergency Response Team (ERT), the U.S. Coast Guard's Hazard Assessment Computer System (HACS), or from other hazard analysts.

Two different situations may require the evacuation of the off-site public:

- The emergency resulting from an actual occurrence of an accident involving atmospheric release during drum-opening operations.
- Precautionary planning before the start of drum-opening operations, in anticipation of an accident.

The above hypothetical scenario involving a single drum may be used in planning precautionary evacuations before the start of a dangerous drum-opening operation. On the other hand, in an actual accident, the rate may be estimated if the number of drums releasing and the size of the opening in each such drum can be estimated by observation.

The decision to evacuate or alert the public off the site as a precautionary measure depends on the degree of hazard presented by the materials known to be present at the site. For the scenario described above, a table of numerical hazard distances for several of the commonly encountered chemicals and those expected to be found at the site will be prepared before drum-opening commences as part of the Health and Safety Plan. These distances may then be used as numerical decision criteria for precautionary evacuation by comparing them to the known distances of populated areas from the site.

6.0 REFERENCES

Casis, J.A., et al., 1985. Guidance Document for cleanup of Surface Tank and Drum Sites. Prepared for Office of Emergency and Remedial Response, U.S. EPA, Washington, D C. under Contract No. 68-01-6930.

7.0 ATTACHMENTS

Attachment A - Techniques for Opening Containers (2 Sheets)

ATTACHMENT A
PAGE 1 OF 2

TECHNIQUES FOR OPENING CONTAINERS

Types	Size	DOT Designation	Type of Opening	Recommended Opening Technique
Steel drum, open head, unlined and lined	5-110G	DOT 5 - DOT 6 - DOT 17 - DOT 37 - DOT 42 -	Detachable steel lid with a clamp or lever-locking ring, or a ring with forged lugs and secured by a bolt.	Remove bolt. If possible, relieve pressure on clamp or lever-locking ring remotely (i.e., lanyard); Remove ring with lanyard. Remove lid by hand.
Steel drum, closed head, lined	5-110G	DOT 5 - DOT 6 - DOT 17 - DOT 37 - DOT 42 -	Plastic bung opening not larger than 2.3 in.	Preferred method is to remotely open bung. Manually open otherwise.
Steel drum, cl sed head, unlined (steel, monel, stainless, nickel, and aluminum)	5-110G	DOT 5 - DOT 6 - DOT 17 - DOT 37 - DOT 42 -	Steel or other metal bung not over 2.3 in.	Remote method.
Burlap bag, double Kraft paper bag, cloth bag, plastic bag	Various	DOT 36 - DOT 44 - DOT 45 -	Various.	Open with sharp implement; reseal bag or overpack in fiberpack.

TECHNIQUES FOR OPENING CONTAINERS (Cont'd)

Types	Size	DOT Designation	Type of Opening	Recommended Opening Technique
Glass carboys and jugs	6-20G	Usually DOT 1- branded into the wooden outer sheathing; often sheathing is no longer present.	Lapped or ground glass stopper; occasionally a plastic screw cap will be encountered.	Manually.
Laboratory reagent bottles (amber bottles), small reagent cans	Various	None	Screw top or press lid.	Usually encountered in lab packs. Not to be handled or sampled. Replace drum lid carefully. Contact ZPMO for action.
Polyethylene and oth r plastic drums r barrels	5-110G	DOT 2 -	Usually bung opening not over 2.7 in. in diameter.	Manually.
Gas cylinders	Various	DOT 3 - DOT 4 - DOT 8 - DOT 39 -	Valve, threaded fitting, quick-connect or puncture-type fittings.	Not to be handled or sampled. Contact ZPMO for action.
Fiberpack or corrugated	5-110G	DOT 12 - DOT 21 - DOT 23 -	Usually a detachable plastic lid with a clamp or lever-locking ring.	Manually remove locking ring and lid.

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STANDARD OPERATING PROCEDURES

Number	Page
SA-5 3	1 of 10
Effective Date: 05/04/90	Revision: 1
Applicability: EMG	
Prepared: Earth Sciences	
Subject: TANK SAMPLING	Approved: D. Senovich

TABLE OF CONTENTS

1.0 PURPOSE

The purpose of these procedures is to provide general reference information regarding sampling of liquid or solid materials from tanks by methods which do not require tank entry.

2.0 SCOPE

This procedure covers tank inspection and sampling techniques for use in assessing the condition and, contents of tanks. This guideline does not address actual entry for internal inspection or sampling which requires strict Health and Safety protocols during this potentially hazardous activity.

3.0 GLOSSARY

None.

4.0 RESPONSIBILITIES

Sit Manager - responsible to assure that the need for tank sampling is well justified and that the sampling techniques chosen are adequate to obtain a representative sample and prevent significant spills and atmospheric releases.

Field Operations Leader - responsible for implementing the FSAP and for overseeing the sampling effort in the field.

Health and Safety Officer - responsible for developing the safety-related procedures for tank entry and sampling and for assuring their correct implementation in the field.

5.0 PROCEDURES

5.1 ACCESS FOR SAMPLING

If possible, tanks will be opened and sampled from the top. The physical size, shape, construction material and location of access will determine the best methods of opening and sampling. In some cases, (for example, if the tank is being sampled from a valve at the bottom of the tank) it may b necessary to have spill response personnel on-site in case of an accidental release.

When liquids are contained in sealed vessels, gas vapor pressures build up, sludges settle out, and density layering develops. The potential for explosive reactions or the release of noxious gases when containers are opened require considerable safeguards. The vessels should be opened with extreme caution. Preliminary sampling of any headspace gases may be warranted. As a minimum, a preliminary check with an explosimeter or an organic vapor analyzer will determine levels of personnel protection and may be of aid in selecting a sampling method.

5.2 TANK SAMPLING

At least two persons must always perform tank sampling: one should collect the actual samples and the other should stand back, usually at the head of the access stairway and bserve, ready to assist or call for help. If the walls or r of of the tank are corroded, the sampl rs should n t attempt to climb up the outside of a tank, but instead an aerial lift should be used to gain access to the sampling point.

The sampling of tanks is similar to the sampling of drums. The techniques for sampling are the same, except sampling equipment may need to be longer to give a representative sample of deep tanks Steps to be followed in tanks sampling include the following:

1. Record the tank's condition, markings, openings or valve types, and approximate size in gallons in the site logbook and on the sample log sheet. Note the tank location on the site sketch.

2. Attach an identification number to the tank using a stencil or weatherproof tag. Number succeeding tanks consecutively. Record the numbers in the site logbook.

3. Determine whether the tank contents are stratified by inserting a long plastic or glass tube sampler, withdrawing it, and examining the tube contents. Samples of stratified contents can be taken using a bomb, weighted bottle, or a Kemmerer sampler. For a description of these methods, see Attachment A of this Guideline. If a composite sample is desired, take one sample each for the upper, middle, and lower sections of the tank or for each identified layer, and composite them in one container.

   NOTE: If a reaction is observed when the glass tube is inserted (violent agitation, fumes, light, etc.) the investigators should leave the area immediately. If the glass tube becomes cloudy or smokey after insertion into the tank, the presence of hydrofluoric acid is indicated and a comparable length of rigid plastic tubing should be used.

4. If contents of the tank are homogenous, a sample may be taken using glass tubes. See Attachment B for details of this procedure.

5. After collecting the sample in the appropriate container(s), add preservative required, tighten the lid, attach a label and identification tag and tape the lid in place, as appropriate. Fill out the appropriate sample log sheets and Chain-of-Custody Record.

5.3 SAMPLE PACKAGING AND SHIPPING

Many samples collected from storage tanks will be shipped as high-hazard samples (see SA-6.2; Sample Packaging and Shipping).

6.0 REFERENCES

None.

7.0 ATTACHMENTS

Attachment A - Methods of Sampling Stratified Contents of Tanks
Attachment B - Collection of Liquid Containerized Wastes Using Glass Tubes

ATTACHMENT A

METHODS OF SAMPLING STRATIFIED CONTENTS OF TANKS

1. Sampling Using the Bacon Bomb Sampler

Discussion

The Bacon Bomb (Figure A-1) is designed for the withdrawal of samples by the "thief" method from various levels within a storage tank. It consists of a cylindrical body with an internal tapered plunger that acts as a valve to admit the sample. A line attached to the top of the plunger is used to open and close the valve. A removable top cover provides a point of attachment for the sample in and has a locking mechanism to keep the plunger closed after sampling. The Bacon Bomb is usually constructed of chrome-plated brass and bronze with a rubber O-ring acting as the plunger sealing surface. Stainless steel versions are also available. The volumetric capacity is 8, 16, or 32 ounces (236, 473 r 946 milliliters).

Uses

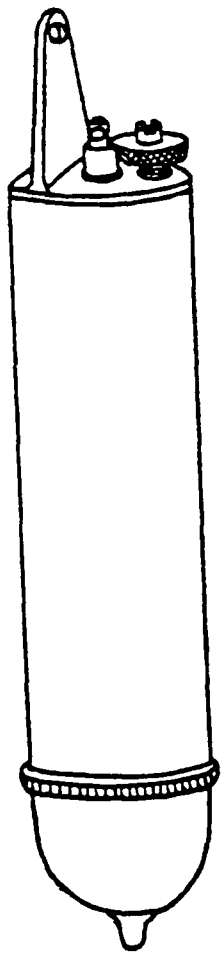
The Bacon Bomb is a heavy sampler best for viscous materials held in large storage tanks or in lagoons. If a more non-reactive sample , needed, the stainless steel version should be used or the samplers could be coated with Teflon.

Sampling Method

1. Attach the sample line and the plunger line to the sampler.
2. Measure and then mark the sampling line at the desired depth for sampling.
3. Gradually lower the sampler by the sample line until the desired level is reached.
4. When the desired level is reached, pull up on the plunger line and allow the sampler to fill before releasing the plunger line to seal off the sampler.
5. Retrieve the sampler by the sample line, being careful not to pull up on the plunger line and thereby prevent accidental opening of the bottom valve.
6. Rinse or wipe off the exterior of the sampler body.
7. Position the sampler over the sample container and release its contents by pulling up on the plunger line.
8. Thoroughly decontaminate the sampler prior to next use.

FIGURE A-1

BACON BOMB SAMPLER



2. Discussion

The weighted bottle sampler consists of a glass bottle, a weight sinker, a bottle stopper, and a line for opening the bottle and lowering and raising the sampler during sampling (Figure A-2) There are variations of this sampler, as illustrated in the American Society of Testing and Materials (ASTM) Methods D-270 and E-300. This sampler can be either fabricated or purchased commercially.

Uses

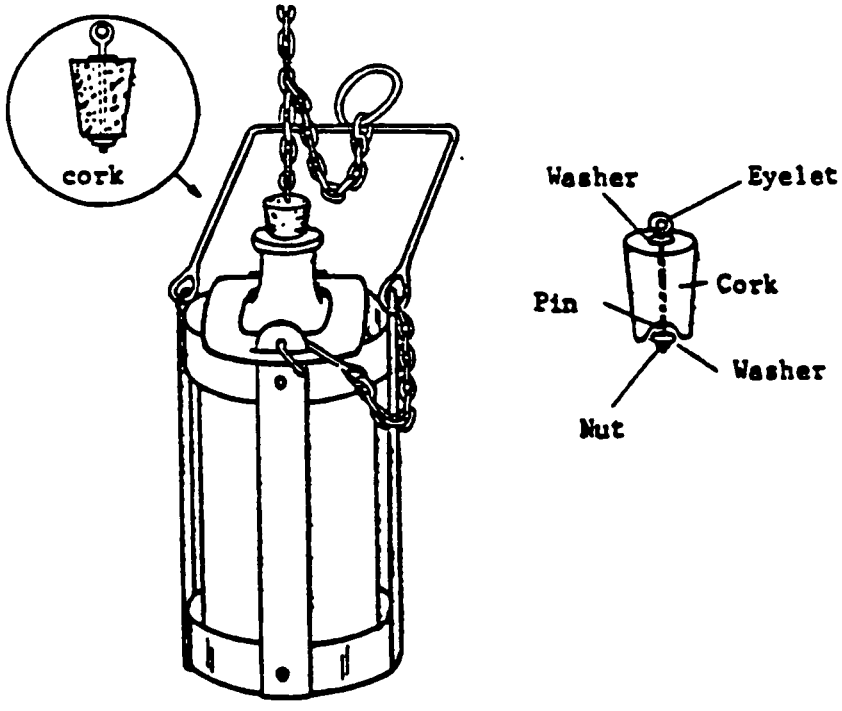
Weighted bottle samplers are used to sample liquids at a particular depth. These samplers are difficult to use in very viscous liquids. In addition, the outside of the bottle is exposed to the waste This is undesirable if the bottle is used as the sample container. An alternative to the weighted bottle sampler is the Kemmerer bottle.

Sampling Method

1. Gently lower the sampler into the liquid to the desired depth so as not to remove the stopper prematurely.
2. Pull out the stopper with a sharp jerk of the sampler line.
3. Allow the bottle to fill completely, as evidenced by the cessation of air bubbles.
4. Raise the sampler and cap the bottle.
5. The bottle can be used as the sample container, but it must be thoroughly decontaminated.

FIGURE A-2

WEIGHTED BOTTLE SAMPLER



1000-ml (1-quart) weighted bottle catcher

3. Collection of Samples From Depth with a Kemmerer Bottle

The Kemmerer bottle is a messenger-activated sampling device (see Figure A-3). In the open position, liquid flows easily through the device. Once lowered to the desired depth, a messenger is dropped down the sample line, tripping the release mechanism and closing the bottle. In the closed position, the bottle is sealed, both on top and bottom, from any additional contact with the liquid column and the sample can be retrieved.

Most commercially-available Kemmerer bottles are of brass or plastic construction. Modification of existing systems with non-reactive materials such as Teflon, glass or stainless steel, would only be partially successful due to the complicated machining necessary for the release mechanism. Other modification, such as a stoppered bottom drain, are simpler and useful in minimizing sample disturbance during transfer to the appropriate containers.

Uses

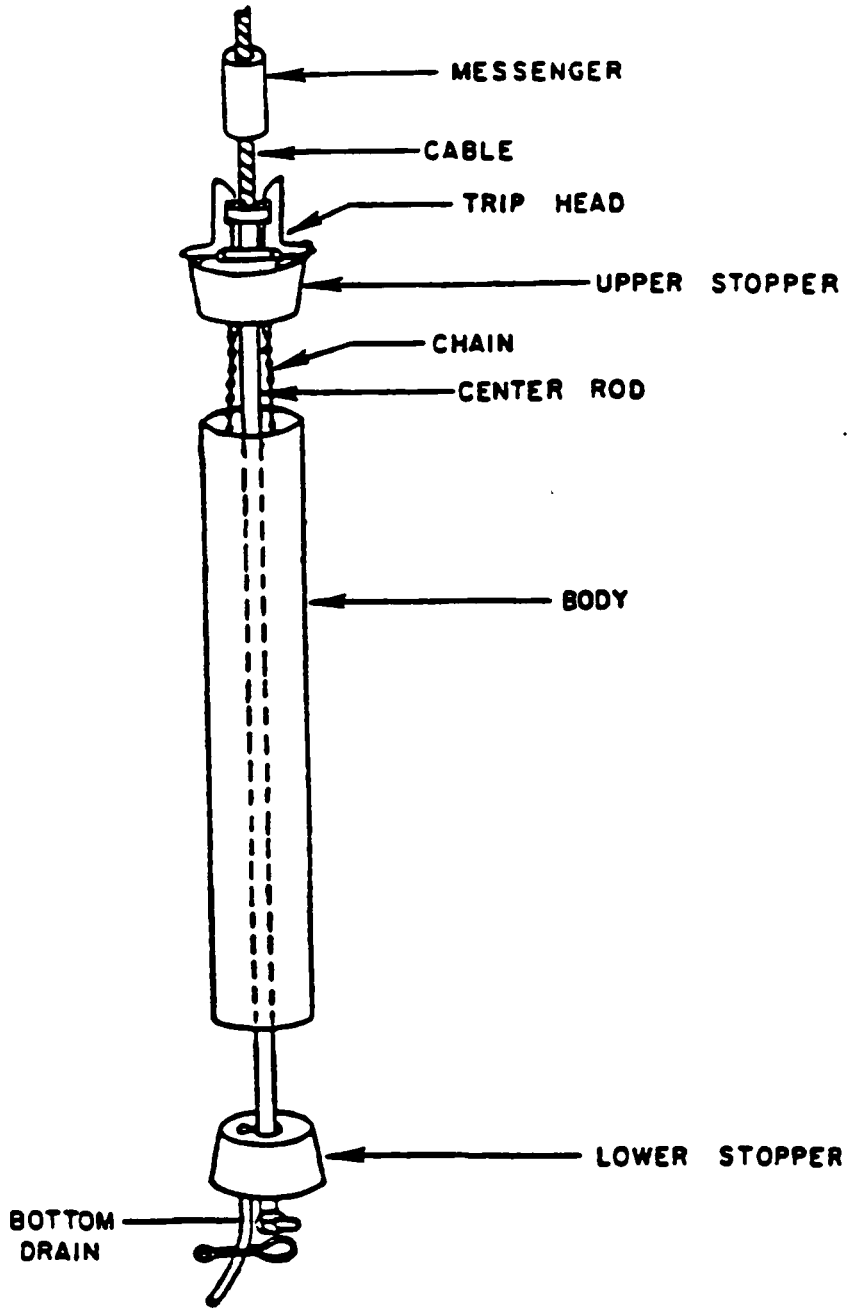
The Kemmerer bottle is currently the most practical method of collecting discrete, at -depth samples from vessels. The application is limited, however, by the incompatibility of various construction materials with some analytical techniques. Proper selection, i.e., all metal assemblies for organic analysis, or all plastic assemblies for trace element analysis, will overcome this deficiency.

Sampling Method

1. Inspect Kemmerer bottle for thorough cleaning and ensure that sample drain valve is closed (if bottle is so equipped).
2. Measure and then mark sample line at desired sampling length.
3. Open bottle by lifting top stopper-trip head assembly.
4. Gradually lower bottle until desired level is reached (predesignated mark from Step 2).
5. Place messenger on sample line and release.
6. Retrieve sampler; hold sampler by center stem to prevent accidental opening of bottle stopper.
7. Rinse or wipe off exterior of sampler body (wear proper gloves and protective clothing).
8. Recover sample by grasping lower stopper and sampler body with one hand (gloved), and transfer sample by either (a) lifting top stopper with other hand and carefully pouring contents into sample bottles, or (b) holding drain valve (if present) over sample bottle and opening valve.
9. Allow sample to flow slowly down side of sample bottle with minimal disturbance.
10. Preserve the sample, if necessary.

FIGURE A-3

MODIFIED KEMMERER SAMPLER



ATTACHMENT B

COLLECTION OF LIQUID CONTAINERIZED WASTES USING GLASS TUBES

Description

Liquid samples from opened containers are collected using lengths of glass tubing. The glass tubes are normally 122 centimeters in length and 6 to 16 millimeters inside diameters. Longer tubes may be used but larger diameter tubing is not effective. The tubing allows inspection of the tank contents for stratification. This method should not be attempted with less than a two-person sampling team.

Uses

This method provides a quick, relatively inexpensive means of collecting concentrated containerized wastes. The major disadvantage is from potential sample loss, which is especially prevalent when sampling low viscosity fluids. Splashing can also be a problem, and proper protective clothing should always be worn.

Sampling Method

1. Remove cover from sample container opening.
2. Insert glass tubing almost to the bottom of the container. Try to keep at least 30 centimeters of tubing above the top of the container.
3. Allow the waste in the tank to reach its natural level in the tube, then cap the top of the tube with a rubber stopper or thumb.
4. Carefully remove the capped tube from the tank and insert the uncapped end in the sample container.
5. Release the thumb or stopper on the tube and allow the sample container to fill to approximately 90 percent of its capacity.
6. Repeat Steps 2 through 6 if more volume is needed to fill the sample container.
7. Cap the sample container tightly with a Teflon-lined cap and affix the label and sample identification tag.

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Number	Page
SA-6 1	1 of 14
Effective Date: 05/04/90	Revision: 2
Applicability: EMG	
Prepared: Earth Sciences	
Approved: D Senovich	

Subject: SAMPLE IDENTIFICATION AND CHAIN-OF-CUSTODY

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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 sampl s 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 laborat ry 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.

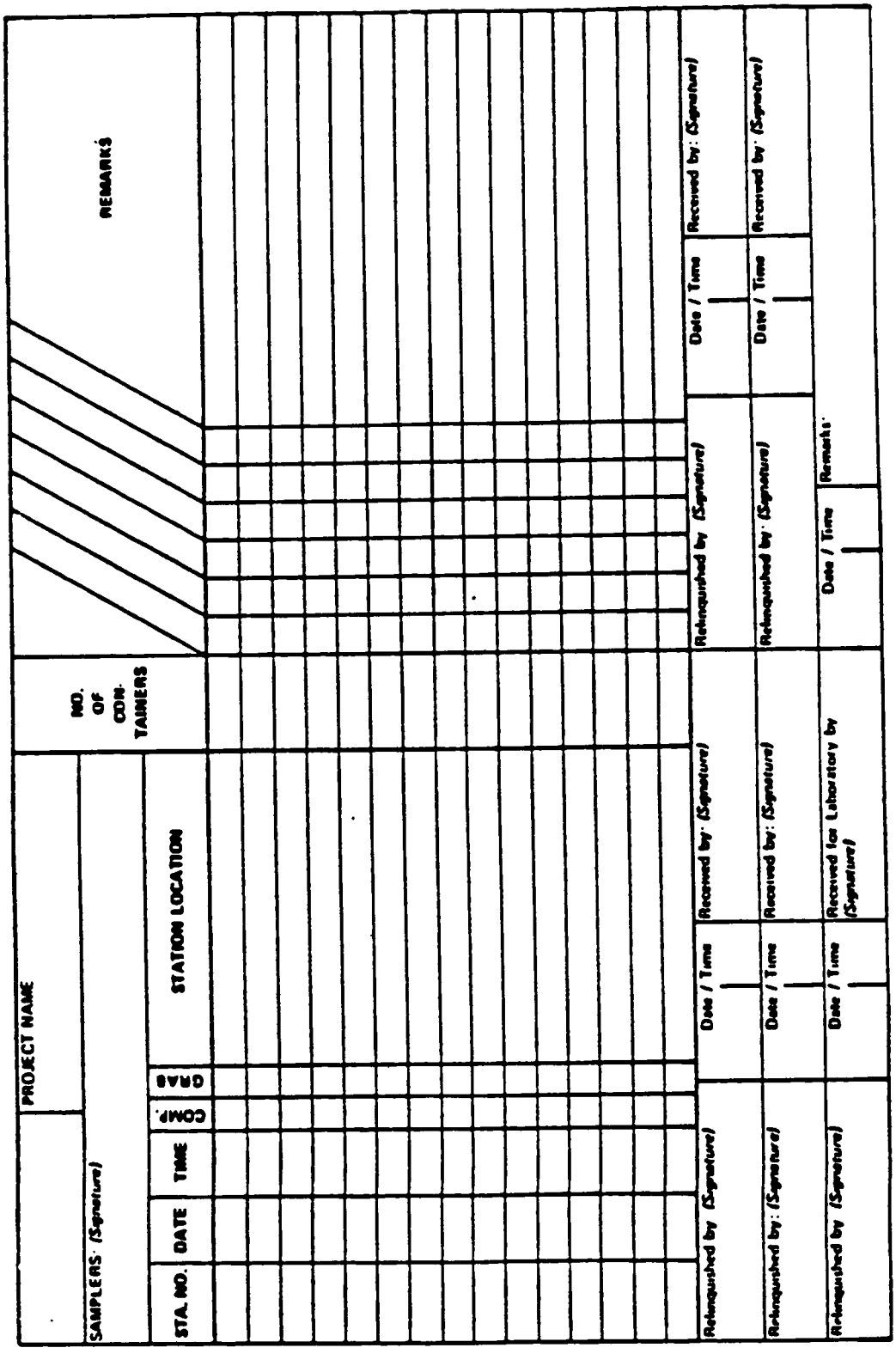
6.0 REFERENCES

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

ATTACHMENT A
CHAIN-OF-CUSTODY RECORD FORM FOR USE IN REGION I
(Original is 8-1/2 by 11)



ATTACHMENT B
CHAIN-OF-CUSTODY RECORD FORM FOR USE IN REGION II
(Original is 8 by 10-1/2)

CHAIN OF CUSTODY RECORD

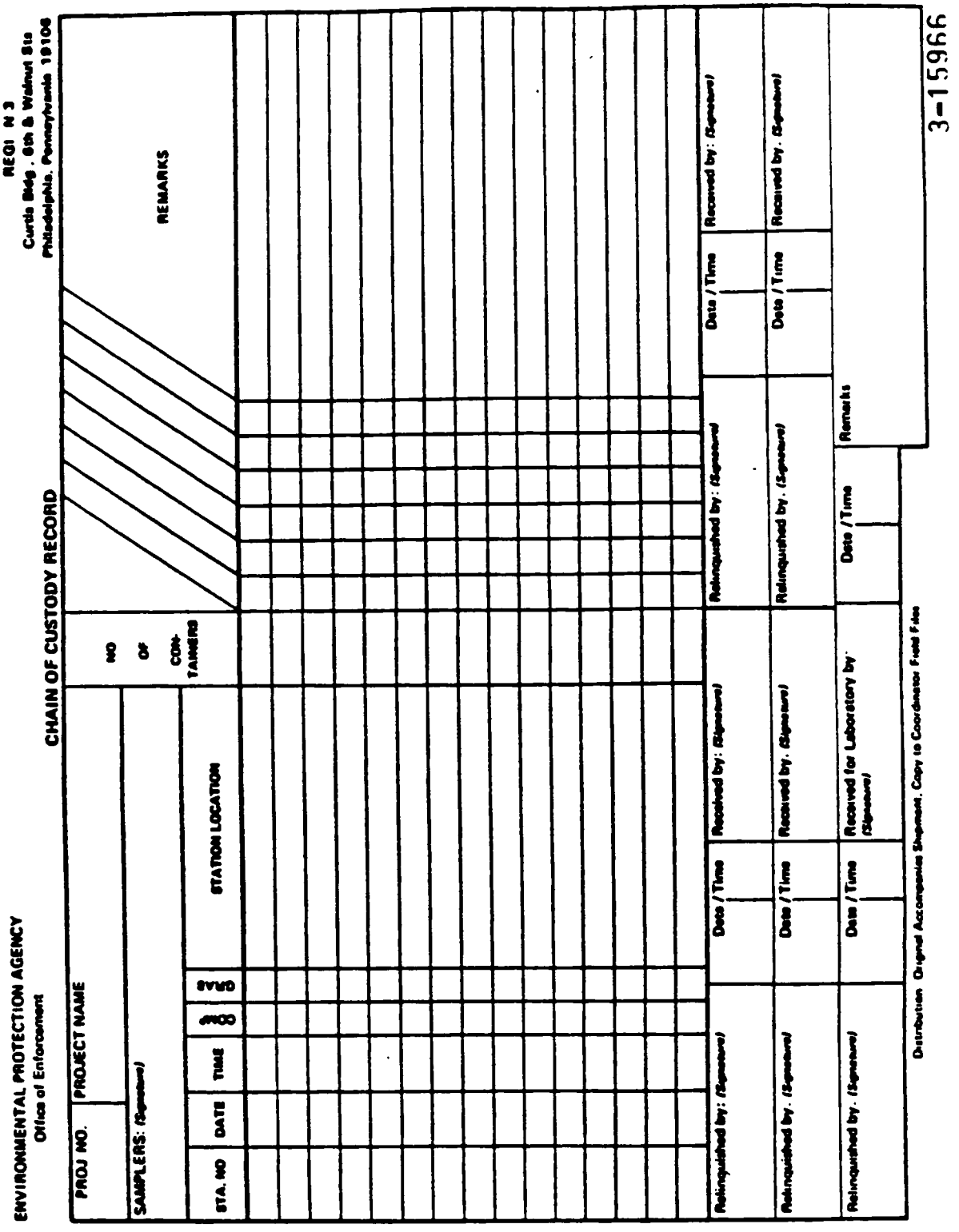
ENVIRONMENTAL PROTECTION AGENCY – REGION II
SURVEILLANCE & ANALYSIS DIVISION
EDISON, NEW JERSEY 08837

Name of Unit and Address		
Sample Number	Number of Containers	Description of Sample

Person Assuming Responsibility for Samples	Time	Date

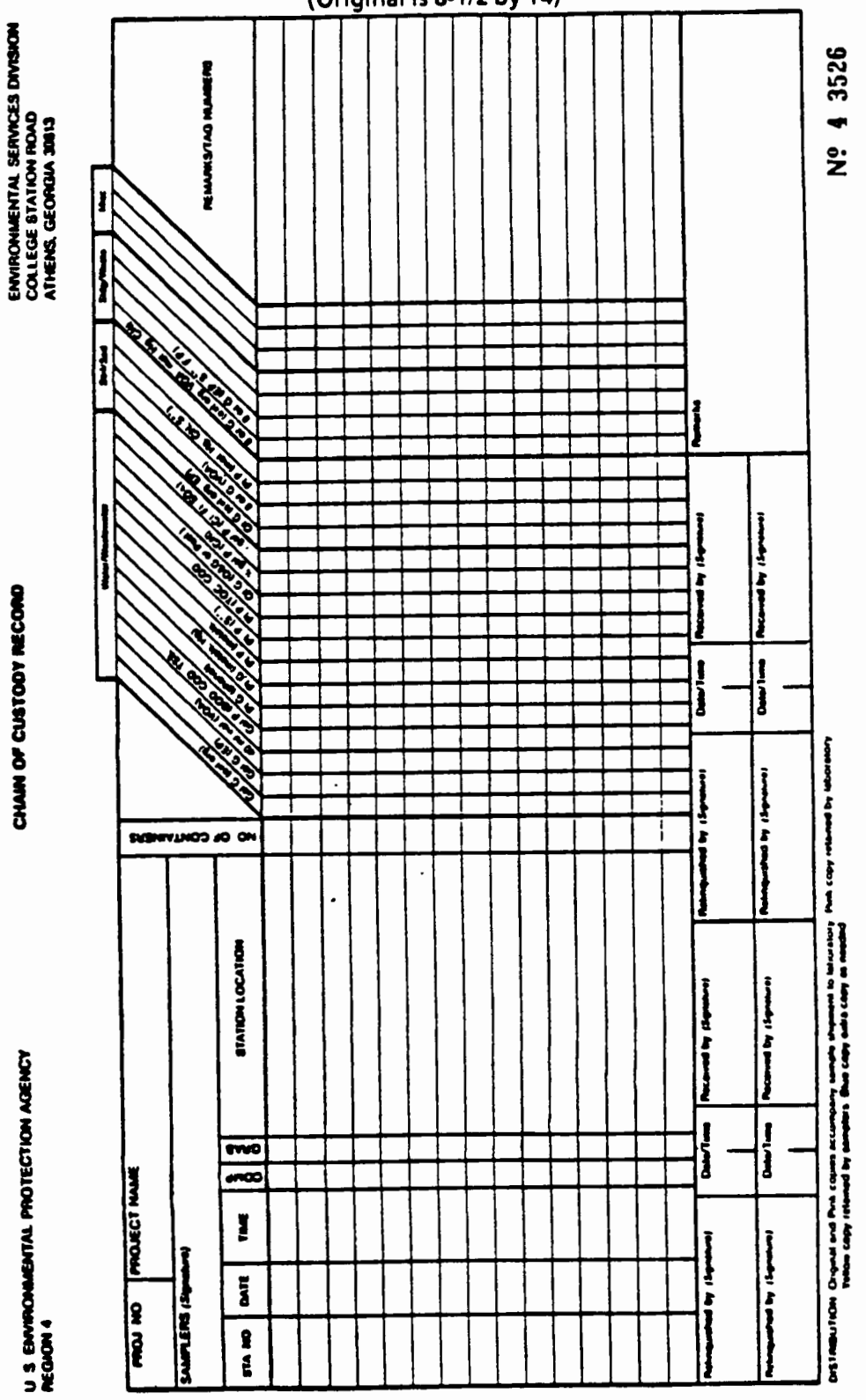
Sample Number	Relinquished By	Received By	Time	Date	Reason for Change of Custody

ATTACHMENT C
CHAIN-OF-CUSTODY RECORD FORM FOR USE IN REGION III
(Original is 8-1/2 x 11-3/4")



3-15966

ATTACHMENT D
CHAIN-OF-CUSTODY RECORD FORM FOR USE IN REGION IV
(Original is 8-1/2 by 14)



ATTACHMENT E
SAMPLE LABEL

NUS CORPORATION PROJECT: _____

STATION LOCATION: _____

DATE: ___/___/___ TIME: _____ hrs.

MEDIA: WATER ☐ SOIL ☐ SEDIMENT ☐ _____ ☐

CONCENTRATION: LOW ☐ MED ☐ HIGH ☐

TYPE: GRAB ☐ COMPOSITE ☐

ANALYSIS	PRESERVATION
VOA ☐ BNA's ☐	Cool to 4°C ☐
PCB's ☐ PESTICIDES ☐	HNO_3 to pH <2 ☐
METALS: TOTAL ☐ DISSOLVED ☐	NAOH to pH>12 ☐
CYANIDE ☐	_____ ☐
_____ ☐	

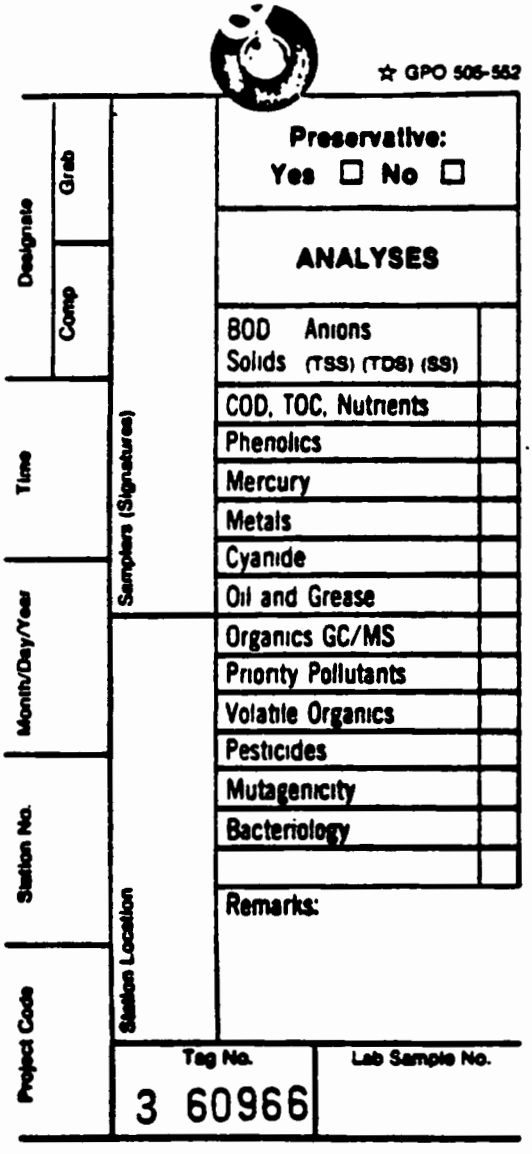
Sampled by: _____

Case No.: _____ Traffic Report No.: _____

Remarks:

ACFILE: FORMS\BOTLABL

ATTACHMENT F
SAMPLE IDENTIFICATION TAG



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA

ATTACHMENT G
CHAIN-OF-CUSTODY SEAL

CUSTODY SEAL

Signature

Date

CUSTODY SEAL

Date

Signature

NUS CORPORATION

ENVIRONMENTAL MANAGEMENT GROUP

STANDARD OPERATING PROCEDURES

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TABLE OF CONTENTS

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 Attachm nt 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, perchl roethylene (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 n t 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 n nflammable 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.

F r 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 A

DOT HAZARDOUS MATERIAL CLASSIFICATION (49 CFR 173.2)

1. Radioactive material (except a limited quantity)
2. Poison A
3. Flammable gas
4. Nonflammable gas
5. Flammable liquid
6. Oxidizer
7. Flammable Solid
8. Corrosive material (liquid)
9. Poison B
10. Corrosive material (solid)
11. Irritating material
12. Combustible liquid (in containers having capacities exceeding 110 gallons [416 liters])
13. ORM-B
14. ORM-A
15. Combustible liquid (in containers having capacities of 110 gallons [416 liters] or less)
16. ORM-E

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	DOT PROPER SHIPPING NAME	HAZARD CLASS	CODE	I D	CONTAINER NUMBERS	PIC	BULK
1	55 gal	200 lbs.	x	Nitric Acid, Fuming	Oxidizer	55-OXI	C	1	✓	
1	55 gal	450 lbs	x	Flammable Liquid, n.o.s.	Flammable Liquid	55-ABF	—	2		✓
1	55 gal	250 lbs	x	Flammable liquid, n.o.s	Flammable Liquid	55-FLI	B	3	✓	
1	16 A	12 lbs.	x	Bromine	Corrosive Material	55-COR	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 _____

Shipper Work Order _____

Service Order No _____

 Rev 1-79

NUS CORPORATION

ENVIRONMENTAL MANAGEMENT GROUP

STANDARD OPERATING PROCEDURES

Number	Page
SA-6 3	1 of 4
Effective Date: 05/04/90	Revision: 2
Applicability: EMG	
Prepared: Earth Sciences	
Subject: SITE LOGBOOK	Approved: D Senovich

TABLE OF CONTENTS

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 dep nd 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. Th 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 thr ugh 45) at 17:50 hours. Site activities terminated at 18:22 h urs. All p rsonnel offsite, gate locked.

_____
Field Operations Leader

TABLE OF CONTENTS

1.0 PURPOSE

This procedure contains examples of forms in current use for RI activities, and a brief explanation of the function of these forms. The intent of this procedure is simply to compile and introduce these forms, and not to provide detailed explanations of the Forms.

2.0 SCOPE

Attachment A lists the forms illustrated in this procedure. Forms identified as controlled documents are issued by EPA, are sequentially numbered, and may not be altered. Those which are not listed as controlled documents and not required documents issued by EPA may be altered or revised for project-specific needs, with notification of.

3.0 GLOSSARY

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

4.0 RESPONSIBILITIES

Field Operations Leader - The Field Operations Leader is responsible for ensuring that the appropriate forms illustrated in this guideline are correctly used and accurately filled out. In general, the sampling technician or Field Operations Leader will fill out forms related to sample labeling, shipment and analysis (see Section 5.1); the site geologist/geohydrologist will fill out borings logs, groundwater level and geohydrological test forms (see Section 5.2); and the Field Operations Leader, site Health and Safety Officer, or field technicians, will fill out equipment calibration and maintenance records (see Section 5.3).

5.0 PROCEDURES

5.1 SAMPLE COLLECTION, LABELING, SHIPMENT AND REQUEST FOR ANALYSIS

5.1.1 Sample Label

The sample label is a 2-by 4-inch white label with black lettering and an adhesive backing. Attachment B-1 is an example of a sample label. These labels are required on every sample but are not controlled documents. Guidelines for filling out sample labels are contained in SA-6.1.

5.1.2 Sample Identification Tag

The Sample Identification Tag (Attachment B-2) must be used with samples collected for Contract Laboratory Program (CLP) analysis. The tag is a white, heavy paper label that is attached to the neck of the sample bottle with a string or wire. The Sample Identification Tag is a controlled document, and is available from the Regional Sample Control Center (RSCC). Procedure SA-6.1 provides the steps in filling out Sample Identification Tags.

5.1.3 Chain-of-Custody Record F rm

The Chain-of-Custody Rec rd Form accompanies a sample (or group of samples) as it is transferred from person to person. This form must be used for any samples collected for chemical or geotechnical analysis, whether on-site or off-site. It is a controlled document. Each EPA Region in Zone 1 uses a

slightly different Chain-of-Custody form. Attachment B-3 illustrates a Chain-of-Custody Record form used by Region III Chain-of-custody record forms for Regions I, II, and IV are illustrated in SA-6.1 as well as procedures for filling out forms.

5.1.4 Chain-of-Custody Seal

Attachment B-4 is an example of a custody seal. The Custody seal is a 1- by 3-inch adhesive-backed label It is part of a chain-of-custody process and is used to prevent tampering with samples after they have been collected in the field. It is used whenever samples are shipped with an accompanying Chain-of-Custody Record form. The chain-of-custody seal is available from the RSCC Procedure SA-6.1 describes the procedures for using chain-of-custody seals.

5.1.5 Bottle Delivery Order (DO) Form

If CLP analyses are requested, a Delivery Order (DO) form (Attachment B-5) is completed by the Authorized Requestor and submitted to the CLP Sample Bottle Repository (see Procedure SA-6 6) This form is required but not a controlled document.

5.1.6 Repository Packing List (PL) Form

The Repository Packing List form (Attachment B-6) is used for CLP analyses. This form is completed by the Sample Bottle Repository when the requested sample bottles are shipped. A copy of the PL is received with the sample bottle shipment and is retained by the Authorized Requestor.

5.1.8 Sample Log Sheet

A Sample Log Sheet is a notebook (3-ring binder) page that is used to record specified types of data while sampling. Attachments B-7 to B-10 are examples of Sample Log Sheets. The data recorded on these sheets are useful in describing the waste source and sample as well as pointing out any problems encountered during sampling. Guidelines for filling out the Sample Log Sheet are contained in SA-6.6. These forms are not controlled documents.

5.1.9 Traffic Reports (for CLP Laboratory Analyses)

A Traffic Report (TR) is a preprinted form that is provided by the EPA Sample Management Office to each Region through the Regional Sample Control Center (RSCC). These forms are obtained from the RSCC as needed for specific work assignments. These forms are part of the EPA sample-tracking system and are used to trace the shipment of samples for CLP laboratory analysis. Presently, these forms are for two types of samples: organics (OTR) and inorganics (ITR) (see Attachments B-11 and B-12, respectively). The organics and inorganics forms are used to document and identify the collection of low- and medium-concentrations samples for organic and inorganic analysis. Up to 20 samples can be recorded on each traffic report. Guidelines for filling out traffic report forms are contained in SA-6.6

5.1.10 Traffic Report Label

The Traffic Report Label is a small prenumbered white label with black lettering and an adhesive backing. Attachment B-13 provides examples of several traffic report labels. The number which appears on a traffic report label is uniquely numbered and used to track samples for CLP analysis In addition to the numb r, each lab l contains a designation as to the type of analysis to be performed (VOA, etc.) or as to preservation of the sample (preserved unpreserved, etc.). Use of these labels is described in Procedure SA-6.6.

5.1.11 Special Analytical Services (SAS) Packing List

In addition to routine analytical services (RAS), some special analytical services (SAS) are available through the CLP. These may include quick turnaround or verification analyses, non-priority pollutant analyses, analyses requiring lower detection limits than RAS methods provide, or other specific analyses (e.g., EP toxicity testing). For all "all SAS" type of request (in contrast to "RAS plus SAS," see Procedure SA-6.6), the SAS Packing List (Attachment B-14) is used rather than a traffic report. SAS Packing Lists are provided by the SMO to each region through the RSCC, which provides forms as required. Use of the SAS form is further described in Procedure SA-6 6

5.1.12 Dioxin Shipment Record (DSR)

The Dioxin Shipment Record (DSR) provides a record for one shipment batch (up to 24 samples) of dioxin samples to a CLP laboratory. Samples are individually numbered using the pre-printed labels provided with the DSR (see Attachment B-15). DSRs are provided by the SMO to each region through the RSCC. DSRs must be used to track shipment of dioxin samples submitted for CLP analysis. See Procedure SA-6.6 for detailed description of the use of DSRs.

5.1.13 Sample Shipping Log

The sample shipping log, shown in Attachment B-16 is required by Region III EPA and is to be completed whenever samples are shipped to a CLP Laboratory. The sample shipping log is then submitted to the RSCC the week following sample collection.

5.2 GEOHYDROLOGICAL AND GEOTECHNICAL FORMS

5.2.1 Groundwater Level Measurement Sheet

A groundwater level measurement sheet, shown in Attachment C-1 should be filled out for each round of water level measurements at a site. These sheets are not controlled documents.

5.2.2 Data Sheet for Pumping Test (Pumping Well)

During the performance of a pumping test, a large amount of data must be recorded, often within a short time period. The pumping test data sheet (Attachment C-2) facilitates this task by standardizing the data collection format, and allowing the time interval for collection to be laid out in advance This form is not a controlled document.

5.2.3 Data Sheet for Pumping Test (Observation Well) or In-Situ Hydraulic Conductivity Test

This data sheet (Attachment C-3) is similar to that described in Section 5.2.2. However, somewhat different data must be recorded for pumping test observation wells and in-situ hydraulic conductivity tests, as shown on this sheet. This form is not a controlled document.

5.2.4 Packer Test Reporting Forms

A packer test reporting form shown in Attachment C-4 is used for collecting data when conducting packer tests during monitoring well drilling. These sheets are not contr lled documents.

5.2.5 Summary Log of Boring

During the progress of each boring, a log of the materials encountered, operation and driving of casing, and location of samples must be kept. The Summary Log of Boring (Attachment C-5) is used for this purpose. In addition, if volatile organics are monitored on cores, samples or cuttings from the borehole (using HNU or OVA detectors), the results are entered on the boring log at the appropriate depth. The boring log also provides space for entry of the laboratory sample number and the concentration of a few key analytical results. This feature allows direct comparison of contaminant concentrations with soil characteristics.

The Summary Log of Boring is not a controlled document.

5.2.6 Monitoring Well Construction Details Form

A Monitoring Well Construction Details Form must be completed for every monitoring well installed. This form contains specific information on length and type of well riser pipe and screen, backfill, filter sand and grout characteristics, and surface seal characteristics. This information is important in evaluating the performance of the monitoring well, particularly in areas where water levels show temporal variation, or where there are multiple (immiscible) phases of contaminants. Depending on the type of monitoring well (in overburden or bedrock), different forms are used (see Attachments C-6 through C-10). The Monitoring Well Construction Details Form is not a controlled document. Guidelines on completing this form are contained in GH-1.7.

5.2.7 Test Pit Log

Wh n a test pit or trench is constructed for investigative or sampling purposes, a Test Pit Log must be filled out by the responsible field geologist or sampling technician. Test Pit Logs (Attachment C-11) are not controlled documents.

5.3 EQUIPMENT CALIBRATION AND MAINTENANCE FORMS

5.3.1 Equipment Calibration Log

The calibration or standardization of monitoring, measuring or test equipment is necessary to assure the proper operation and response of the equipment, to document the accuracy, precision or sensitivity of the measurement, and determine if correction should be applied to the readings. Some items of equipment require frequent calibration, other infrequent. Some are calibrated by the manufacturer, other by the user.

Each instrument requiring calibration has its own Equipment Calibration Log (Attachment D-1) which documents that the manufacturer's instructions were followed for calibration of the equipment, including frequency and type of standard or calibration device. This form is not a controlled document.

6.0 REFERENCES

None.

7.0 ATTACHMENTS

Attachment A - Technical Forms in Current Use for Remedial Investigations
Attachment B-1 - Sample Label
Attachment B-2 - Sample Identification Tag
Attachment B-3 - Chain-of-Custody Record From, Region III
Attachment B-4 - Chain-of-Custody Seal
Attachment B-5 - CLP Sample Bottle Repository Order Form
Attachment B-6 - Repository Packing List Form
Attachment B-7 - Groundwater Sample Log Sheet Form
Attachment B-8 - Soil Sample Log Sheet Form
Attachment B-9 - Surface Water Sample Log Sheet Form
Attachment B-10 - Container Sample Log Sheet Form
Attachment B-11 - Organics Traffic Report Form
Attachment B-12 - Inorganics Traffic Report Form
Attachment B-13 - Traffic Report Labels
Attachment B-14 - Special Analytical Services (SAS) Packing List
Attachment B-15 - Dioxin Shipment Record Form
Attachment B-16 - Sample Shipping Log
Attachment C-1 - Groundwater Level Measurement Sheet
Attachment C-2 - Pumping Test Data Sheet
Attachment C-3 - Hydraulic Conductivity Testing Data Sheet
Attachment C-4 - Packer Testing Report Form
Attachment C-5 - Summary Log of Boring
Attachment C-6 - Overburden Monitoring Well Construction Sheet
Attachment C-7 - Confining Layer Monitoring Well Construction Sheet
Attachment C-8 - Bedrock (Open Hole) Monitoring Well Construction Sheet
Attachment C-9 - Bedrock (Well Installed) Monitoring Well Construction Sheet
Attachment C-10 - Bedrock (Well Installed) Monitoring Well Construction Sheet
Attachment C-11 - Test Pit Log Form
Attachment D-1 - Equipment Calibration Log

ATTACHMENT A

TECHNICAL FORMS IN CURRENT USE FOR REMEDIAL INVESTIGATIONS

	Attachment Number	Form Usage Described in SOP Number	Controlled/ Required Document
B-1	Sample Label	SA-6.1	Required
B-2	Sample Identification Tag	SA-6.1	Controlled
B-3	Chain of Custody Record, Region III	SA-6.1	Controlled
B-4	Chain-of-Custody Seal	SA-6.6	Controlled
B-5	CLP Sample Bottle Repository Form	SA-6.6	Required
B-6	Repository Packing List Form	SA-6.6	Required
B-7	Groundwater Sample Log Sheet	SA-6.6	Required
B-8	Soil Sample Log Sheet	SA-6.6	Required
B-9	Surface Water Sample Log Sheet	SA-6.6	Required
B-10	Container Sample Log Sheet	SA-6.6	Required
B-11	Organics Traffic Report Form	SA-6.6	Controlled
B-12	Inorganics Traffic Report Form	SA-6.6	Controlled
B-13	Traffic Report Labels	SA-6.6	Controlled
B-14	Special Analytical Services (SAS) Packing List	SA-6.6	Required
B-15	Dioxin Shipment Record Form	SA-6.6	Required
B-16	Sample Shipping Log	SA-6.4	Required
C-1	Groundwater Level Measurement Sheet	GH-2.5	Required
C-2	Pumping Test Data Sheet	GH-2.3	Required
C-3	Hydaulic Conductivity Testing Data Sheet	GH-2.4	Required
C-4	Packer Testing Report Form	GH-2.2	Required
C-5	Summary Log of Boring	GH-1.5	Required
C-6	Overburden Monitoring Well Construction Sheet	GH-1.5	Required
C-7	Confining Layer Monitoring Well Construction Sheet	GH-1.5	Required
C-8	Bedrock (Open Hole) Monitoring Well Construction Sheet	GH-1.5	Required
C-9	Bedrock (Well Installed) Monitoring Well Construction Sheet	GH-1.5	Required
C-10	Bedrock (Well Installed) Monitoring Well Construction Sheet	GH-1.5	Required
C-11	Test Pit Log	GH-1.8	Required
D-1	Equipment Calibration Log	----	Required

ATTACHMENT B-1

SAMPLE LABEL

NUS CORPORATION PROJECT: _____

STATION LOCATION: _____

DATE: ___/___/___ TIME: _____ hrs.

MEDIA: WATER ☐ SOIL ☐ SEDIMENT ☐ _____ ☐

CONCENTRATION: LOW ☐ MED ☐ HIGH ☐

TYPE: GRAB ☐ COMPOSITE ☐

ANALYSIS	PRESERVATION
VOA ☐ BNA's ☐	Cool to 4°C ☐
PCB's ☐ PESTICIDES ☐	HNO_3 to pH <2 ☐
METALS: TOTAL ☐ DISSOLVED ☐	NAOH to pH>12 ☐
CYANIDE ☐	_____ ☐
_____ ☐	

Sampled by: _____

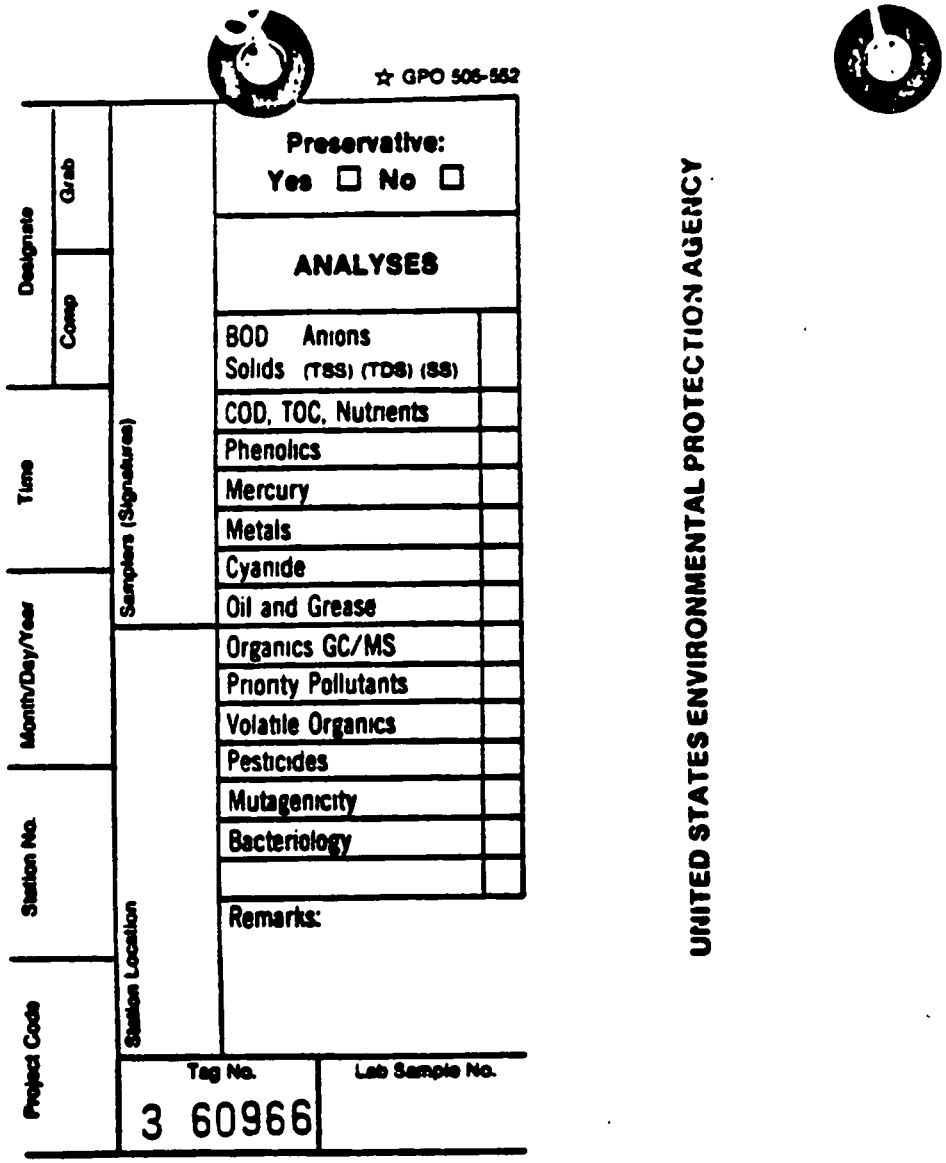
Case No.: _____ Traffic Report No.: _____

Remarks:

ACFILE: FORMS\BOTLABL

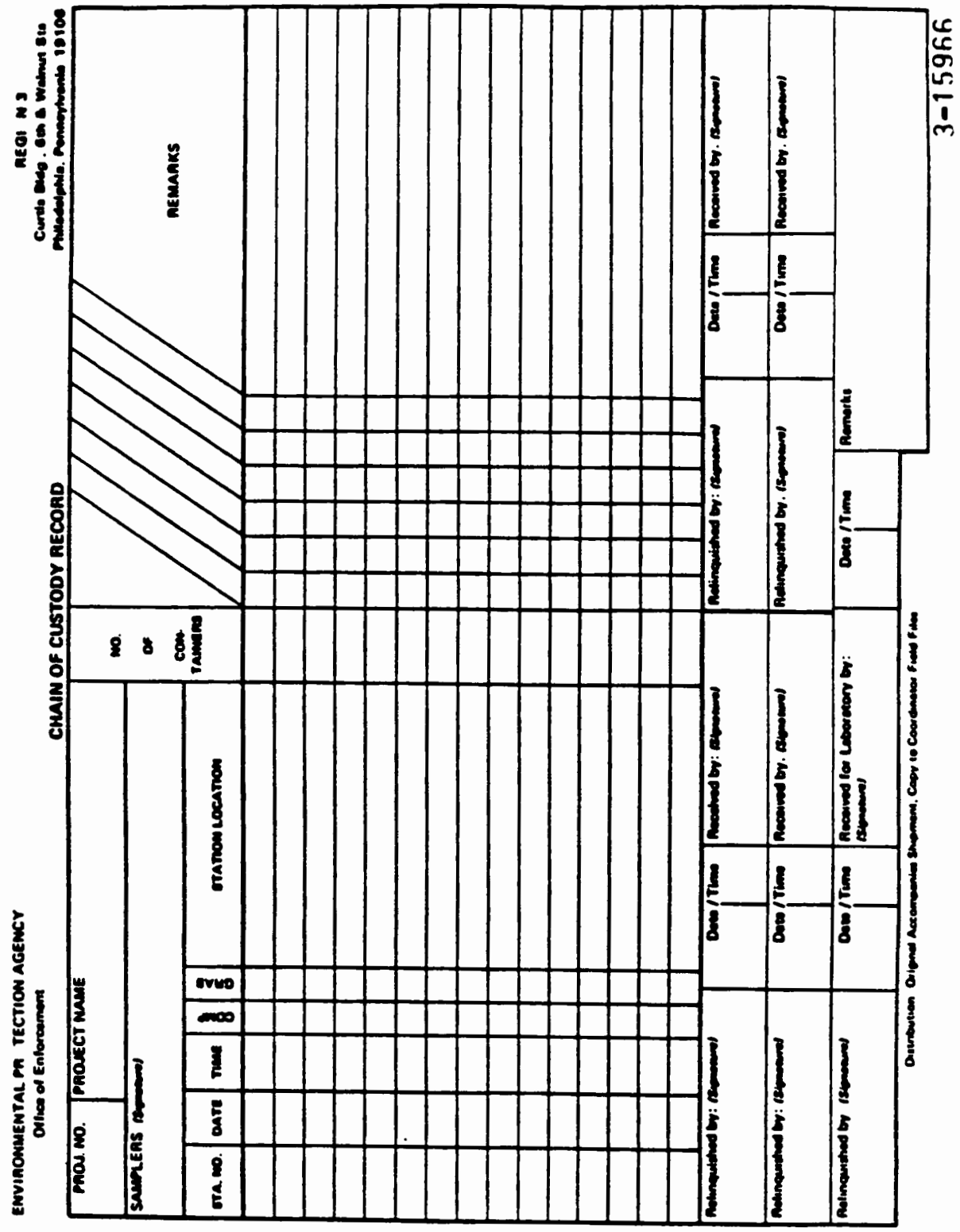
ATTACHMENT B-2

SAMPLE IDENTIFICATION TAG



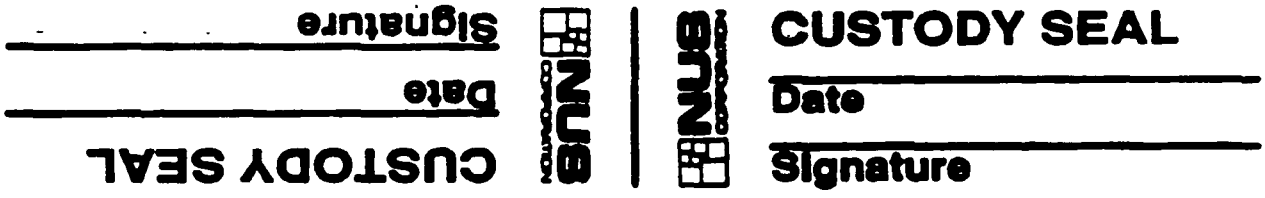
ATTACHMENT B-3

CHAIN-OF-CUSTODY RECORD FORM FOR USE IN REGION III
(Original is 8-1/2 x 11-3/4")



ATTACHMENT B-4

CHAIN-OF-CUSTODY SEAL



ATTACHMENT B-5
CLP SAMPLE BOTTLE REPOSITORY
SUPERFUND DELIVERY REQUEST

REQUEST NO. _____

Date of Request: _____

Type of Request:
Routine [ ]
Fast Turnaround [ ] _____
Emergency [ ] _____
(Date/Time request called in)

From (Name): _____
Affiliation: _____
Telephone: _____
AR Signature: _____

TO: I-Chem Research Corporation
23787-F Eichler Street
Hayward, CA 94545
Phone: 415/782/3095

Ship the following items for arrival by: _____ (Date)
(If applicable) Ship to arrive no earlier than: _____ (Date)

Item		Description	No. of Items Per Case	No. of Cases Requested
A	80-oz.	amber glass bottle	6	
B	40-ml	glass vial	72	
C	1-liter	polyethylene bottle	12	
D	120-ml	wide-mouth glass vial	12	
E	1-oz.	wide-mouth glass jar	12	
F	8-oz.	wide-mouth glass jar	12	
G	4-oz.	wide-mouth glass jar	12	
H	1-liter	amber glass bottle	12	
J	32-oz.	wide-mouth glass jar	12	
K	4-liter	amber glass bottle	4	
L	500-ml	polyethylene bottle	24	

Ship To: _____
(Provide street address) _____
Attention: _____
Call before delivery: _____
(Phone No.): _____

DISTRIBUTION: *White-Repository* *Yellow-Requestor* *Pink-SMO*

ATTACHMENT B-6

CLP SAMPLE BOTTLE REPOSITORY
SUPERFUND PACKING LIST

REPOSITORY

I-Chem Research Corporation
23787-F Eichler Street
Hayward, CA 94545
Phone: 415/782-3905

DELIVERY REQUEST NO. _____

Request date: _____

Type of Request: R ☐ FTA ☐ E ☐

Required Delivery Date: _____

DESTINATION (from Delivery Request)

Name: _____

Address: _____

_____

_____

Telephone No: _____

The materials listed below have been shipped as requested.

Date Shipped: _____

Mode of Shipment: _____

Shipment ID No: _____

Signature: _____

Type of Shipment: ___ Complete ___ Partial ___ Partial/Completes Request

Item No.	Description		No. of Cases Shipped	Lot Number(s)	QC Clearance Number(s)
A	80-oz	glass			
B	40-mL	glass			
C	1-L	poly			
D	120-mL	glass			
E	16-oz	glass			
F	8-oz	glass			
G	4-oz	glass			
H	1-L	glass			
J	32-oz	glass			
K	4-L	glass			
L	500-mL	poly			

——AUTHORIZED REQUESTOR USE ONLY——

Sign below and forward the yellow copy to the Sample Management Office (SMO) within 7 days of shipment receipt. Keep the pink copy for your file.

The above request was received by the designee, inspected, and accepted.

Date of Receipt: _____ Requestor Signature: _____

Send yellow copy to: USEPA Sample Management Office
P.O. Box 818
Alexandria, VA 22313

DISTRIBUTION: White—Shipment Designee
Blue—Shipping Contractor
Green—SMO
Yellow—Requestor (for return to SMO)
Pink—Requestor
Gold—Repository

ATTACHMENT B-7

NUS CORPORATION
A Halliburton Company

SAMPLE LOG SHEET

Page _____ of _____

☐ Monitoring Well Data
☐ Domestic Well Data
☐ Other _____

Case # _____

By _____

Project Site Name _____ Project Site Number _____

NUS Source No _____ Source Location _____

Total Well Depth	Purge Data				
Well Casing Size & Depth:	Volume	pH	S.C.	Temp (°C)	Color & Turbidity
Static Water Level:					
One Casing Volume:					
Start Purge (hrs.):					
End Purge (hrs.):					
Total Purge Time (min.):					
Total Amount Purged (gal.):					
Monitor Reading:					
Purge Method:					
Sample Method:					
Depth Sampled:					

Sample Date & Time:	Sample Data			
	pH	S.C.	Temp. (°C)	Color & Turbidity
Sampled By:				

Signature(s):	Observations / Notes:
Type of Sample ☐ Low Concentration ☐ High Concentration ☐ Grab ☐ Composite ☐ Grab - Composite	

Analysis:	Preservative		Organic	Inorganic
		Traffic Report #		
		Tag #		
		AB #		
		Date Shipped		
		Time Shipped		
		Lab		
		Volume		

ATTACHMENT 8-8

NUS CORPORATION
A Halliburton Company

SAMPLE LOG SHEET

Page _____ of _____

- ☐ Surface Soil
- ☐ Subsurface Soil
- ☐ Sediment
- ☐ Lagoon / Pond
- ☐ Other _____

Case # _____

By _____

Project Site Name _____ Project Site Number _____

NUS Source No. _____ Source Location _____

Sample Method:	Composite Sample Data		
	Sample	Time	Color / Description
Depth Sampled:			
Sample Date & Time:			
Sampled By:			
Signature(s):			
Type of Sample ☐ Low Concentration ☐ High Concentration ☐ Grab ☐ Composite ☐ Grab -Composite			
	Sample Data		
	Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)	

Analysis:	Observations / Notes

	Organic	Inorganic
Traffic Report #		
Tag #		
AB #		
Date Shipped		
Time Shipped		
Lab		
Volume		

ATTACHMENT 8-9

NUS CORPORATION
A Halliburton Company

SAMPLE LOG SHEET

Page _____ of _____

☐ Spring
☐ Lake
☐ Stream
☐ Other _____

Case # _____

By _____

Project Site Name _____ Project Site Number _____

NUS Source No _____ Source Location _____

Sample Method.	Sample Data			
	pH	S C.	Temp (°C)	Color & Turbidity
Depth Sampled:				
Sample Date & Time:				
Sampled By:				
Signatures:				

Type of Sample
☐ Low Concentration
☐ High Concentration
☐ Grab
☐ Composite
☐ Grab - Composite

Analysis:	Preservative

	Organic	Inorganic
Traffic Report #		
Tag #		
AB #		
Date Shipped		
Time Shipped		
Lab		
Volume		

ATTACHMENT B-10

NUS CORPORATION
A Halliburton Company

SAMPLE LOG SHEET

Container Data

Page ____ of ____

Case # _____

By _____

Project Site Name _____ Project Site Number _____

NUS Source No. _____ Source Location _____

Container Source	Container Description
☐ Drum ☐ Bung Top ☐ Lever Lock ☐ Bolted Ring ☐ Other _____ ☐ Bag / Sack ☐ Tank ☐ Other _____	Color _____ Condition _____ Markings _____ Vol. of Contents _____ Other _____

Disposition of Sample

☐ Container Sampled
☐ Container opened but not sampled. Reason _____

Container not opened. Reason _____

Sample Description

	Layer 1	Layer 2	Layer 3
Phase	☐Sol. ☐Liq.	☐Sol. ☐Liq.	☐Sol. ☐Liq
Color			
Viscosity	☐L ☐M ☐H	☐L ☐M ☐H	☐L ☐M ☐H
% of Total Volume			
Other			

Monitor Reading:

Sample Method:

Type of Sample

☐ Low Concentration
☐ High Concentration
☐ Grab
☐ Composite
☐ Grab - Composite

Sample Date & Time:

Sampled By:

Signature(s):

Analysis:

	Organic	Inorganic
Traffic Report #		
Tag #		
AB #		
Date Shipped		
Time Shipped		
Lab		
Volume		

ATTACHMENT B-11

USEPA CONTRACT LABORATORY PROGRAM
SAMPLE MANAGEMENT OFFICE
P.O. BOX 818 ALEXANDRIA, VA 22313
703/557-2490 FTS-557-2490

CASE NO: | SAS NO. (IF APPLICABLE)

ORGANIC TRAFFIC REPORT

(FOR CLP USE ONLY)

TYPE OF ACTIVITY (CIRCLE ONE) ①
SUPERFUND—PA SI ESI RIFS RD RA ER
NPLD O&M OTHER _____
NON-SUPERFUND—_____PROGRAM

SITE NAME.

CITY, STATE | SITE SPILL ID:

REGION NO | SAMPLING COMPANY ②

SAMPLER (NAME)

SHIP TO ③

ATTN: _____

SAMPLING DATE ④

BEGIN _____ END: _____

DATE SHIPPED _____ CARRIER: _____ ⑤

AIRBILL NO: _____

SAMPLE DESCRIPTION
(ENTER IN BOX A)
1 SURFACE WATER
2 GROUND WATER
3 LEACHATE
4 SOIL
5 SEDIMENT
6 OIL (SAS)
7 WASTE (SAS)

TRIPLE VOLUME REQUIRED FOR MATRIX SPIKE/DUPLICATE AQUEOUS SAMPLE

SHIP MEDIUM AND HIGH CONCENTRATION SAMPLES IN PAINT CANS

SEE REVERSE FOR ADDITIONAL INSTRUCTIONS

CLP SAMPLE NUMBER (FROM LABELS)	SAMPLE DESCRIPTION (A) (FROM BOX 1) 1 2 3 4 5 6 7	CONCENTRATION (B) L = LOW/MED M = MED (SAS)	RAS ANALYSIS (C) VOLATILE	BASE/NEUT /ACID	PESTICIDE /PCB's		SPECIAL HANDLING (D)	STATION LOCATION (E)

EPA Form 2075-7 (8-87)

WHITE — SMO COPY PINK — CLIENT COPY WHITE — LAB COPY FOR RETURN TO SMO YELLOW — LAB COPY

ATTACHMENT B-12

USEPA CONTRACT LABORATORY PROGRAM
SAMPLE MANAGEMENT OFFICE
P.O. BOX 818 ALEXANDRIA, VA 22313
703/557-2490 FTS-557-2490

CASE NO | SAS NO (IF APPLICABLE)

INORGANIC TRAFFIC REPORT

(FOR CLP USE ONLY)

TYPE OF ACTIVITY (CIRCLE ONE) ①
SUPERFUND—PA SI ESI RIFS RD RA ER NPLD O&M OTHER _____
NON-SUPERFUND—_____PROGRAM

SITE NAME

CITY, STATE | SITE SPILL ID

REGION NO | SAMPLING COMPANY ②

SAMPLER (NAME)

SHIP TO ③

ATTN

SAMPLING DATE ④

BEGIN _____ END _____

DATE SHIPPED _____ CARRIER _____ ⑤

AIRBILL NO

SAMPLE DESCRIPTION ⑥
(ENTER IN BOX A)
1 SURFACE WATER
2 GROUND WATER
3 LEACHATE
4 SOIL
5 SEDIMENT
6 OIL (SAS)
7 WASTE (SAS)

DOUBLE VOLUME REQUIRED FOR MATRIX SPIKE/DUPLICATE AQUEOUS SAMPLE

SHIP MEDIUM AND HIGH CONCENTRATION SAMPLES IN PAINT CANS

SEE REVERSE FOR ADDITIONAL INSTRUCTIONS

CLP SAMPLE NUMBER (FROM LABELS)	⑦ SAMPLE DESCRIPTION (FROM BOX 1) 1 2 3 4 5 6 7	⑧ CONCENTRATION L = LOW M = MED H = HIGH (SAS)	⑨ RAS ANALYSIS: TOTAL METALS	CYANIDE	DISSOLVED METALS	HIGH ONLY (SAS): SULFIDE	pH	CONDUCTIVITY	CHLORIDE	⑩ SPECIAL HANDLING	⑪ STATION LOCATION

EPA Form 2075-6 (8-87)

WHITE — SMO COPY PINK — CLIENT COPY WHITE — LAB COPY FOR RETURN TO SMO YELLOW — LAB COPY

ATTACHMENT B-13

TRAFFIC REPORT LABELS

MAB 342

: 6003

AC 865 · Soil/Sediment (VOA)

ATTACHMENT B-14

U.S. ENVIRONMENTAL PROTECTION AGENCY
CLP Sample Management Office
P.O. Box 818 - Alexandria, Virginia 22313
Phone: 703/557-2490 - FTS/557-2490

SAS Number

SPECIAL ANALYTICAL SERVICE
PACKING LIST

Sampling Office:	Sampling Date(s):	Ship To:	For Lab Use Only
Sampling Contact: (name)	Date Shipped:		Date Samples Rec'd:
(phone)	Site Name/Code:	Attn:	Received By:

	Sample Numbers	Sample Description i.e., Analysis, Matrix, Concentration	Sample Condition on Receipt at Lab
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			

For Lab Use Only

White - SMO Copy, Yellow - Region Copy, Pink - Lab Copy for return to SMO, Gold - Lab Copy

ATTACHMENT B-15

USEPA Contract Laboratory Program
Sample Management Office
P.O. Box 818 Alexandria Virginia 22313
FTS 8-557-2490 703 557-2490

CASE NO: | **BATCH NO:**

CLP DIOXIN SHIPMENT RECORD

Site Name	Sampling Office	Ship To	FOR LAB USE ONLY Date Samples Rec'd
City & State	City & State		
EPA Site No	Sampling Contract (name)	Date Shipped	Received By
Latitude	Sampling Date	Transfer To	Date Samples Rec'd
Longitude		Date Shipped	Received By
Tier 1 2 3 4 5 6 7 (circle one)	Data Turnaround 15-Day ___ 30-Day ___		

SAMPLE NUMBERS	MATRIX: SOIL/SEDIMENT	MATRIX: OTHER	DESCRIPTION: FIELD SAMPLE	DESCRIPTION: SAMPLE ID DUPLICATE	DESCRIPTION: SAMPLE ID SPIKE	DESCRIPTION: QA ANAL	DESCRIPTION: CONCENTRATION/MEDIUM	DESCRIPTION: ORDER (LAS ONLY)	ADD'L ANALYSIS: SPECIFY (LAS ONLY)	FOR LAB USE: SAMPLE CONDITION ON RECEIPT

WHITE [illegible] YELLOW [illegible] PINK [illegible] GOLD [illegible]

ATTACHMENT B-16

page___ of ___ EPA SAMPLE SHIPPING LOG FOR ALL SAMPLES SENT THROUGH THE CONTRACT LAB PROGRAM (12/85 version)

CASE#_____ SAS#_____ SITE NAME:_____

Site Leader:_____ EPA Project Officer:_____

Phone:

QC SAMPLE INFO AND/OR COMMENTS	CONC. (low/ med/ high)	SAMPLE PHASE (aq/ sol)	TYPE OF REQUEST org.die inor. SAS	SAMPLE TRAFFIC REPORT NUMBER	ORGANICS OR INORGANICS										SAS REQUEST:(details required)			
					LAB NAME	DATE SHIPPED	DATA RECEIVED XX out -items not requested VOA	BNA	PEST	TCDD	METALS	CN	LAB NAME	SAS REQUEST (itemize)	DATE SHIPPED	DATA REC'D

ATTACHMENT C-1

GROUNDWATER LEVEL MEASUREMENT SHEET

LOCATION

Project Name: _____
Project No.: _____
Personnel: _____
Date: _____

Municipality: _____
County: _____
State: _____
Street or Map Location (If Off-Site) _____

WEATHER CONDITIONS

Temperature Range: _____
Precipitation: _____
Barometric Pressure: _____

Equipment No.: _____
Equipment Name: _____
Latest Calibration Date: _____

Tidally-Influenced: [ ] Yes [ ] No

Well or Piezometer Number	Date/Time	Elevation of Reference Point (Feet)*	Water Level Indicator Reading (Feet)*	Adjusted Depth (Feet)*	Groundwater Elevation (Feet)*

* All elevations to nearest 0.01 foot.

ATTACHMENT C-2
PUMPING TEST DATA SHEET

PUMPING TEST DATA SHEET *NUS CORPORATION*

PROJECT NAME ______________________ MEASURED WELL ________

PROJECT NO.: ____________ DATE: ____________ PUMPING WELL ________

GEOLOGIST: ______________________ CHECKED: ____________ TEST NO. ________

DISTANCE FROM PUMPING WELL(ft.)(r): ________ PUMP SETTING, FEET BELOW MONITORING POINT ________

STATIC H_2O LEVEL (ft.)(s_o): ________ MONITORING POINT: ______________________

TIME PURGE START OR STOP (t_o): ________ ELEVATION OF MONITORING POINT (ft. above MSL) ________

TIME	(t) MIN. SINCE PUMP START OR STOP	WATER LEVEL MEASUREMENTS (ft.)			(s) DD Or RECOVERY (ft.)	PUMPING RATE (Q) GPM	REMARKS
		READING	CORRECTION	DTW			

ATTACHMENT C-3

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET ***NUS CORPORATION***

PROJECT NAME: WELL/BORING NO.
PROJECT NO: GEOLOGIST
WELL DIAMETER: SCREEN LENGTH/DEPTH: TEST NO.
STATIC WATER LEVEL (Depth/Elevation) / DATE:
TEST TYPE (Rising/Falling/Constant Head). CHECKED:
METHOD OF INDUCING WATER LEVEL CHANGE: PAGE ___ OF ___

TIME	ELAPSED TIME (min or sec)	MEASURED DEPTH TO WATER (ft)	CORRECTION	DEPTH TO WATER (ft.)	DRAWDOWN OR HEAD (ft.)	REMARKS

ATTACHMENT C-4
PACKER TESTING REPORT FORM

PACKER TEST REPORT

PROJECT. ____________ BORING NO. ____________ CASING DEPTH: ____________ TEST INTERVAL. ____________

PROJECT NO. ____________ TEST NO: ____________
CONTRACTOR: ____________
BY: ____________ CHECKED: ____________

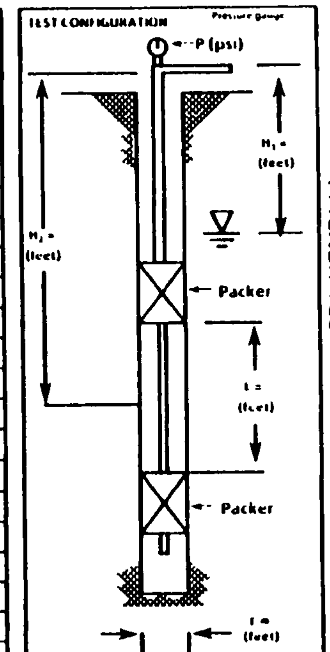
PAGE ____ OF ____
STATIC WATER LEVEL ____________
PACKER PRESSURE ____________

Flow Test					Calculated Results							
Pressure, P (psi)	Elapsed Time (min)	Flow Reading	Δ Flow ΔQ (ft³)	Δ Flow ΔQ (gal)	Flow Rate Q (gal/min)	H_1* (ft)	Hp(ft) = P/2.31 (psi)	H_2* (ft)	H = Hp + (H1 or H2)	Cp	K (ft/yr) = Cp Q/H	K (cm/sec) = 9.67 x 10⁻⁷ K (ft/yr)

CP = (1/(2 π L)) ln (L/r) (70 315 5)
7.48 Gallons = 1 Ft³
1 psi = 2.31 ft head
Remarks ____________

* H_1 is used when the test length is below the water table
H_2 is used when the test length is above the water table

TEST CONFIGURATION



Length of Test Section in feet L	Cp			
	In Hole Bit Size			
	[illegible]	[illegible]	[illegible]	[illegible]
1	31 000	28 500	[illegible]	[illegible]
2	19 400	18 100	16 400	[illegible]
5	9 600	[illegible]	[illegible]	[illegible]
6	6 800	[illegible]	6 100	5 800
10	5 700	5 400	[illegible]	[illegible]
15	4 100	[illegible]	[illegible]	[illegible]
20	[illegible]	[illegible]	[illegible]	[illegible]

ATTACHMENT C-5

BORING LOG ***NUS CORPORATION***

PROJECT BORING NO
PROJECT NO DATE DRILLER:
ELEVATION: FIELD GEOLOGIST:
WATER LEVEL DATA
(Date, Time & Conditions)

SAMPLE NO. & TYPE OR RQD	DEPTH (ft) OR RUN NO	BLOWS/ 6" OR RQD (%)	SAMPLE RECOVERY SAMPLE LENGTH	LITHOLOGY CHANGE (Depth, ft.) OR SCREENED INTERVAL	MATERIAL DESCRIPTION: SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BREAKS	REMARKS

REMARKS ______________________________

BORING ________

PAGE ____ OF ____

ATTACHMENT C-5
(CONTINUED)

SOIL TERMS

UNIFIED SOIL CLASSIFICATION (USCS)

COARSE GRAINED SOILS (More than half of material is LARGER than No 200 sieve size)					FINE GRAINED SOILS (More than half of material is SMALLER than No 200 sieve size)					
FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 3" & basing fractions on estimated weights)			GROUP SYM-BOL	TYPICAL NAMES	FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 3" & basing fractions on estimated weights)				GROUP SYM-BOL	TYPICAL NAMES
					Identification procedures on fraction smaller than No 40 sieve size					
						DRY STRENGTH (Crushing Characteristics)	DILATANCY (Reaction to Shaking)	TOUGHNESS (Consistency Near Plastic Limit)		
GRAVELS 50% or > of coarse fraction retained on No 4 sieve	CLEAN GRAVELS (Little or no fines)		GW							
			GP							
	GRAVELS WITH FINES (Appreciable amount of fines)		GM		SILTS & CLAYS Liquid limit < 50	None to slight	Quick to slow	None	ML	
			GC			Medium to high	None to very slow	Medium	CL	
SANDS More than 50% of coarse fraction passes No 4 sieve	CLEAN SANDS (Little or no fines)		SW			Slight to medium	Slow	Slight	OL	
			SP		SILTS & CLAYS Liquid limit > 50	Slight to medium	Slow to none	Slight to medium	MH	
	SANDS WITH FINES (Appreciable amount of fines)		SM			High to very high	None	High	CH	
			SC			Medium to high	None to very slow	Slight to medium	OH	
					HIGHLY ORGANIC SOILS	Readily identified by color odor spongy feel and frequently by fibrous texture			Pt	

Boundary classifications Soils possessing characteristics of two groups are designated by combining group symbols For example GW GC well graded gravel sand mixture with clay binder
All sieve sizes on this chart are U S standard

DENSITY OF GRANULAR SOILS

DESIGNATION	STANDARD PENETRATION RESISTANCE BLOWS/FOOT
Very loose	0-4
Loose	5 10
Medium dense	11 30
Dense	31 50
Very dense	Over 50

CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNC COMPRESSIVE STR TONS/SQ FT	STANDARD PENETRATION RESISTANCE - BLOWS/FOOT	FIELD IDENTIFICATION METHODS
Very soft	Less than 0 25	0 to 2	Easily penetrated several inches by fist
Soft	0 25 to 0 50	2 to 4	Easily penetrated several inches by thumb
Medium stiff	0 50 to 1 0	4 to 8	Can be penetrated several inches by thumb
Stiff	1 0 to 2 0	8 to 15	Readily indented by thumb
Very stiff	2 0 to 4 0	15 to 30	Readily indented by thumbnail
Hard	More than 4 0	Over 30	Indented with difficulty by thumbnail

ROCK TERMS

ROCK HARDNESS (FROM CORE SAMPLES)

DESCRIPTIVE TERMS	SCREWDRIVER OR KNIFE EFFECTS	HAMMER EFFECTS
Soft	Easily gouged	Crushes when pressed with hammer
Medium soft	Can be gouged	Breaks (one blow) Crumbly edges
Medium hard	Can be scratched	Breaks (one blow) Sharp edges
Hard	Cannot be scratched	Breaks conchoidally (several blows) Sharp edges

ROCK BROKENNESS

DESCRIPTIVE TERMS	ABBREVIATION	SPACING
Very broken	(V Br)	0 2"
Broken	(Br)	2" 1
Blocky	(Bl)	1 3
Massive	(M)	3 10

LEGEND

SOIL SAMPLES - TYPES

S 3" O D Split Barrel Sample
ST 3" O D Undisturbed Sample
O Other Samples Specify in Remarks

ROCK SAMPLES - TYPES

E BX (Conventional) Core (~2 1/8" O D
Q NQ (Wireline) Core (~1 7/8" O D)
/ Other Core Sizes Specify in Remarks

WATER LEVELS

12/10
9 12 8 Initial Level "/Date & Depth

12/10
9 12 8' Stabilized Level "/Date & Dept

ATTACHMENT C-6

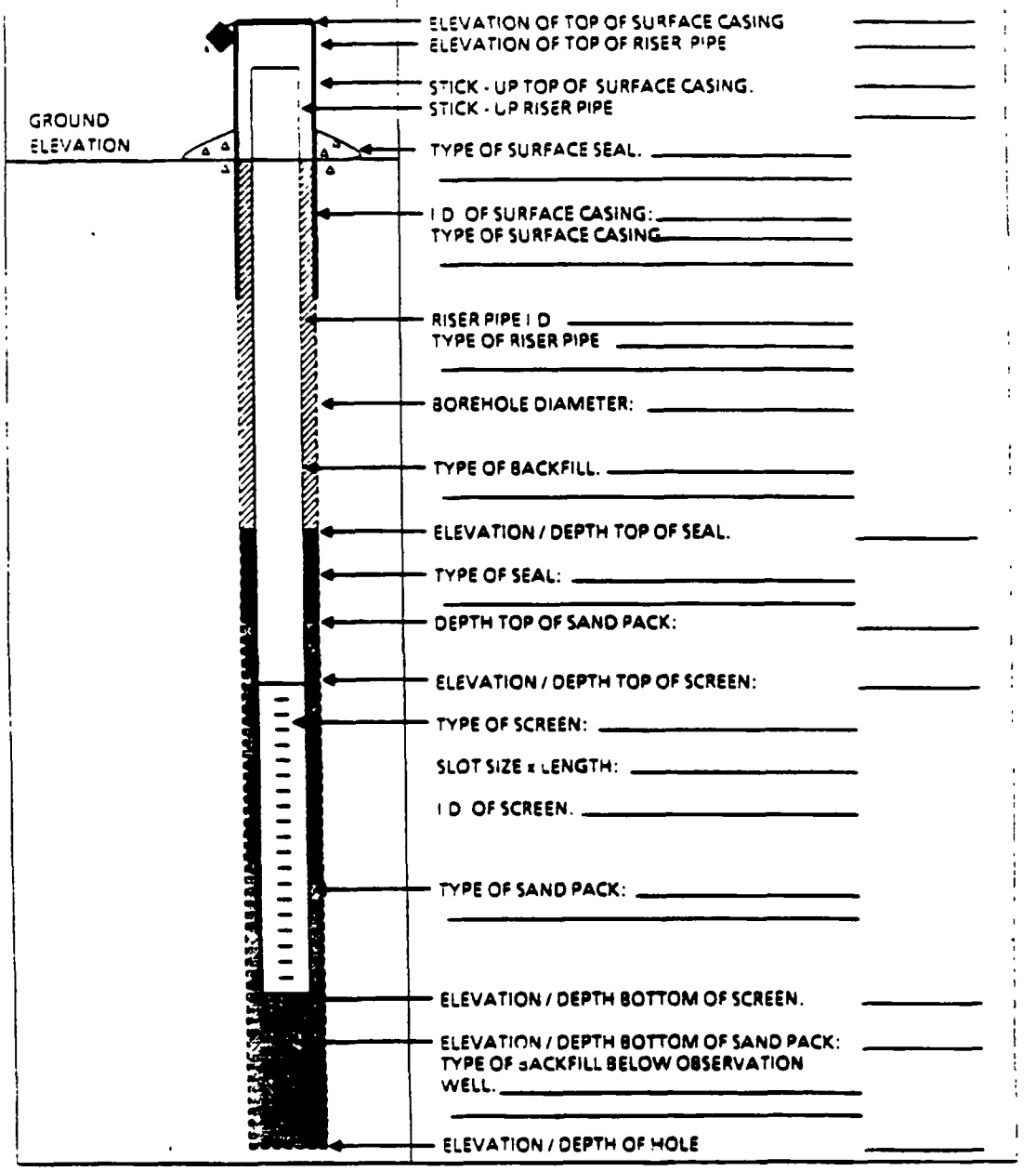
NUS CORPORATION
A Halliburton Company

BORING NO. _____

OVERBURDEN
MONITORING WELL SHEET

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

DRILLER _____
DRILLING METHOD _____
DEVELOPMENT METHOD _____



ATTACHMENT C-7

NUS CORPORATION

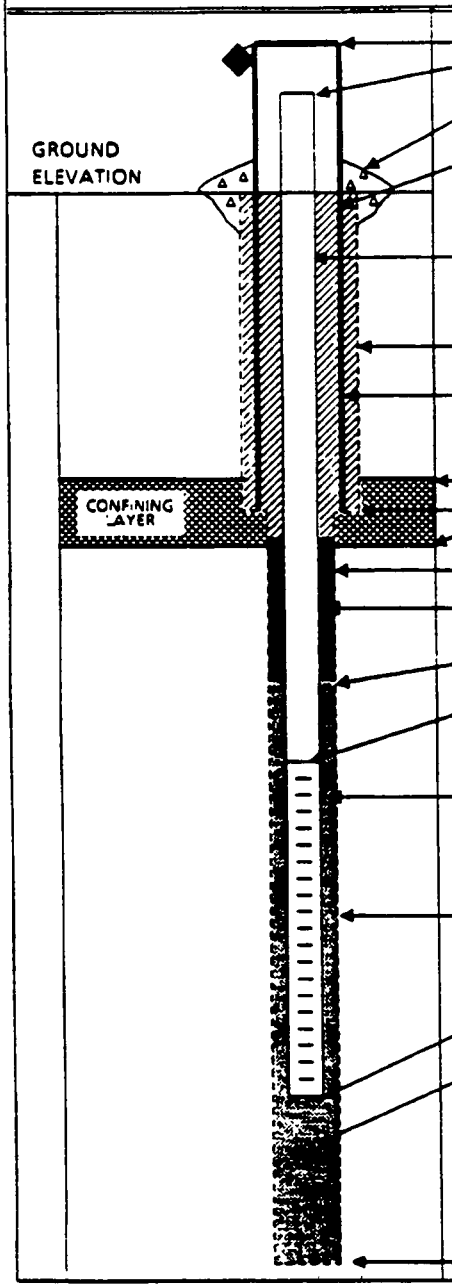
BORING NO _____

CONFINING LAYER
MONITORING WELL SHEET

11-5-87

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

DRILLER _____
DRILLING METHOD _____
DEVELOPMENT METHOD _____



ELEVATION OF TOP OF PERM CASING _____
ELEVATION OF TOP OF RISER PIPE. _____
TYPE OF SURFACE SEAL _____
I D OF PERM CASING _____
TYPE OF SURFACE CASING. _____
RISER PIPE I.D _____
TYPE OF RISER PIPE: _____
BOREHOLE DIAMETER: _____
PERM CASING I.D _____
TYPE OF CASING & BACKFILL _____
ELEVATION / DEPTH TOP CONFINING LAYER _____
ELEVATION / DEPTH BOTTOM OF CASING: _____
ELEVATION / DEPTH BOT, CONFINING LAYER: _____
ELEVATION / DEPTH TOP OF SEAL: _____
TYPE OF SEAL. _____
DEPTH TOP OF SAND PACK: _____
ELEVATION/DEPTH TOP OF SCREEN. _____
TYPE OF SCREEN: _____
TYPE OF SAND PACK. _____
BOREHOLE DIA BELOW CASING. _____
ELEVATION / DEPTH BOTTOM OF SCREEN: _____
ELEVATION / DEPTH BOTTOM OF SAND PACK: _____
TYPE OF BACKFILL BELOW OBSERVATION WELL _____
ELEVATION / DEPTH OF HOLE: _____

ATTACHMENT C-8

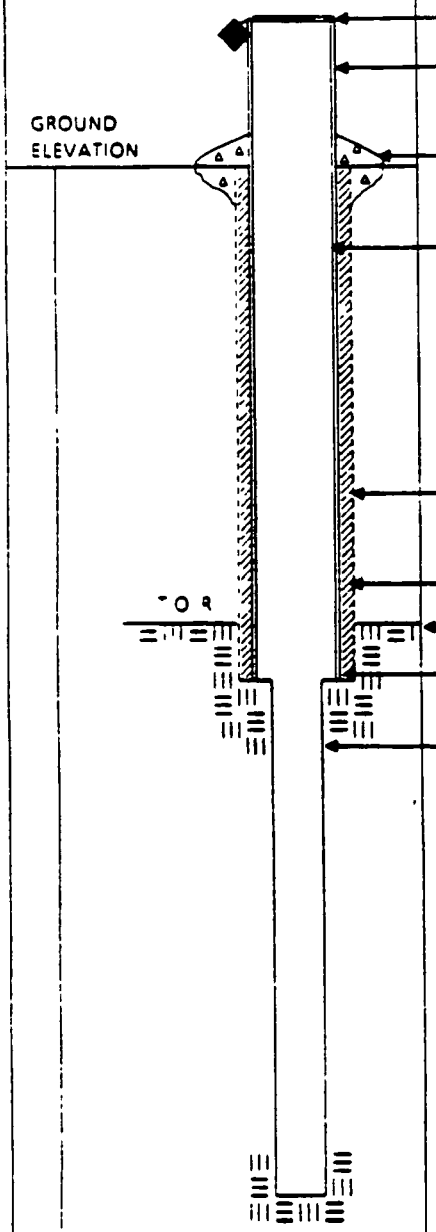
NUS CORPORATION
A Halliburton Company

BORING NO _____

BEDROCK
MONITORING WELL SHEET
OPEN HOLE WELL

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

DRILLER _____
DRILLING METHOD _____
DEVELOPMENT METHOD _____



ELEVATION OF TOP OF CASING _____

STICK UP OF CASING ABOVE GROUND SURFACE _____

TYPE OF SURFACE SEAL _____

I D OF CASING _____

TYPE OF CASING _____

TEMP / PERM _____

DIAMETER OF HOLE. _____

TYPE OF CASING SEAL _____

DEPTH TO TOP OF ROCK. _____

DEPTH TO BOTTOM CASING. _____

DIAMETER OF HOLE IN BEDROCK: _____

DESCRIBE IF CORE / REAMED WITH BIT

_____

_____

_____

DESCRIBE JOINTS IN BEDROCK AND DEPTH

_____

_____

_____

ELEVATION / DEPTH OF HOLE. _____

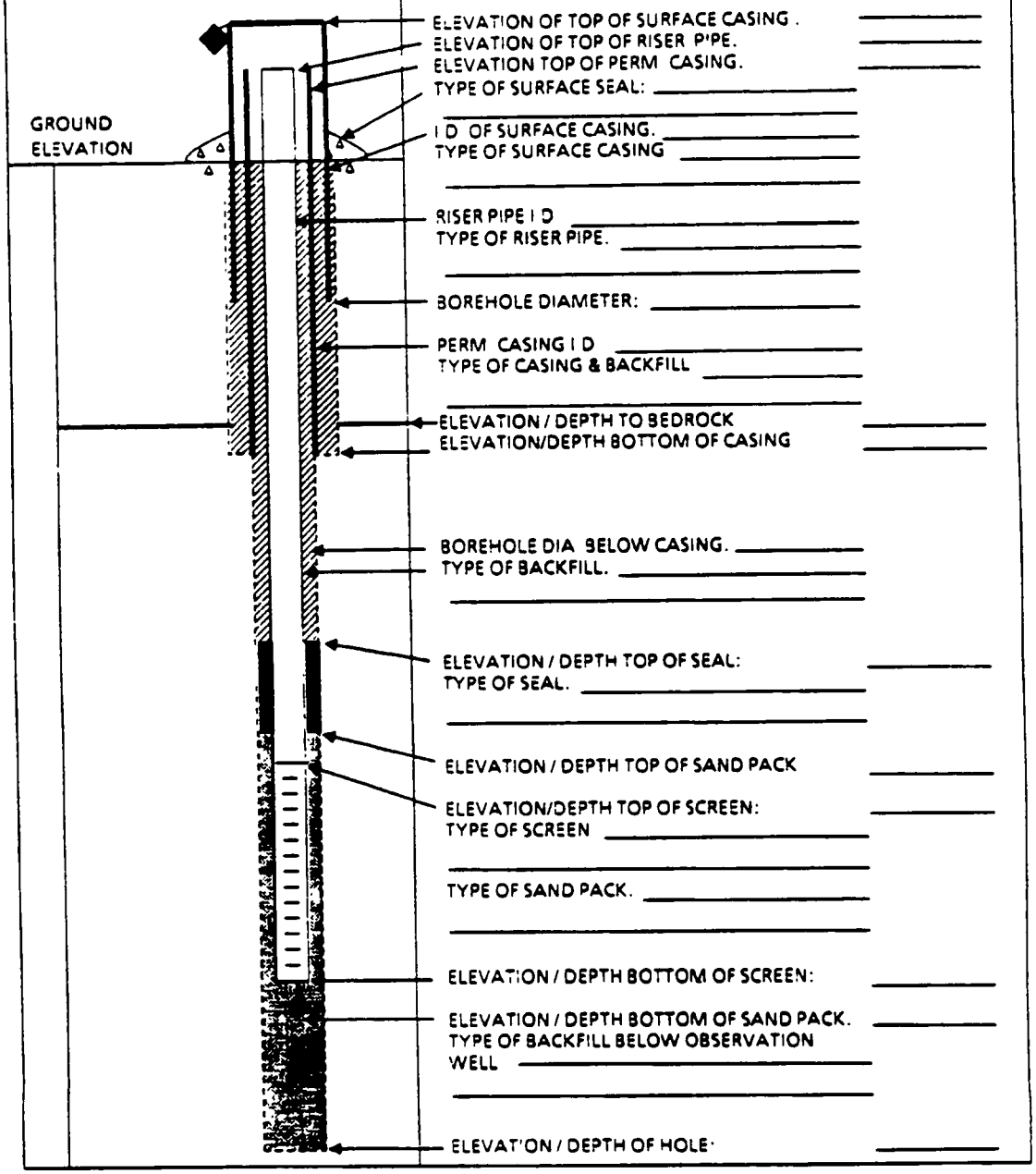
ATTACHMENT C-9

BORING NO _____

BEDROCK
MONITORING WELL SHEET
WELL INSTALLED IN BEDROCK

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

DRILLER _____
DRILLING METHOD _____
DEVELOPMENT METHOD _____



ELEVATION OF TOP OF SURFACE CASING . _____
ELEVATION OF TOP OF RISER PIPE. _____
ELEVATION TOP OF PERM CASING. _____
TYPE OF SURFACE SEAL: _____
I D OF SURFACE CASING. _____
TYPE OF SURFACE CASING _____
RISER PIPE I D _____
TYPE OF RISER PIPE. _____
BOREHOLE DIAMETER: _____
PERM CASING I D _____
TYPE OF CASING & BACKFILL _____
ELEVATION / DEPTH TO BEDROCK _____
ELEVATION/DEPTH BOTTOM OF CASING _____
BOREHOLE DIA BELOW CASING. _____
TYPE OF BACKFILL. _____
ELEVATION / DEPTH TOP OF SEAL: _____
TYPE OF SEAL. _____
ELEVATION / DEPTH TOP OF SAND PACK _____
ELEVATION/DEPTH TOP OF SCREEN: _____
TYPE OF SCREEN _____
TYPE OF SAND PACK. _____
ELEVATION / DEPTH BOTTOM OF SCREEN: _____
ELEVATION / DEPTH BOTTOM OF SAND PACK. _____
TYPE OF BACKFILL BELOW OBSERVATION WELL _____
ELEVATION / DEPTH OF HOLE: _____

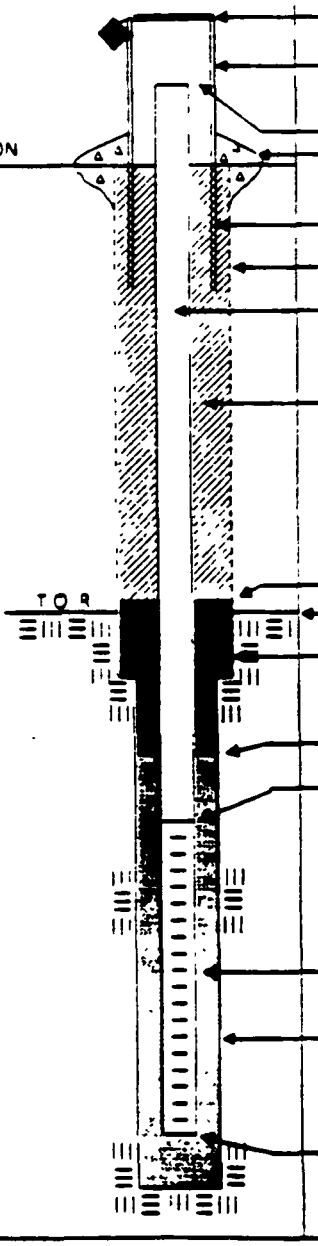
ATTACHMENT C-10

NUS CORPORATION
A Halliburton Company

BORING NO _____

BEDROCK
MONITORING WELL SHEET
WELL INSTALLED IN BEDROCK

PROJECT _____ LOCATION _____ DRILLER _____
PROJECT NO _____ BORING _____ DRILLING METHOD _____
ELEVATION _____ DATE _____ DEVELOPMENT METHOD _____
FIELD GEOLOGIST _____



ELEVATION OF TOP OF SURFACE CASING _____
STICK UP OF CASING ABOVE GROUND SURFACE _____
ELEVATION TOP OF RISER _____
TYPE OF SURFACE SEAL. _____
_____
I D OF SURFACE CASING. _____
DIAMETER OF HOLE _____
RISER PIPE I D _____
TYPE OF RISER PIPE _____
_____
TYPE OF BACKFILL. _____
_____
_____
ELEVATION / DEPTH TOP OF SEAL. _____
ELEVATION / DEPTH TOP OF BEDROCK _____
TYPE OF SEAL. _____
_____
ELEVATION / DEPTH TOP OF SAND _____
ELEVATION / DEPTH TOP OF SCREEN _____
TYPE OF SCREEN _____
SLOT SIZE x LENGTH _____
I D SCREEN _____
TYPE OF SAND PACK _____
_____
DIAMETER OF HOLE IN BEDROCK _____
CORE / REAM _____
_____
ELEVATION / DEPTH BOTTOM SCREEN: _____
ELEVATION / DEPTH BOTTOM OF HOLE. _____

ATTACHMENT C-11

TEST PIT LOG — *NUS CORPORATION*

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

ATTACHMENT D-1

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

NUS CORPORATION

ENVIRONMENTAL MANAGEMENT GROUP

STANDARD OPERATING PROCEDURES

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Effective Date: 05/04/90	Revision: 1
Applicability: EMG	
Prepared: Earth Sciences	
Approved: D. Senovich	

Subject: DECONTAMINATION OF CHEMICAL SAMPLING AND FIELD ANALYTICAL EQUIPMENT

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1.0 PURPOSE

The purpose of these procedures is to provide a general methodology, protocol, and reference information on the proper decontamination procedures to be used on chemical sampling and field analytical equipment

2.0 SCOPE

This procedure addresses chemical sampling and field analytical equipment only, and should be consulted when equipment decontamination procedures are being developed as part of project-specific plans.

3.0 GLOSSARY

None.

4.0 RESPONSIBILITIES

Site Manager - responsible for ensuring that project-specific plans and the implementation of field investigations are in compliance with these guidelines.

Field Operations Leader - responsible for ensuring that decontamination procedures for all chemical sampling and field analytical equipment are programmed prior to the actual field effort and that personnel required to accomplish the task have been briefed and trained to execute the task.

5.0 PROCEDURES

In order to assure that chemical analysis results are reflective of the actual concentrations present at sampling locations, chemical sampling and field analysis equipment must be properly decontaminated prior to the field effort, during the sampling program (i.e., between sample points) and at the conclusion of the sampling program. This will minimize the potential for cross-contamination between sample points and the transfer of contamination offsite.

This procedure incorporates only those aspects of decontamination not addressed in other procedures. Specifically it incorporates those items involved in decontamination of chemical sampling and field analytical equipment.

5.1 ACCESS FOR SAMPLING

5.1.1 Bailers and Bailing Line

The potential for cross-contamination between sampling points via the use of common bailer, or its attached line, is high unless strict procedures for decontamination are followed. It is preferable, for the aforementioned reason, to dedicate an individual bailer and its line to each sample point, although this does not eliminate the need for decontamination of dedicated bailers. For non-dedicated sampling equipment, the following conditions and/or decontamination procedures should be followed.

Before the initial sampling and after each succeeding sampling point, the bailer must be decontaminated. The following steps should be followed if sampling for organic contaminants.

- Potable water rinse
- Alconox or Liquinox detergent wash
- Scrubbing of the line and bailer with a scrub brush may be required if the sample point if heavily contaminated with heavy or extremely viscous compounds
- Potable water rinse
- Rinse with 10 percent nitric acid solution*
- Deionized water rinse
- Acetone or methanol rinse
- Hexane rinse**
- Distilled/Deionized water rinse
- Air dry

If sampling for organics only, the nitric acid, acetone, methanol, and hexane rinses may be omitted Contract-specific requirements may permit alternative procedures.

Braided nylon or polypropylene lines may be used with a bailer, however, the same line must not come in contact with the sample medium, otherwise, the line must be discarded in an approved receptacle and replaced. Prior to use, the bailer should be wrapped in aluminum foil or polyethylene sheeting.

5.1.2 Sampling Pumps

Most sampling pumps are normally low volume (less than 2 gpm) pumps. These include peristaltic, diaphragm, air-lift, pitcher and bladder pumps, to name a few. If these pumps are used for sampling from more than one sampling point, they must be decontaminated.

The procedures to be used for decontamination of sampling pumps compare to those used for a bailer except the 10 percent nitric acid solution is omitted. Each of the liquid factions is to be pumped through the system. The amount of pumping is dependent upon the size of the pump and the length of the intake and discharge hoses. Certain types of pumps are unacceptable for sampling purposes.

An additional problem is introduced when the pump relies on absorption of water via an inlet or outlet hose. For organic sampling, this hose should be Teflon. Other types of hoses leach organics into the water being sampled (especially the phthalate esters) or adsorb organics from the sampled water. For all other sampling, the hose should be Viton, polyethylene, or polyvinyl chloride (in order of preference). Whenever possible, dedicated hoses should be used.

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* Due to the leaching ability of nitric acid, on stainless steel, this step is to be omitted if a stainless steel sampling device is being used and metals analysis is required with detection limits less than approximately 50 ppb; or the sampling equipment is dedicated.

** If sampling for pesticides, PCBs, or fuels.

5.1.3 Filtering Equipment

Part of the sampling plan may incorporate the filtering of groundwater samples, and subsequent preservation. This should occur as soon after sample retrieval as possible; preferably in the field as soon as the sample is obtained. To this end, three basic filtration systems are most commonly used - the in-line disposable Teflon filter, the inert gas over-pressure filtration system, and the vacuum filtration system.

For the in-line filter, decontamination is not required since the filter cartridge is disposable, however, the cartridge must be disposed of in an approved receptacle and the intake and discharge lines must still be decontaminated.

For the over-pressure and the vacuum filtration systems, the portions of the apparatus which come in contact with the sample must be decontaminated as outlined in the paragraphs describing the decontamination of bailers. (Note: Varieties of both of these systems come equipped from the manufacturer with Teflon-lined surfaces for those that would come into contact with the sample. These filtration systems are preferred when decontamination procedures must be employed.)

5.2 FIELD ANALYTICAL EQUIPMENT

5.2.1 Water Level Indicators

Water level indicators that come into contact with groundwater must be decontaminated using the following steps:

- Rinse with potable water
- Rinse with deionized water
- Acetone or methanol rinse
- Rinse with deionized water

Water level indicators that do not come in contact with the groundwater but may encounter incidental contact during installation or retrieval need only undergo the first and last steps stated above.

5.2.2 Probes

Probes, e.g., pH or specific ion electrodes, geophysical probes, or thermometers which would come in direct contact with the sample, will be decontaminated using the procedures specified above unless manufacturer's instructions indicate otherwise; in those cases, the methods of decontamination must be clearly described in the FSAP. Probes that contact a volume of groundwater not used for laboratory analyses can be rinsed with deionized water. For probes which make no direct contact, e.g., OVA equipment, the probe will be wiped with clean paper-towels or cloth wetted with alcohol.

6.0 REFERENCES

None.

7.0 RECORDS

None.

APPENDIX D
CHAIN-OF-CUSTODY DOCUMENTATION

M901376

ENSR CHAIN OF CUSTODY RECORD

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Client/Project Name:	Project Location:	Analysis Requested
Project Number:	Field Logbook No.:	
Sampler. (Print Name) /Affiliation:	Chain of Custody Tape No :	
Signature	Send Results/Report to.	

Field Sample No./ Identification	Date	Time	Grab	Comp	Sample Container (Size/Matl)	Sample Type (Liquid, Sludge, Etc.)	Preservative	Field Filtered							Lab I.D.	Remarks

Relinquished by: (Print Name)	Date:	Received by: (Print Name)	Date:	Analytical Laboratory (Destination):
Signature:	Time:	Signature:	Time:	
Relinquished by: (Print Name)	Date:	Received by: (Print Name)	Date:	
Signature	Time:	Signature:	Time:	
Relinquished by (Print Name)	Dat :	Received by. (Print Name)	Date	
Signature:	Time:	Signature:	Time	Serial N . 000959

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SITE _____ PROJECT# _____

SAMPLE ID# _____

ANALYSIS _____

PRESERVATIVE: HNO_3, H_2SO_4, OTHER _____

DATE _____ TIME _____

SAMPLER _____

OTHER _____